STUDIES ON CAUSES AND CONSEQUENCES OF THE 1989-92 CREDIT SLOWDOWN

Federal Reserve Bank of New York

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Studies on Causes and Consequences of the 1989-92 Credit Slowdown

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FOREWORD

The 1990-91 recession and the recent economic expansion have been marked by an exceptional weakness in bank and nonbank credit flows. A major cause of the credit weakness has been tepid loan demand stemming from the general sluggishness of economic activity in recent years. That does not appear to be the whole story, however. The need to reduce historically unprecedented business and household debt burdens that had resulted from heavy debt accumulation in the 1980s has been an important element underlying the recent credit slowdown. At the same time, for a variety of reasons, both bank and nonbank lenders appeared to have restrained credit supply significantly over 1989-92. The confluence of these credit market problems clearly played a role in the disappointing performance of the economy in recent years.

Against this background, it seemed worthwhile to us at the Federal Reserve Bank of New York to examine a broad range of important issues concerning the recent credit slowdown. The results of that examination are contained in the present volume. The papers deal with, among other issues, the importance of credit demand versus credit supply factors, the role of bank and nonbank credit sources, the impact of credit supply shifts on the economy and the implications of those shifts for monetary policy. The first paper in the collection contains a summary of the main findings and a perspective on the implications for monetary policy.

Overall, this collection provides a comprehensive analysis of the 1989-92 credit slowdown experience, and should make a significant contribution to understanding the recent problems in the nation's credit markets. We also hope that the results and insights of the study will prove useful to all those concerned with issues of monetary policy.

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February 1994

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Causes and Consequences of the 1989-92 Credit Slowdown: Overview and Perspective

by M. A. Akhtar[1]

Between early 1989 and late 1992, U.S. economic growth averaged less than 1 percent, well below the long-run trend growth of the economy. This sluggish pattern of growth persisted in the face of substantial easing in monetary policy. Indeed, the economy failed to recover significantly after the 1990-91 downturn. Apparently, the favorable effects of monetary easing were not sufficient to overcome numerous factors depressing the economy: lower defense spending, commercial real estate depression, relatively tight fiscal policy, global competition, corporate restructuring, historically low levels of consumer confidence, and the overextended financial positions of households, businesses, and financial institutions.

The sluggish real growth was accompanied by an unprecedentedly sharp slowdown in credit growth over 1989-92. Many observers have identified high debt service burdens of the nonfinancial sectors and widespread balance sheet problems of borrowers and lenders as crucial elements underlying both the credit slowdown and the persistent weakness of the economy. Others have attributed the sluggish economic performance to supply-side factors underlying the credit slowdown, which resulted in a prolonged period of substantially reduced credit availability to businesses and households. More recently, concerns about credit availability appear to have eased as credit growth has shown some signs of recovery.

Against the background of these developments, this overview provides a broad perspective on the causes and consequences of the 1989-92 credit slowdown. It begins by presenting a general conceptual framework for the analysis and then reviews the evidence from the collection of studies on the credit slowdown. The article also discusses implications of the evidence for monetary policy and offers some tentative general observations on the recent credit slowdown experience.

Overall, studies reviewed here provide substantial evidence of credit supply problems, or a "credit crunch" during the 1989-92 period for both bank and nonbank credit sources. The evidence on the consequences of credit supply constraints is less compel-

[1] I am grateful to Richard Davis and Glenn Hubbard for comments and discussions, and to Martina Heyd for competent research assistance.

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ling, but the studies do indicate, at least collectively, that credit constraints have played some role in weakening economic activity. The depressing effects of the credit crunch appear not to have been the primary or dominant cause of the economic slowdown, however. As for the implications for monetary policy, credit supply problems clearly contributed to reducing the effectiveness of monetary policy, although it is difficult to isolate their effects from those of other factors disrupting or altering the channels of policy influence to the economy.

I. Credit Slowdown vs. Credit Crunch: A General Framework

There is no generally accepted definition of the term "credit crunch," but it is usually taken to mean a sharp reduction in the supply or availability of credit at any given level of interest rates. To clarify terminology and to provide a broad context for the issues involved in identifying a credit crunch, we begin with the more encompassing notion of credit slowdown or decline. At the broadest level, an observed slowdown or decline in credit may result from either the demand side or the supply side. At a given lending rate or the price of credit, the demand for credit may fall because of other (nonprice) determinants of credit demand. In the usual graphical supply-demand framework, the demand schedule for credit may shift down and to the left. This is shown in Chart 1, panel 1, under very simplistic market conditions, where the price of credit includes both the loan rate and nonrate loan terms, such as collateral, maturity, and covenants. From a macroeconomic perspective, this type of shift may occur because of lower credit demand stemming from either cyclical weakness in economic activity or structural factors—such as changes in the tax code, inventory techniques, or the borrowers' desired debt-to-income ratio—that reduce the perceived need for credit permanently. In general, shifts in credit demand induced by cyclical weakness in economic activity are relatively commonplace while credit demand shifts due to structural changes are somewhat less frequent but not unusual.

A downward shift in credit demand tends to put downward pressures on loan rates and other loan terms and, given an unchanged supply schedule, leads to easier loan terms at the new credit market equilibrium. Moreover, if a downward credit demand shift is caused by structural factors, it may also be accompanied by a steepening (flattening) of the demand schedule; the demand for credit may become less (more) responsive to changes in the price of credit (Chart 1, panel 1, D_2 schedule).

On the supply side, a credit slowdown or decline may reflect reduced willingness to lend at prevailing interest rates and demand conditions. Factors that can cause reduced willingness to lend include, among others, balance sheet difficulties of lenders (poor quality assets, high loan losses, etc.), higher capital requirements and regulatory constraints on lenders, and increases in actual or perceived riskiness of borrowers' credit quality. The last factor is intended to capture credit supply shifts resulting from changes in a borrower's balance sheet conditions. Specifically, a deterioration in the quality of a borrower's balance sheet reflecting, for example, a drop in asset prices, weakens his ability to repay existing debts or to borrow new funds.[2] The decline in creditworthiness of the borrower, in turn, may reduce the lender's willingness to extend a loan, causing a decline in the supply of credit. In this situation, the supply shift reflects reduced credit availability to

[2] More generally, the deterioration in the quality of the borrower's balance sheet (and the associated decline in the creditworthiness) may result either from a cyclical decline, or from noncyclical shocks (economy-wide or partial) such as an asset price drop in one or more sectors. As discussed below, it is very difficult to separate credit supply from demand effects of general cyclical shocks to the economy.

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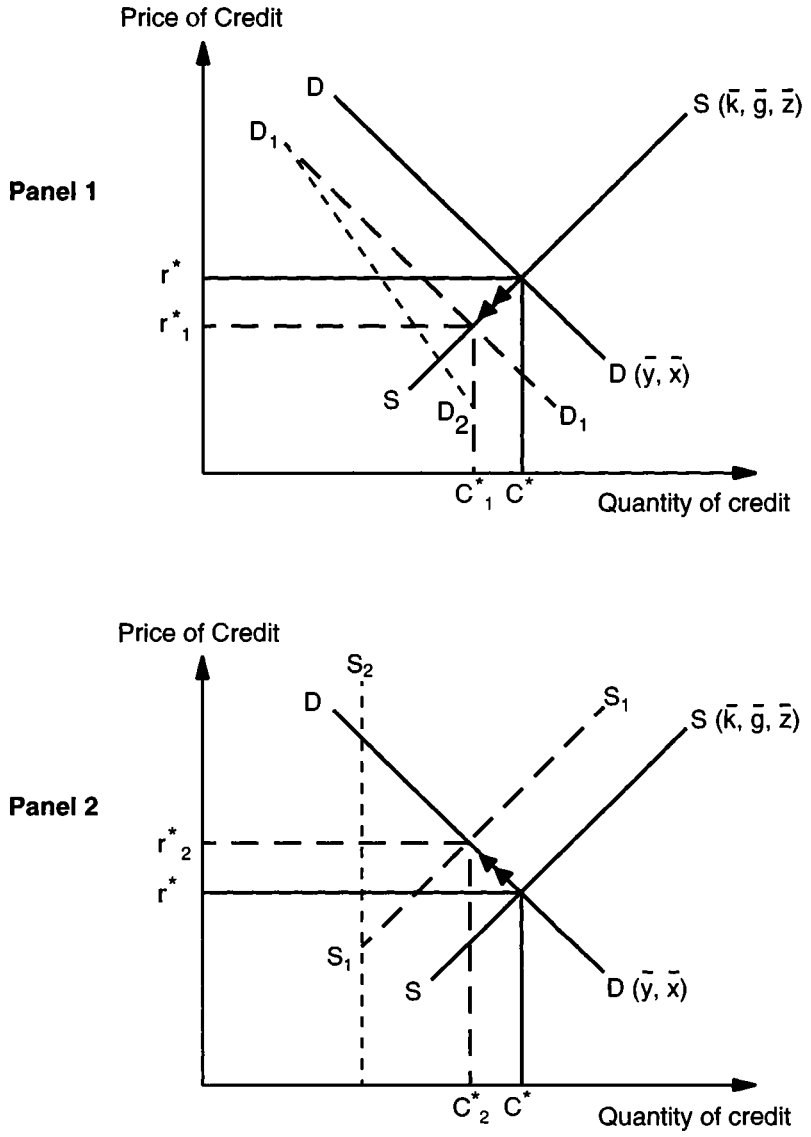
desire to lend to those borrowers whose creditworthiness has remained unchanged. Note that, the drop in borrowers' creditworthiness could be treated, in principle, as a drop in credit demand by borrowers of *given* risk characteristics (unchanged creditwor-

Chart 1: Credit Demand and Supply



D = initial credit demand schedule, where all determinants other than the price of credit (loan rate and nonrate loan terms) are held constant ($\bar{y}$ is a proxy for aggregate demand in the economy and $\bar{x}$ represents all other variables).

S = initial credit supply schedule, where all determinants other than the price of credit are held constant ($\bar{k}$ is a proxy for capital, $\bar{g}$ is a proxy for regulatory and supervisory constraints, and $\bar{z}$ represents all other variables).

C^*= initial equilibrium credit.

r^* = initial equilibrium price of credit.

D_1 and D_2 represent the credit demand schedule after shifts, while S_1 and S_2 represent the credit supply schedule after shifts. C^*_1, C^*_2, r^*_1, and r^*_2 represent new equilibrium values for credit and the price of credit.

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borrowers whose credit quality has been impaired, but there is no change in the lender's thiness) in that there are fewer such borrowers. Nonetheless, at a practical level, it is more convenient to look at the effect of changes in borrowers' credit quality—especially those resulting from noncyclical shocks—on the willingness of lenders to supply credit.

In any event, the reduced willingness to lend may show up as a leftward shift in the credit supply schedule (Chart 1, panel 2). In this case, borrowing is rationed by price as loan rates and nonrate loan terms tend to tighten and the new credit market equilibrium is attained at higher interest rates and generally more restrictive loan terms, other things equal.

The reduced willingness to lend may not show up as a simple leftward shift of credit supply envisaged in the context of a market-clearing environment, however. Instead, lenders may resort to increased nonprice credit rationing, that is, loans are rationed by quantity rather than by variations in prices (interest rates and nonrate loan terms). In this case, lenders do not feel that they can protect themselves against risk by charging higher credit prices. Put another way, the credit supply schedule is not fully operative; in the extreme case, the schedule shifts leftward and becomes vertical, with the supply of credit becoming completely insensitive to interest rates (Chart 1, panel 2, S_2 schedule). In practice, the existence of nonprice credit rationing does not preclude the role of interest rates and other loan terms; some borrowings may be rationed by price and others by quantity or by both. Nonprice credit rationing may take many different forms: some borrowers obtain loans while other borrowers with identical creditworthiness do not; loans for certain types of borrowing or to certain classes of borrowers are unavailable; some apparently creditworthy borrowers are denied loans at prevailing interest rates because lenders' do not perceive them to be creditworthy.[3]

The papers in this volume deal with both demand and supply factors in the credit slowdown since 1989, but the emphasis is on sorting out the role of supply-side factors and their implications for nonfinancial economic activity. Accordingly, the term "credit crunch" as used here refers to a slowdown or decline in the supply of credit, whether rationed by price or nonprice mechanisms, or simply to credit supply problems. This definition is clearly much broader than the narrow use of that term to describe situations of nonprice credit rationing. It is also broader than another frequently mentioned definition of credit crunch: "a widespread, sudden, sharp, indiscriminate, and rather brief credit shutdown" (Wojnilower, 1993).[4]

In a macroeconomic context, the existence of credit supply problems implies that the observed credit slowdown (reduction) cannot be fully explained by cyclical developments in aggregate demand, except insofar as cyclical developments may have significant adverse effects on borrowers' creditworthiness as perceived by lenders. There are, of course, numerous identification problems in sorting out supply from demand factors in the credit slowdown. For example, a sharp reduction in the willingness to lend may lead to a decline in output, inducing a reduction in the demand for credit. In these circumstances, the credit slowdown will be reported as reflecting lower demand for credit even though it was, in fact, caused by an initial shock to the supply of credit (Friedman 1993 a, b).

[3] See Jaffee and Stiglitz (1990) for a detailed survey of various aspects of credit rationing.

[4] For other perspectives on defining a credit crunch, see Peek and Rosengren (1992), Owens and Schreft (1992) and Wojnilower (1992a). For other perspectives on the current credit crunch, see Bernanke and Lown (1991), Cantor and Wenninger (1993), Jones (1993), Jordan (1992), Kaufman (1991), Kliesen and Tatom (1992), Peek and Rosengren (1992), Sinai (1993), Syron (1991), and Wojnilower (1993). For detailed analysis of earlier crunches, see Wojnilower (1980) and Wolfson (1986).

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More generally, with both demand and supply factors operating simultaneously and interacting with each other, it is very difficult to distinguish shifts in the supply schedule from developments on the demand side. Lenders usually tend to tighten credit standards and terms for lending when the overall economy slips into a recession because, on average, business and household loans entail higher risks than before. But the extent of lenders' response depends not only on the degree of perceived economic weakness and its effects on borrowers' credit quality but also on the state of their own balance sheets. From the perspective of borrowers, this situation would look like a contraction in credit supply while lenders may believe this to be a response to developments in aggregate demand. Strictly speaking, there is no change in the lenders' willingness to extend credit to borrowers of given circumstances (that is, unchanged creditworthiness). At the same time, the reduced supply is not a response to lower demand for credit. The constriction in the supply of credit has clearly been caused by a decline in the willingness of lenders, albeit reflecting the adverse effect of the weaker economy on the creditworthiness of borrowers and balance sheets of banks. Any sorting out of the demand and supply aspects in this case would be further complicated by the fact that the recession itself would reduce the demand for credit.

The identification of demand and supply factors in the recent credit slowdown is particularly difficult because of the conjunction of the prolonged cyclical weakness in the economy with a correction of earlier credit excesses. Those credit excesses, as noted in Section IIID below, reflected the process of unusually rapid increases in debt in the mid-1980s and became unsustainable over time as both borrowers and lenders experienced balance sheet and other difficulties, with cyclical developments reinforcing pressures for correction. In this highly "endogenous" process, the demand for credit is believed to have fallen simultaneously with reductions in banks' capacity and willingness to lend.

Notwithstanding these difficulties, the twelve studies in this volume examine a broad range of issues concerning the 1989-92 credit slowdown. Five of these studies (Lown/Wenninger, Cantor/Rodrigues, Johnson/Lee, Demsetz, Seth) look at various aspects of the role of bank and nonbank credit sources in the slowdown of private nonfinancial debt, focusing on the importance of credit demand relative to credit supply factors. One study (Hamdani/Rodrigues/Varvatsoulis) reviews survey data on credit tightening from lenders and borrowers, and another study (Mosser/Steindel) explores the role of economic activity and other "fundamentals" in explaining the recent credit slowdown. Three studies (Harris/Boldin/Flaherty, Mosser, Steindel/Brauer) investigate the effects of credit supply problems on various aspects of nonfinancial economic activity. Finally, two studies (Hilton/Lown, Hickok/Osler) consider some special aspects of the credit slowdown: one attempts to assess the impact of credit supply shifts on the broadly defined money stock, M2, and the other provides a broad overview of the nature and extent of the credit slowdown abroad, largely based on the experience in France, Japan, and the United Kingdom.

The remainder of this article reviews evidence from the twelve studies under four broad headings: the extent of the credit slowdown; factors behind the credit slowdown; consequences of the credit crunch for nonfinancial economic activity; and implications of the credit crunch for monetary policy. The last section offers a few tentative concluding observations on the recent credit crunch experience.

II. Extent of the Recent Credit Slowdown

Collectively, the studies in this volume show that the U.S. economy has experienced a broadly based and sharp credit slowdown in recent years. In documenting and describ-

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ing the credit slowdown from the viewpoint of various types of borrowers (business, household, real estate, small business) or lenders (banks, other depositories, finance companies, insurance companies, foreign banks, bond markets), most of the studies begin by examining the extent of credit slowdown in the recent period. Since the timing of the slowdown is not uniform across all borrowers and lenders, however, these studies do not target a common time period for the recent credit slowdown. Nor do they judge the recent credit slowdown against a common historical benchmark. Instead, each study provides a comprehensive look at relevant credit developments from its particular vantage point using whatever time periods make most sense.

Nevertheless, it may be useful to provide a common time frame for summarizing the extent of the slowdown in private nonfinancial debt and its main components on both the lending and the borrowing sides. I use the flow of funds data to highlight the breadth and depth of credit slowdown over the last three years (1989-IV to 1992-IV), taken as a whole, relative to long-term trends in the periods 1960-82 and 1982-89. Because inflation was greater in the earlier periods than in the most recent period, comparisons of nominal credit growth rates may be misleading. I have, therefore, presented data in both nominal and real terms in many cases. For simplicity and convenience, however, I have used the GDP deflator to convert nominal dollars into real dollars rather than search for specific sectoral deflators. (Sectoral deflators might change precise real dollar values but they are unlikely to alter the broader contours of constant dollar data obtained on the basis of the GDP deflator.) The points made here provide a broad overview of the extent of the credit slowdown to nonfinancial borrowers from both bank and nonbank sources, and may be viewed as a summary of details in various studies.

A. Private Nonfinancial Debt

Using data on nominal and real debt and ratios of debt to GDP, I begin by looking at the extent of the slowdown in private nonfinancial debt in terms of its three broad decompositions: business versus household debt, mortgage versus nonmortgage debt, and corporate versus noncorporate debt. As shown in Table 1, private nonfinancial debt growth declined sharply to about 3 percent, at an annual rate, over 1989-92 from long-term trend rates of 9 1/2-10 1/2 percent. Both businesses and households experienced large debt slowdowns, but the rate of decline was much greater for the business sector. Nonfinancial business sector debt growth averaged less than 1 percent in the recent period, compared with a long-term trend rate of 10 percent, while household debt growth averaged 5.6 percent in the recent period, about one-half the average growth rate over 1982-89.

In real terms, private nonfinancial debt actually declined somewhat over 1989-92 compared with trend rates of nearly 7 percent and 4 1/4 percent over 1982-89 and 1960-82, respectively. For both the business and household sectors, real debt trend growth rates were significantly higher in the 1982-89 period than in the earlier period. Credit to the nonfinancial business sector declined by nearly 3 percent, on average, in real terms over 1989-92, following more than 6 percent average growth over 1982-89. The sharp declines in private and business debt growth in recent years have reversed the rising trends of ratios of private and business sector debt to GDP (Chart 2 and Table 1) despite a sustained period of weak growth of nominal GDP.

With nonmortgage debt of both businesses and households slowing to about 2 percent at an annual rate over 1989-92, the greater decline in total business debt growth relative to household debt growth in recent years appears to be largely the result of differences in home and business mortgage debt developments (Table 2). Home mort-

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Table 1: Nonfinancial Debt
Fourth Quarter over Fourth Quarter Percent Change, Annual Rate

	Total Nonfinancial	Private Nonfinancial	Nonfinancial Business	Households
Current dollars				
1960-82	8.6	9.6	10.0	9.2
1982-89	11.0	10.6	10.1	11.1
1989-92	5.2	3.1	0.7	5.6
Constant 1987 dollars[a]				
1960-82	3.1	4.2	4.5	3.8
1982-89	7.2	6.8	6.3	7.3
1989-92	1.7	-0.4	-2.8	2.0
Ratio of debt to GDP				
1960-82	0.2	1.2	1.6	0.8
1982-89	3.5	3.1	2.6	3.6
1989-92	0.3	-1.8	-4.2	0.6
Memo: 1992-IV current dollar share of total nonfinancial debt	100.0	65.3	31.4	33.9

a. GDP deflator was used to construct constant dollar series.

gage debt advanced at a hefty 7 percent annual rate in the 1989-92 period, although its rate of growth decelerated substantially from the historically high average growth rate over 1982-89. By contrast, business debt for real estate development declined at an average annual rate of about 2 percent during 1989-92, down from an average annual growth rate of close to 10 percent in the earlier period.

In real terms, both mortgage and nonmortgage components of business debt declined significantly in the 1989-92 period. But businesses have experienced a much sharper decline in credit flows for mortgages than for other activity in recent years.

Recent business debt developments have also differed significantly by the size of borrowers. As a group, large or corporate business borrowers fared better than small or noncorporate borrowers in the recent credit slowdown. Credit to corporate borrowers increased at an annual average rate of nearly 2 percent during the last three years, down from an 11.3 percent average increase over 1982-89 (Table 3). By contrast, noncorporate borrowers experienced an outright credit decline of 1.3 percent, at an annual rate, in the 1989-92 period compared with growth rates of about 11 percent in 1982-89. It is interesting to note that noncorporate borrowing is the only category among those reported here that showed significantly lower *real* debt growth in the 1982-89 period than in the earlier period.

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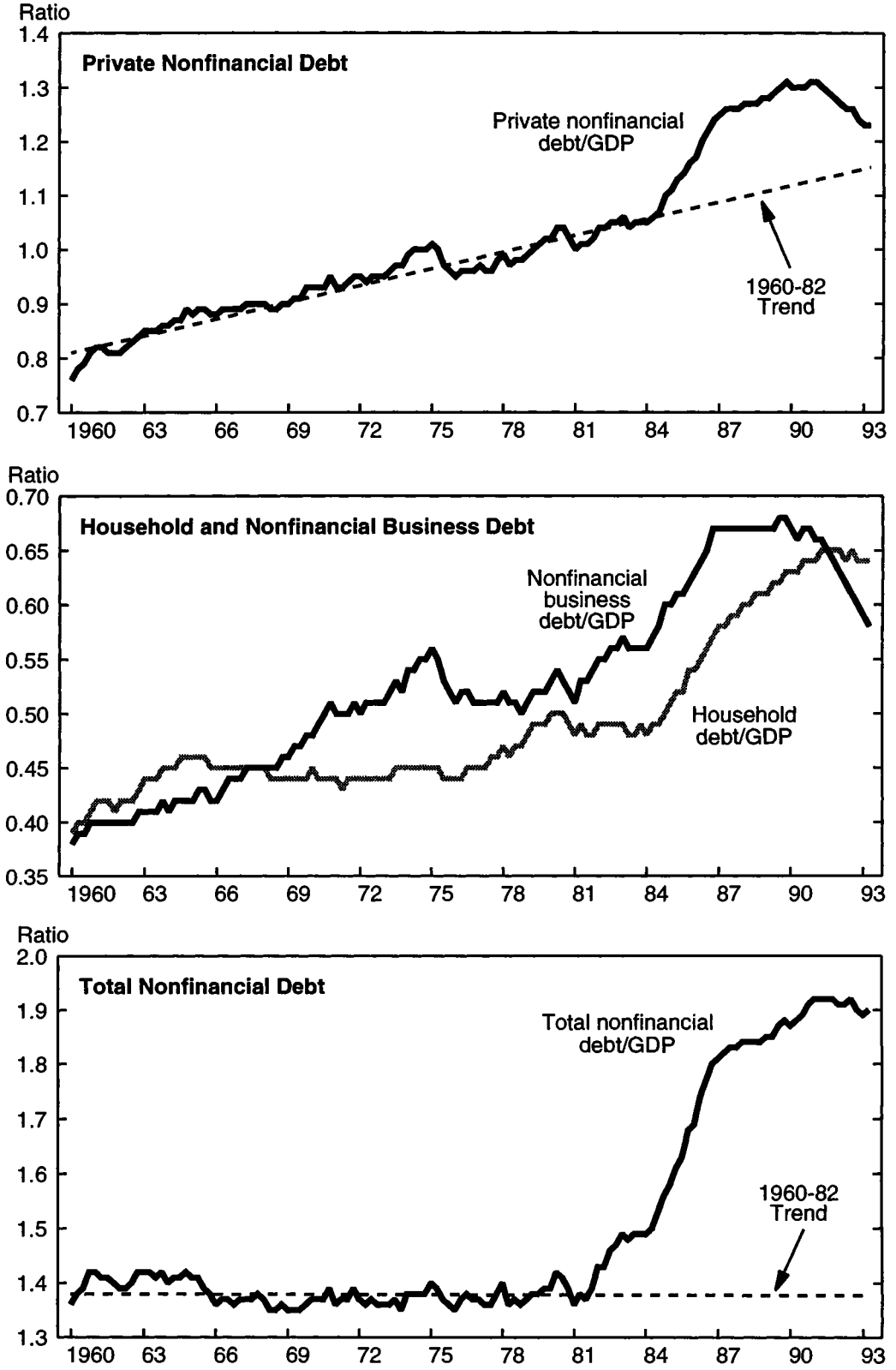
Chart 2: Ratios of Debt to GDP



Sources: Board of Governors of the Federal Reserve System, Flow of Funds Accounts; U.S. Department of Commerce.

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Table 2: Private Nonfinancial Debt
Fourth Quarter over Fourth Quarter Percent Change, Annual Rate

		Mortgage			Nonmortgage		
	Private Nonfinan-cial	Total	Business	Home Mortgage	Total	Business	House-hold
Current dollars							
1960-82	9.6	9.6	10.3	9.3	9.6	9.9	9.1
1982-89	10.6	10.9	9.7	11.5	10.3	10.3	10.3
1989-92	3.1	4.2	-1.9	7.1	2.0	1.9	2.3
Constant 1987 dollars[a]							
1960-82	4.2	4.2	4.8	3.8	4.2	4.4	3.7
1982-89	6.8	7.1	5.9	7.8	6.5	6.5	6.5
1989-92	-0.4	0.7	-5.4	3.6	-1.4	-1.6	-1.1
Memo:1992-IV current dollar share of private nonfinancial debt	100.0	50.2	14.3	35.9	49.8	33.8	16.0

a. Based on GDP deflator.

B. Bank and Nonbank Credit Sources

The slowdown in private nonfinancial debt growth was broadly spread across depository (banks and thrifts) and nondepository credit sources (Table 4). Banks and thrifts, however, experienced a sharper decline in credit growth over 1989-92 than did *overall* nondepository credit growth. Total depository credit actually declined at an annual rate of about 2 percent over 1989-92 following 9.3 percent average growth over 1982-89, while total nondepository credit growth slowed to a 7 percent average rate in the recent period from about 12 percent in the preceding period. Both depository and nondepository credit growth rates are, of course, much lower on a constant dollar basis. At this level of aggregation, the bulk of the deceleration in private nonfinancial credit growth over 1989-92 relative to the 1982-89 average rate is accounted for by depository sources, with both banks and thrifts making substantial contributions to the slowdown.

The outright decline in total depository credit over 1989-92 reflects, to a considerable extent, the collapse of the savings and loan industry. In fact, the commercial bank credit component—which represents about 70 percent of total depository credit—advanced at a 2 percent average annual rate over the 1989-92 period, compared with a long-term trend rate of around 10 percent. This modest bank credit growth was more than fully offset, however, by a 45 percent (13 1/3 percent at an annual rate) decline in credit by savings and loan associations.

While overall nondepository credit growth has held up better than overall depository or bank credit growth, many components of nondepository credit did not fare much better than bank credit. As explained in the Cantor/Rodrigues study, credit growth to businesses experienced roughly similar slowdowns in commercial paper, finance company lending, and bank loans in recent years relative to earlier trends.

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Comparing the contribution of depository and nondepository sources to business credit developments reveals that banks and thrifts accounted for about four-fifths of the fall in business mortgage debt growth in 1989-92 relative to 1982-89 (Table 5). The slowdown in nonmortgage business debt in the recent period relative to the earlier period was somewhat more evenly divided between depository and nondepository sources. For the nonfinancial business sector as a whole, most of the deceleration in the average credit growth from the1982-89 period to the 1989-90 period reflected the slowdown in depository credit; banks accounted for somewhat more than one-half of the depository contribution.

On the household side, the collapse of the savings and loan industry and the lending slowdown by other thrifts were responsible for most of the slowdown in home mortgage debt growth in 1989-92 relative to 1982-89. The pace of commercial bank credit flows for home mortgages actually picked up somewhat during the 1989-92 period. Banks, however, made the largest contribution to the slowdown in nonmortgage household credit, accounting for more than half of the total slowdown in that component.

C. Selected Aspects of Bank Business Loans

Data reported above clearly indicates that commercial banks have played a major role in the 1989-92 credit slowdown for both business mortgages and nonmortgage business loans. For the nonfinancial business sector as a whole, the slowdown in bank loans accounted for more than one-third of the deceleration in average credit growth from 1982-89 to 1989-92.

Table 3: Nonfinancial Business Debt
Fourth Quarter over Fourth Quarter Percent Change, Annual Rate

		By Size of Borrower		By Type of Borrowing	
	Total[a]	Large[b]	Small[c]	Mortgage	Other
Current dollars					
1960-82	10.0	8.7	14.1	10.3	9.9
1982-89	10.1	11.3	10.9	9.7	10.3
1989-92	0.7	1.8	-1.3	-1.9	1.9
Constant 1987 dollars[d]					
1960-82	4.5	3.3	8.5	4.8	4.4
1982-89	6.3	7.5	7.1	5.9	6.5
1989-92	-2.8	-1.7	-4.8	-5.4	-1.6
Memo: 1992-IV current dollar share of private nonfinancial debt	48.1	31.4	15.0	14.3	33.8

a. All corporate and noncorporate debt.
b. Corporate sector, excluding farm debt.
c. Nonfarm, noncorporate debt.
d. Based on GDP deflator.

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Both large (corporate) and small (noncorporate) business borrowers from banks experienced outright declines in bank loans over 1989-92, but the rate of decline was considerably greater for noncorporate borrowers (Table 6). Specifically, over the 1989-92 period, nonmortgage bank loans to noncorporate borrowers declined at a 4 1/2 percent annual rate, more than twice the pace of decline for corporate borrowers.

Table 4: Nonfinancial Private Credit Growth
Fourth Quarter over Fourth Quarter Percent Change, Annual Rate

	Depository Credit	Nondepository Credit	Bank Credit	Depository Loans	Bank Loans
Current dollars					
1960-82	9.7	9.6	10.1	9.7	10.3
1982-89	9.3	11.8	10.1	9.0	9.9
1989-92	-2.0	7.0	2.0	-2.7	1.1
Constant 1987 dollars[a]					
1960-82	4.2	4.1	4.7	4.3	4.8
1982-89	5.5	8.0	6.3	5.3	6.1
1989-92	-5.4	3.5	-1.5	-6.1	-2.4
Memo: 1992-IV current dollar share of private nonfinancial debt	39.9	60.1	28.1	36.3	25.5

a. GDP deflator was used to construct constant dollar series.

Table 5: Contributions to the Credit Slowdown
From 1982-89 to1989-92

	Business			Household		
	Mortgage	Other	Total	Home Mortgage	Other	Total
Decline in credit growth rate[a]	11.6	8.4	9.4	4.4	8.0	5.6
Percent of total decline contributed by:						
Depository sources	82.8	58.3	69.1	84.1	67.5	78.6
Banks	38.8	21.4	37.2	-6.8	55.0	23.2
Thrifts	44.0	36.9	31.9	90.9	12.5	55.4
Nondepository sources	17.2	41.7	30.9	15.9	32.5	21.4

a. Annual average credit growth rate over 1982-89 *minus* annual average growth rate over 1989-92.

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In the absence of bank loan sales, bank credit flows to businesses would probably have been even weaker in recent years. The study by Demsetz indicates, however, that adjustments for bank business loan sales to nonbanks and nonfinancial institutions over the 1986-92 period actually increase the severity of the recent slowdown in commercial and industrial loans on banks' books because business loan sales have decreased in recent years. (Note that the flow of funds data for nonfinancial borrowers reported here already incorporate loan sale adjustments.) Even so, the liquidity provided by loan sales and securitization has most likely enabled banks to maintain higher levels of total loan origination than would have been the case otherwise. Cantor and Rodrigues point out in their study for this volume that mortgage-backed securities have grown about 70 percent since 1988 and that securitization of business and consumer credit has proceeded even more rapidly over that period.[5] Clearly, recent sharp advances in securitization have, to some extent, cushioned the credit slowdown.

As described in detail in the study by Lown and Wenninger, the bank credit slowdown was spread fairly broadly across various regions of the country, but Northeast (New England and Mid-Atlantic) and Pacific regions experienced very large outright declines in total and business bank loans over 1989-92. Other regions also experienced contractions in commercial and industrial loans, although in some cases the rates of decline were relatively modest.

[5] Cantor and Demsetz (1993) show that over the two years to the second quarter of 1992, the growth in loans for home mortgages, consumers, and businesses inclusive of off-balance-sheet lending (securitization and loan sales) exceeded the growth in loans on the books of banks, thrifts, mortgage companies, and finance companies as a group.

Table 6: Nonfinancial Business Loans by Banks
Fourth Quarter over Fourth Quarter Percent Change, Annual Rate

		Nonmortgage Business Loans			
	Total	Total[a]	Large Business[b]	Small Business[c]	Mortgages
Current dollars					
1960-82	10.6	10.3	10.0	14.0	12.0
1982-89	9.9	7.2	8.0	7.1	16.5
1989-92	-1.7	-2.3	-2.2	-4.5	-0.7
Constant 1987 dollars[d]					
1960-82	5.2	4.9	4.5	8.5	6.5
1982-89	6.1	3.5	4.3	3.3	12.7
1989-92	-5.2	-5.7	-5.6	-7.9	-4.2
Memo: 1992-IV share of private nonfinancial debt	13.7	8.7	6.9	1.4	5.0

a. All corporate and noncorporate business.
b. Nonfarm corporate business.
c. Nonfarm, noncorporate business.
d. Based on GDP deflator.

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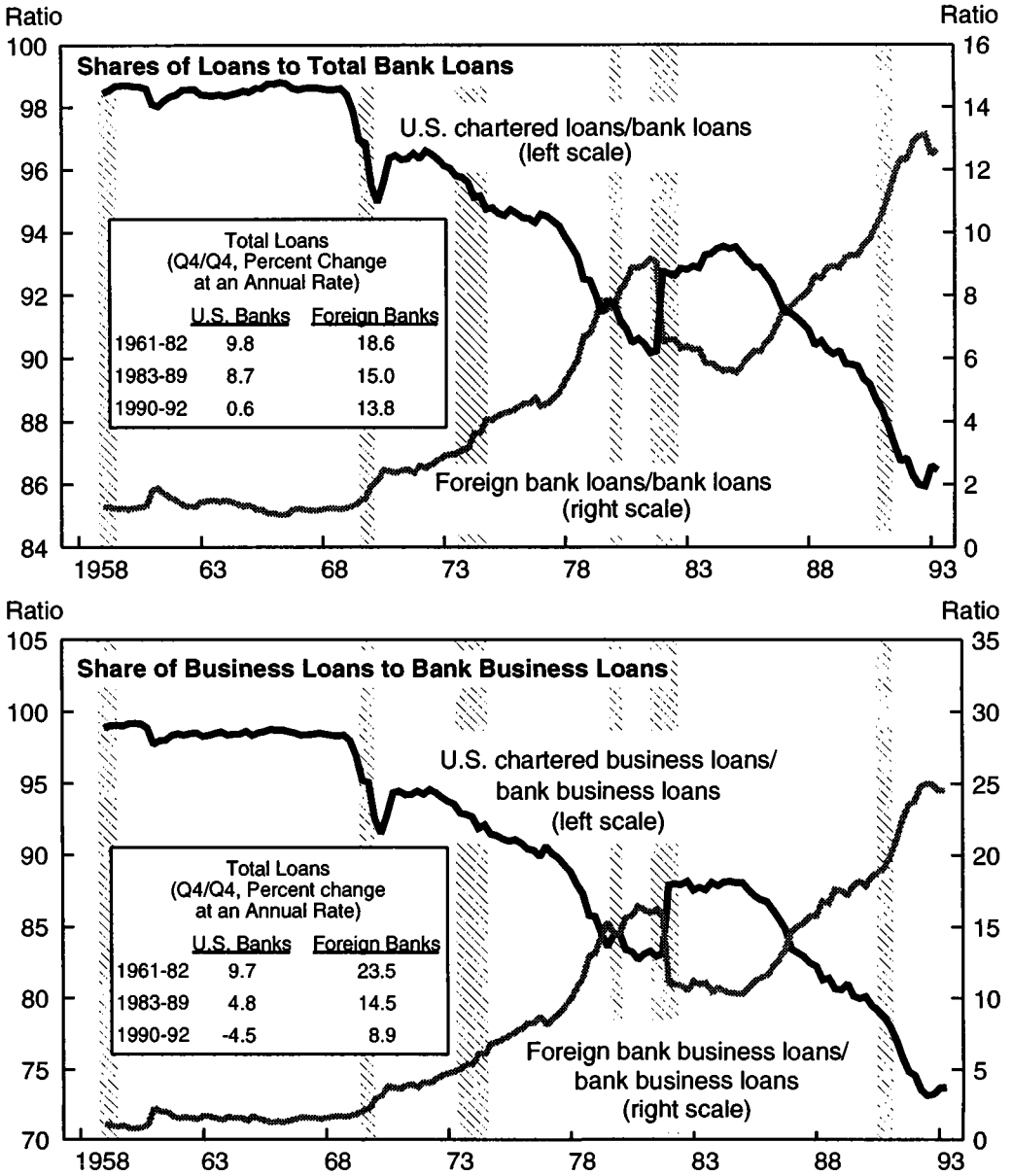
Chart 3: Comparison of Domestic and Foreign Bank Loan Shares



Source: Board of Governors of the Federal Reserve System, Flow of Funds Accounts.
Note: Shaded areas indicate periods designated recessions by the National Bureau of Economic Research.

Within the banking system, the bulk of the recent bank credit slowdown is attributable to domestic banks as opposed to foreign banking offices in the United States (Chart 3). Total loans of U.S.-chartered banks showed less than 1 percent annual average growth over 1989-92, and business loans actually declined outright at a 4.5 percent annual rate. By contrast, total U.S. loans of foreign banking offices in the U.S. advanced at an annual rate of about 14 percent over the recent three-year period, only slightly below the average increase over the 1982-89 period. Business loans by foreign banking offices did register a significant slowdown in the recent period, but they continued to increase at a hefty annual pace of about 9 percent.

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These trends in foreign bank loans to U.S. borrowers are analyzed in more detail by Rama Seth in her study for this collection. She finds that as a group, foreign banks supported U.S. total credit growth during the recession, although many foreign banks, especially those from Japan, Italy, and the United Kingdom, cut back on loans over that period. While Seth is unable to provide a full accounting of the continued strong loan growth at foreign banks, she notes that their desire to increase market share and their capital strength may have been important in maintaining the relative strength of foreign bank lending.

The differing patterns of loan developments for foreign relative to domestic banks have substantially reduced the domestic bank shares of total and business loans (Chart 3). Moreover, the flow of funds data used here understate the extent of foreign bank loans to U.S. residents because offshore foreign banks' U.S. lending is excluded (McCauley and Seth 1992). Adjusted for offshore data, the true shares of U.S.-chartered banks are considerably smaller than shown in Chart 3.

III. Factors Behind the Credit Slowdown

Studies in this volume investigate demand and supply factors underlying the slowdown in private nonfinancial debt for both bank and nonbank sources of credit. The evidence includes descriptive and econometric analysis and is based on hard data as well as on survey materials for borrowers and lenders. On the demand side, the studies look for both cyclical effects—the credit slowdown viewed as a by-product of the economic slowdown—and noncyclical demand influences. On the supply side, the evidence for both price and nonprice rationing of credit is considered.

A. Cyclical and Noncyclical Demand Influences

At an impressionistic level, the recent credit slowdown cannot be fully explained by the 1990-91 recession and the slow growth period surrounding the recession. Several studies in our collection—especially those by Cantor/Rodrigues, Lown/Wenninger, and Mosser/Steindel—provide noneconometric data analysis of cyclical effects on various debt or credit components. The general thrust of the authors' analysis of cyclical effects is captured by data in Table 7, although collectively these studies cover a much broader range of issues and detail. Briefly, the growth rate of private nonfinancial debt in nominal and real terms has been substantially lower in the period surrounding the recent recession than over comparable periods for the four earlier major recessions, on average, or considered individually. Broadly, this pattern holds for major aggregate borrowing components and for both bank and nonbank credit. The only significant exception is the flow of home mortgage debt from both bank and nonbank sources, which has been significantly stronger in real terms over the period surrounding the latest recession than around the last three major recessions since 1970.

The comparison of credit flows reported in Table 7 probably understates, to some extent, the contribution of cyclical developments to the private credit slowdown around the current recession relative to the earlier episodes. As shown in Chart 4, the pace of economic activity, nominal and real, was weaker in the current cycle than it had been on average in the earlier cycles. Nevertheless, as pointed out by Lown/Wenninger and others, the differences in the pace of activity do not fully explain the sharp credit slowdown in the current episode relative to the earlier episodes. Moreover, the credit weakness itself may be responsible, in part, for the slower pace of economic activity in the current cycle. With changing relationships between credit flows and economic activity, it is

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very difficult to assess the contribution of weaker-than-average growth in the current cycle to the severity of the credit slowdown. But one simple way to get a very rough sense of this contribution is to use the average relationship between real credit flows and economic growth for the earlier cycles as a benchmark to calculate the implied credit flows associated with recent growth performance. This type of exercise suggests that the weaker-than-average pace of economic activity accounts for only about 35 percent of the gap between the private credit growth in the current cycle and the average private credit growth in the past four cycles.

Some noncyclical or structural demand shifts may also have contributed to reducing the demand for credit in recent years. Such shifts are "permanent," by definition, but their influence on demand may be difficult to separate from that of cyclical forces. Some studies in this volume note the relevance of structural demand shifts in recent developments in credit flows. In particular, the Lown/Wenninger and Mosser/Steindel papers discuss the influence of a possible downward shift in inventory demand relative to sales, especially in the manufacturing sector, on the demand for commercial and industrial

Table 7: Credit Growth over Various Business Cycles[a]
Percent change, Annual Rate

				Mortgage		
	Private Nonfinancial	Business Nonfinancial	Household	Business	Home Mortgage	Non-mortgage
Current dollars						
Average, current cycle	3.1	0.7	5.6	-1.9	7.1	2.0
Average, earlier cycles(A)[a]	8.8	9.2	8.5	10.2	8.5	8.6
Average, earlier cycles(B)[b]	9.0	9.7	8.3	10.6	8.2	9.0
Constant 1987 dollars[c]						
Average, current cycle	-0.4	-2.8	2.0	-5.4	3.6	-1.4
Average, earlier cycles(A)[d]	3.9	4.2	3.5	5.2	3.6	3.7
Average earlier cycles(B)[a]	3.2	3.9	2.5	4.7	2.4	3.2

a. Business cycle periods cover four quarters before trough, trough quarter and seven quarters after trough.

b. Average of the 1958, 1970, 1975 and 1982 cycles.

c. Average of the 1970, 1975 and 1982 cycles.

d. Based on GDP deflator.

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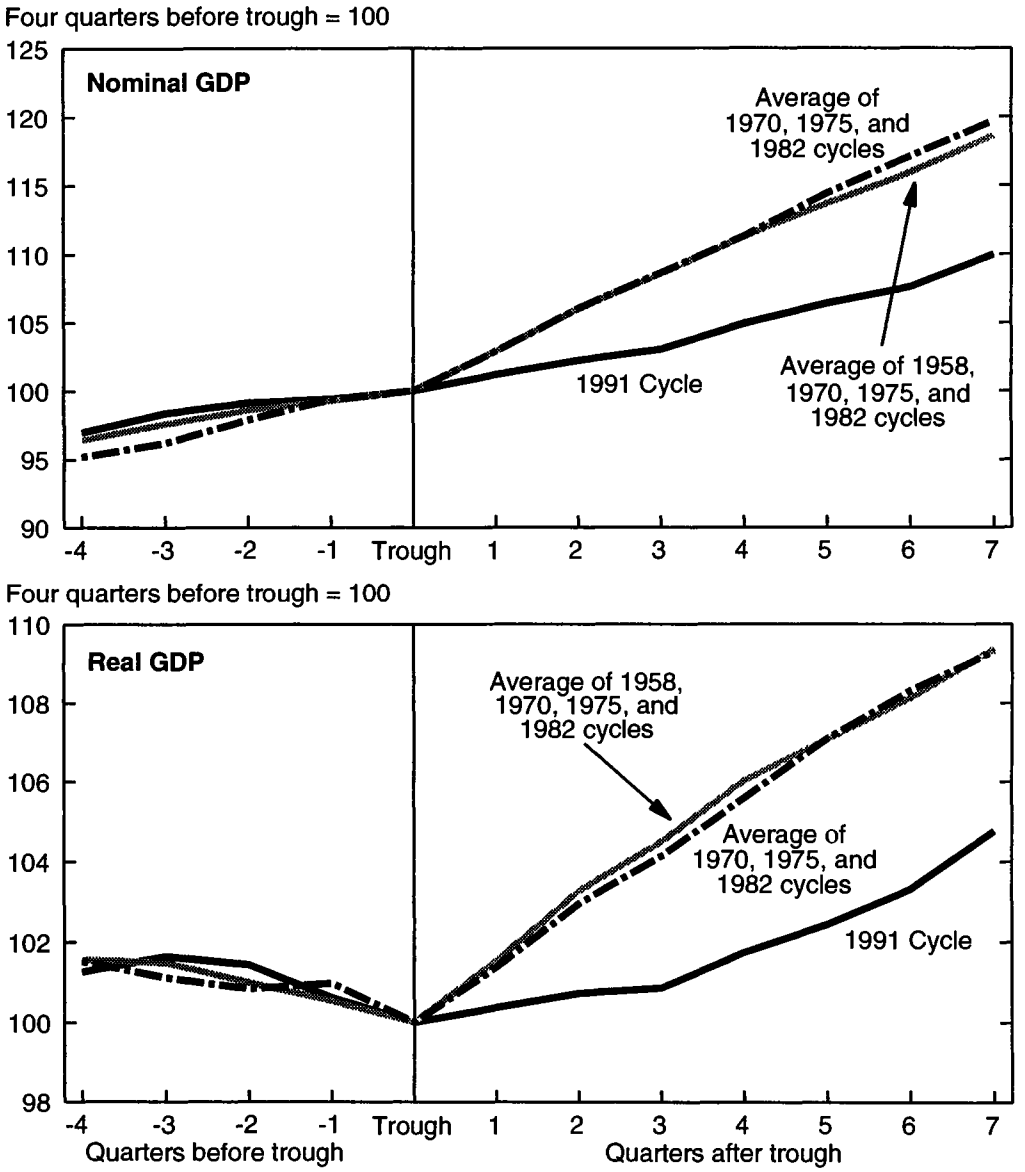
loans. Because of just-in-time and other management techniques, the amount of inventories needed for a given level of sales and, therefore, the financing requirements for those inventories have declined in recent years. Even though such a shift is likely to have been gradual and to have started before the recent credit slowdown, Lown and Wenninger argue that a considerable portion of the unusual weakness in commercial and industrial bank loans over the recent period may be explained by the need to finance a lower-than-normal level of inventories.

Econometric analysis yields results which are broadly consistent with the less formal data analysis, namely, demand influences as reflected in standard macroeconomic variables are unable, by themselves, to explain adequately the recent credit slowdown. At the outset, it is worth noting that the estimates discussed here generally do not distin-

Chart 4: Economic Activity in Various Business Cycles



Source: U.S. Department of Commerce.

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guish between cyclical and noncyclical demand influences. The estimated equations simply attempt to explain particular credit flows using aggregate demand components and other appropriate macroeconomic factors as explanatory variables. Movements of explanatory variables, in this context, capture all relevant normal or long-run influences on credit flows.

Using cash flow and income or aggregate demand components as explanatory variables, Mosser and Steindel estimate total loan equations for nonfinancial corporations, consumers, home mortgages, and business mortgages. They find that swings in economic-activity-related fundamentals seem to account for only about one-quarter to one-half of the slowdown in corporate and consumer borrowings. In the case of consumer credit, the authors reestimate equations by adding home equity lines to take account of shifts between consumer credit and home equity loans resulting from the Tax Reform Act of 1986; the results are roughly similar to those without the home equity variable. For business and home mortgage components, estimates are unstable, although for home mortgages, the estimated equations are able to explain the recent slowdown in loans. Mosser and Steindel provide a particularly detailed analysis of corporate and consumer loans and argue that most of the prediction errors for those loans do not seem to reflect any exogenous shift in the relationships between credit demand and explanatory variables.

For bank loans, Lown and Wenninger estimate four sets of equations, one each for commercial and industrial loans, business mortgages, home mortgages, and consumer loans. The equations are estimated with VAR methodology to approximate reduced-form relationships, using a range of economic activity and interest rate variables. Broadly, the estimated equations for business mortgages and consumer loans underpredict the credit slowdown, while those for home mortgages more than fully account for the extent of the slowdown. For commercial and industrial loans, Lown and Wenninger are unable to reach any firm conclusions because of unstable regressions.

Cantor and Rodrigues estimate equations for total bank business loans and for nonbank business credit using GDP, investment, and inventories as explanatory variables. The prediction errors from both the bank and nonbank equations are large, indicating that macroeconomic activity variables do not provide an adequate explanation for the slowdown in either bank business lending or nonbank business credit.

In summary, aggregate demand influences are unable to explain a substantial part of the recent slowdown or decline in nonfinancial business borrowings from bank and nonbank sources; this is true for both mortgage and nonmortgage business borrowings. Demand factors also fail to account for the recent slowdown in consumer credit, and taking account of shifts between consumer credit and home equity loans does not significantly alter this result. Recent developments in total home mortgage debt and home mortgage bank loans, however, appear to be adequately explained by the evolution of aggregate demand influences.

B. Supply-Side Factors

With a significant fraction of the credit slowdown left unexplained by standard aggregate demand variables, one must turn to the supply side. Indeed, the prediction errors or residuals from equations estimated with demand variables may be viewed as representing one measure of the supply-side influence on the credit slowdown. Of course, even if we could account for all of the recent credit slowdown with the help of demand variables, that result by itself would not necessarily imply that supply-side factors did not contribute importantly to the credit slowdown. Such a result may simply reflect, for

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example, the fact that demand influences overwhelm supply-side factors. More generally, with both credit demand and supply falling, if the drop in credit demand is larger, actual credit developments will tend to be dominated by demand influences, making it difficult to estimate the net contribution of supply-side factors.

Four studies—Lown/Wenninger, Cantor/Rodrigues, Johnson/Lee, and Hamdani/Rodrigues/Varvatsoulis—in this collection have devoted considerable attention to the role of supply-side factors in the credit slowdown. Their analysis covers bank and nonbank sources of credit and survey data. Overall, the evidence points to significant credit supply problems for both bank and nonbank sources of credit.

On the bank side, Lown and Wenninger look at a number of supply-side factors and provide both descriptive and econometric evidence on the role of those factors. They find that in the 1989-92 period, spreads between bank lending rates and bank funding costs for both corporate and consumer loans were at or above their previous record levels. They also note that the percentages of short- and long-term loans requiring collateral increased sharply over 1989-92. Both indicators are consistent with a leftward shift in the bank loan supply schedule.

Other noneconometric evidence discussed by Lown/Wenninger and others suggests that banks engaged in nonprice credit rationing or, more generally, experienced reduced ability or willingness to lend. Banks sharply increased their holdings of securities relative to loans, and some of the increase appeared to be noncyclical.[6] Survey data from banks indicate significant tightening in credit standards on mortgages and other business loans during 1989-92.

Weakening bank capital positions—reflecting, in part, deteriorating bank loan quality and increasing charge-off rates—seem to have played a significant role in credit supply problems over 1989-92. Lown and Wenninger argue that poorly capitalized banks reduced their lending more sharply than well-capitalized banks during 1990-91. Based on a more comprehensive examination of the relationship between bank capital positions and bank credit, Johnson and Lee reach a somewhat stronger conclusion along the same lines. Specifically, the results indicate that banks with weak capital positions did less lending than banks with strong capital positions during the 1990-92 period.

Lown and Wenninger also argue that the increased emphasis by the regulators on bank capital and the riskiness of bank loan portfolios may have contributed to the bank loan slowdown, although the role of the regulators and examiners is difficult to separate from other factors. While Lown/Wenninger and Johnson/Lee explore the effects of capital positions on bank lending, none of the studies in this volume explicitly investigate the role of regulators and regulatory changes in the credit slowdown process.[7]

Using state-level data, Lown and Wenninger estimate cross-sectional regressions for bank loan growth with employment, capital, and loan-loss reserves as independent variables; the latter two variables are intended to capture the effect of banking conditions (that is, supply-side factors) on loan growth. The results suggest that capital and/or loan-loss reserves contributed significantly to weak bank lending in 1990 and 1991, and that the effects of these supply-side factors were greatest for the New England region followed by the Mid-Atlantic and the West South Central regions. By applying the cross-sectional regression coefficients to changes in the explanatory variables by region,

[6] More formally, Rodrigues (1993) shows that weak economic activity cannot explain all of the recent run-up in securities holdings and that the sustained steepness in the term structure of interest rates and risk-based capital standards may have contributed to that run-up.

[7] For various perspectives on the role of regulators/examiners and capital standards, see Greenspan (1992), Syron and Randall (1992), Peek and Rosengren (1992), LaWare (1992), and Wojnilower (1992b, 1993).

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Lown and Wenninger provide a quantitative sense of the contribution of supply-side factors to the overall bank credit slowdown. Specifically, they suggest that supply-side problems accounted for roughly 15 to 40 percent of the slowdown in bank lending from 1989 to 1990.

Also using cross-sectional data, Demsetz estimated equations for bank loan sales with expected economic activity, assets, capital ratios, nonperforming loan ratios, and other bank characteristics as explanatory variables. She finds that both capital ratios and nonperforming loan ratios are significant in explaining loan sales but their contribution to predictions of loan sales declines is modest and swamped by that of economic activity.

Turning to nonbank credit sources, the Cantor/Rodrigues study offers evidence that supply-side forces were at work here as well. The authors' econometric estimates for nonbank business credit using GDP and its components as explanatory variables yield large prediction errors which suggest a significant role for supply-side factors. The results also indicate that the timing of the credit slowdown for nonbank sources was parallel to that for bank sources, with no evidence of a shift from bank to nonbank sources of funds.

Cantor and Rodrigues also provide considerable descriptive evidence on the role of supply-side factors in the slowdown of credit from various nonbank sources—such as finance companies, life insurance companies, and the commercial paper market. Business credit extended by finance companies advanced at a significantly slower pace starting in late 1989, when many finance companies were downgraded by the credit rating agencies because of major losses in commercial lending and, more generally, weak balance sheet positions. With more credit downgrades during the recession and large amounts put up for loan loss provisions and net charge-offs, total finance company business credit became roughly flat over 1990-92. Cantor and Rodrigues note that credit downgrades probably had a significant effect on lending because finance companies raise most of their funds in short-term public credit markets. The authors also suggest that credit stringency at banks may have had adverse feedback effects on finance company credit availability as many finance companies, faced with problems in raising funds in the commercial paper market, increased their borrowings from bank backup credit lines, presumably at higher costs.

Most of the problems of the life insurance industry, Cantor and Rodrigues argue, stemmed from commercial real estate lending, junk bond portfolios, and high rates on guaranteed investment contracts. Against the background of weak economic activity, these difficulties led to numerous credit downgrades, sharp declines in stock prices and some outright failures in the life insurance industry. Life insurers became generally preoccupied with preserving liquidity and avoiding a collapse. In this environment, the National Association of Insurance Commissioners in mid-1990 adopted new rules establishing more stringent reserve and capital requirements for below-investment-grade bonds and private placements. These developments, Cantor and Rodrigues believe, have reduced the willingness of insurance companies to invest in below-investment-grade bonds and, more generally, have induced a shift toward low-risk assets.

Unlike the situation in earlier credit crunches, nonfinancial business borrowers did not increase the rate of commercial paper issuance during the latest credit crunch. Because of numerous credit rating downgrades and fifteen defaults since 1989 (compared with only two defaults in the entire earlier history of the market), perceived credit risk in the commercial paper market increased greatly, leading investors, especially mutual fund investors, to lose confidence. Meanwhile, to protect small investors and sustain confidence in the money market mutual fund industry, the Securities and Exchange Commission in July 1990 imposed strict limits on the amount of the "second-tier" (low-

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quality) commercial paper that mutual funds could hold. As a result of these developments, both the amount of second-tier commercial paper issued and the mutual fund holdings of that paper dropped precipitously over 1990-92. Cantor and Rodrigues believe that the credit quality concerns are not fully reflected in the rate spread between the top-tier and second-tier paper because the second-tier issuers are often "rationed" out of the market before they drive up rates. Cantor and Rodrigues also discuss the public bond market. The market for below-investment-grade public bonds ("junk bonds") showed virtually no activity during 1990 and 1991 but recovered significantly in 1992. By contrast, the market for publicly placed investment-grade bonds remained quite strong, cushioning weakness in other credit markets to some extent.[8]

C. Survey Evidence on Supply-Side Factors

Hamdani, Rodrigues, and Varvatsoulis examine survey data from bank lenders and nonfinancial borrowers on credit tightening in recent years. Using both the narrative approach and econometric estimates, they find evidence of significant credit tightening by lenders because of supply-side factors. By purging the NFIB (National Federation of Independent Business) Survey data of aggregate demand influences, they uncover particularly strong and consistent evidence of a credit crunch for small business borrowers that depend primarily on banks for their financing (about 90 percent of small business debt consists of bank loans).[9] The results indicate that the recent credit crunch for small borrowers was more severe than earlier crunches. A significant part of this credit crunch appears to have taken the form of nonprice credit rationing or tightening of nonrate loan terms.

Hamdani, Rodrigues, and Varvatsoulis also find considerable evidence of credit supply constriction for large borrowers. They find that overall, the extent of bank credit tightening for large businesses appears to have been greater than what can be explained by the general economic slowdown. Using the SLO (Senior Loan Officer) survey data from banks, again purged of aggregate demand influences, the authors argue that the degree of credit stringency during 1990-91 seems to have been similar to that in the 1974-75 episode.

Finally, Hamdani, Rodrigues, and Varvatsoulis estimate loan growth models using standard demand variables and survey variables on loan availability for both the SLO and NFIB surveys. The results suggest that restrictive loan supply conditions as proxied by the survey supply variables have had significant impact on commercial and industrial bank loan growth over 1989-1992.

D. Correction for the Debt Overhang of the 1980s

As noted earlier, disentangling the supply and demand factors underlying the recent credit slowdown is particularly difficult because the economic downturn was superimposed on a process of balance-sheet corrections for debt excesses of the mid-1980s. This process of correction for earlier debt excesses is widely believed to have contributed significantly to the credit slowdown over 1989-92.

[8] The severity of credit supply reductions, as noted earlier, has also been moderated somewhat by rapid increases in off-balance-sheet lending (securitization and loan sales) in recent years.

[9] In fact, the authors' credit supply proxies, purged of aggregate demand influences, may understate the extent of credit supply shifts because they exclude supply shifts associated with movements of lending spreads and at least some of the effect of changes in borrowers' quality on the willingness to lend.

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During the last decade, a broad range of forces—including financial deregulation and innovation, developments in information and data processing technology, commercial real estate development, and mergers, acquisitions, and leveraged buyouts—combined to increase greatly both the supply of and the demand for credit, resulting in enormous increases in the amount of debt.[10] The upward march of debt was supported, in part, by speculative asset price increases, especially for real estate.

Over time, the process of rapid debt increases led, perhaps inevitably, to problems for both borrowers and lenders. By 1989 and 1990, households and businesses faced historically unprecedented and unsustainable debt and debt service burdens (Chart 5). With declining real estate and other asset values, and weakening economic activity, high debt burdens resulted in balance sheet difficulties for borrowers and loan quality problems for lenders. Not surprisingly, therefore, bank and nonbank lenders alike experienced a weakening of capital positions and increasingly higher loan loss reserves, charge-offs, and delinquency rates. All these factors together, so the argument runs, explain the sharp credit slowdown in recent years.

This account of the correction process is consistent with the view that the credit slowdown contained important supply-side elements although it was perhaps driven by demand forces. In particular, in the down-phase, balance sheet changes induced by declining real estate and other asset values led to weaker capital positions for banks and consequently lower capacity and willingness to lend over 1989-92, just as on the up-side balance sheet changes had increased capacity and willingness to lend in the earlier period. The lenders' reduced willingness to lend, in this case, reflects not only changes in their own balance sheets but also a shift in their attitude associated with the deterioration, actual or perceived, in the quality of borrowers' balance sheets and credit worthiness.

Perhaps even more important, according to this story, the correction process seems to have been dominated by market forces (both demand and supply) as opposed to policy factors. In fact, monetary policy had been easing since early 1989, and as a result, unlike earlier credit crunches, interest rates had declined significantly before serious credit supply problems emerged. To be sure, tighter capital requirements and regulatory pressures, stemming from both legislative changes and more intensive supervisory oversight, contributed to the credit slowdown, in part by reinforcing and highlighting prudential concerns. Such policy factors, however, appear not to have been the primary cause of the credit slowdown. In any event, any contribution of policy factors to the credit slowdown is likely to have been much smaller than the role played by market forces; these forces particularly evident in a reduced desire to borrow and hold or extend debt, caused a decline in both credit demand and credit supply.[11]

Research work in this volume does not provide any estimates of the extent to which the credit slowdown is attributable to the correction process for the debt overhang of the 1980s. While several studies discuss developments leading up to the credit slowdown, quantitative assessments are generally aimed at sorting out demand from supply (or cyclical from noncyclical) factors using historical trends. The study by Johnson and Lee does address the related question of the linkage between the earlier credit excesses by

[10] For a review of developments leading up to the credit crunch period, see Cantor and Wenninger (1993). For a broad perspective on the debt overhang of the 1980s, see Frydl (1991).

[11] Incidentally, note that shifts in attitudes toward debt would normally be treated as "exogenous" in most macroeconomic models; the use of exogenous/endogenous in the current context, however, would appear to be inappropriate since such terms must be expressed relative to a specific model.

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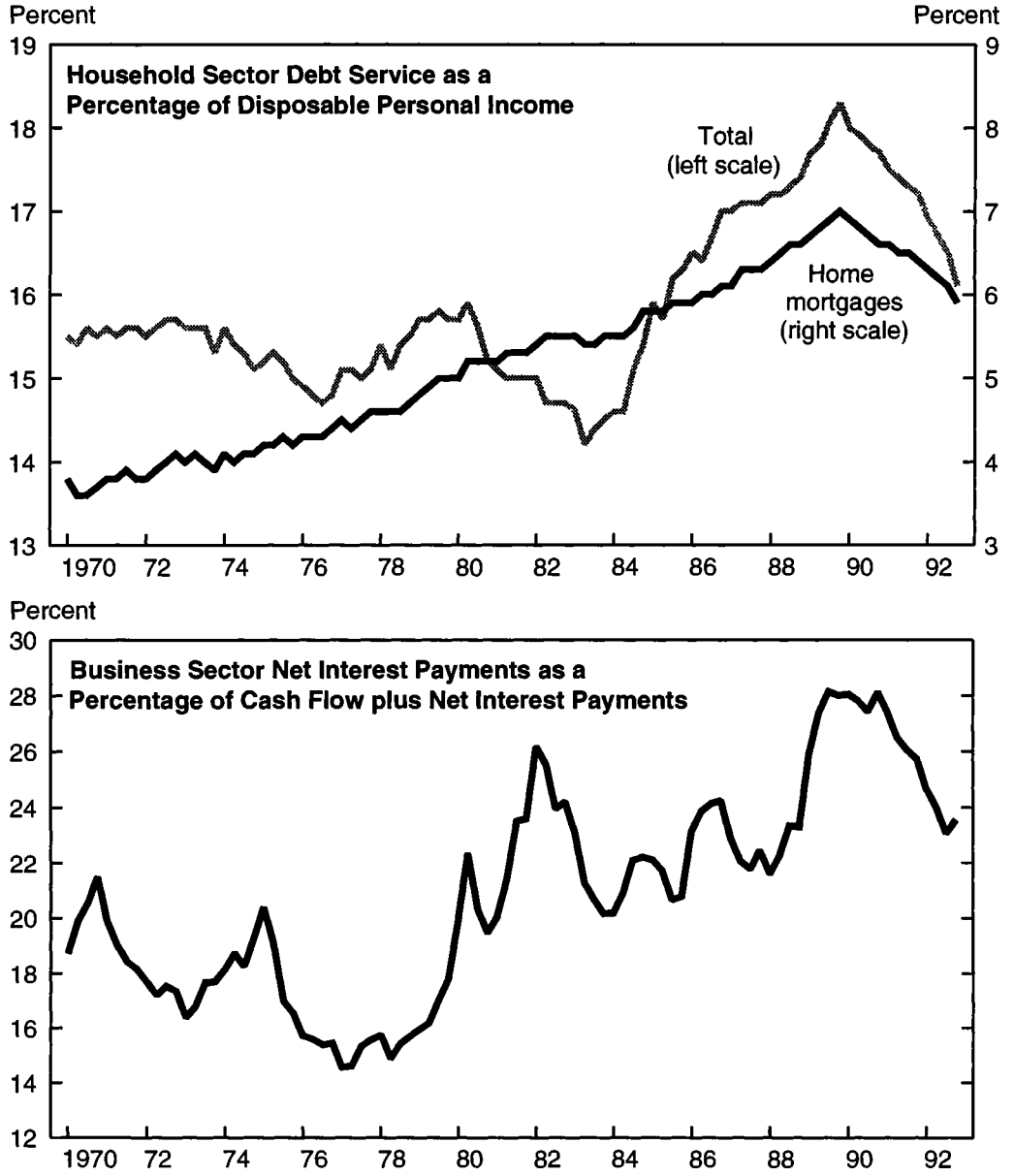
Chart 5: Debt Service Burdens



Source: U.S. Department of Commerce.
Notes: In the upper panel, debt service is an estimate of scheduled payments of principal and interest on home mortgage and consumer debt. In the lower panel, cash flow is defined as depreciation (book value) plus retained earnings (book value).

banks and the recent bank credit slowdown. It finds that banks that indulged in "high risk" activities during the 1985-88 period were obliged to curtail their lending more sharply than other banks during the three years to end-1992. But the study does not estimate the extent of "excess debt" resulting from those earlier high risk activities.

Nevertheless, it may be useful to get a rough sense of the impact of the correction for the debt overhang on the credit slowdown since 1989. Specifically, I address the following question: Was the actual cumulative expansion in private nonfinancial debt from

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end-1989 to end-1992 higher or lower than what is consistent with "normal" or long-run trend credit growth adjusted for cyclical developments and for the debt overhang of the 1980s? Using the simple relationship that the amount of credit expansion in any given time period is made up of the credit expansion consistent with the normal or long-run trend rate adjusted for cyclical and other shifts away from that trend, I attempt to measure the gap between the actual credit expansion over the three-year period to the fourth quarter of 1992, and the amount of credit expansion implied by the adjusted long-run path under various assumptions for the relevant variables. If the actual credit expansion over 1989-92 falls short of the estimated credit expansion for that period, the recent credit slowdown has been greater than what could be reasonably attributed to the combination of cyclical effects and the correction for earlier debt excesses. In this case, the correction process itself might have produced overshooting or shifts unrelated to the earlier credit excesses, and cyclical developments might have further depressed credit flows. Of course, a significant positive gap between the actual and the estimated credit expansion has the opposite implications.

There is no obvious and definitive way to measure the "normal" or long-run credit expansion rate. The usual procedure is to use some measure of the historical trend rate. But with credit expansion rates much higher in the 1980s than in the preceding two decades, history does not offer a clear choice for the trend rate or the benchmark period. Perhaps more important, since long-run credit growth must be viewed in real terms, we need relevant prices. At an empirical level, however, the choice of the appropriate price measures needed to deflate various debt components is ambiguous. Similarly, the use of the debt-to-GDP ratio at the component level in figuring out the long-run or normal rate is quite problematical—the ratio of a particular debt component to GDP (or to broad sectoral income measures) need not be stable over time. Adjustment of the long-run trend to account for cyclical and noncyclical developments raises equally difficult questions: How should we measure cyclical effects? How much time should we allow for the correction of the debt overhang to be completed—as much time as it took to build up the problem, more time, or less?

Using various alternatives for the long-run or normal trend credit expansion rate and adjustment factors, I calculated the cumulative amount of excess debt over 1982-89 and several measures of the gap between the level of actual credit expansion over 1989-92 and the amount of trend credit expansion, adjusted for the debt overhang and cyclical developments, during that period. One such exercise is reported in Table 8. The long-run trend rates in this exercise are based on business and household data for mortgage and nonmortgage debt over the 1960-82 period, converted into constant 1987 dollars using the GDP deflator.[12] The cyclical effects are measured on the basis of differences between the 1960-82 trend rates and the combined average growth rates for the periods surrounding the 1970, 1975, and 1982 recessions.

This exercise suggests that the decline in business credit over 1989-92 has gone far beyond what was necessary to correct the earlier debt excesses; only about 55 percent of the decline in business credit over 1989-92 relative to the long-run trend can be attributed to the need to correct the debt overhang. Combining the correction for the debt overhang with cyclical effects still accounts for only a part of the business credit slowdown. Even assuming complete adjustment over three years (1989-92) for the credit ex-

[12] The use of a national price index, instead of sectoral price indexes, seems to be preferable for at least two reasons: appropriate component price measures are not always readily available and, even when they are available, their use would legitimatize credit excesses of the 1980s by incorporating any speculative price increases for particular sectors such as real estate.

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Table 8: Long-Run Trend versus Actual Credit Expansion, 1989-92
Billions of 1987 dollars, GDP deflator basis

	Business			Household			
	Total	Mortgage	Other	Total	Home Mortgage	Other	Total Private
Actual credit expansion	-261.5	-159.0	-102.5	191.6	227.6	-36.0	-69.9
Trend expansion	423.6	151.5	272.1	284.9	185.9	98.9	708.5
Cyclical adjustment	-62.9	-2.0	-60.9	-93.5	-67.8	-25.6	-156.4
Correction for excess expansion over 1982-89	-376.0	-75.1	-301.0	-665.1	-479.9	-185.2	-1041.1
Adjusted trend credit expansion	-15.3	74.4	-89.8	-473.7	-361.8	-111.9	-489.0
Excess/ shortfall	-246.1	-233.4	-12.8	665.3	589.4	75.9	419.1
Partial adjustment	-461.0	-276.3	-184.7	285.2	315.2	-29.9	-175.8

Notes:
1) Changes in billions of 1987 dollars (GDP deflator basis) from 1989-IV to 1992-IV.
2) Long-run trends are based on the 1960-82 growth rates of business and household components.
3) Cyclical adjustments are based on the differences between the 1960-82 trends rates and the combined average growth rates for the periods surrounding the 1970, 1975, and 1982 recessions.
4) Figures in the last row are estimated on the basis of partial correction (3/7) for the 1982-89 excess expansion over 1989-92.
5) In current dollars, actual cumulative private credit expansion over 1989-92 was about $680 billion (11.0 percent of 1992 GDP).
6) Sums may not add up precisely due to rounding.

cesses that took place over seven years (1982-89), the actual business credit increase over 1989-92 fell short of the long-run trend expansion, adjusted for the debt overhang and cyclical effects, by about $246 billion in 1987 prices; the shortfall represents nearly 7 percent of total business credit at end-1992. Under partial adjustment, with three-sevenths of the excess debt eliminated over 1989-92, the debt shortfall from the trend expansion level increases to $461 billion, or about 12.5 percent of total business credit at end-1992. While both commercial mortgages and nonmortgage business debt declined more than implied by the estimated adjusted trend expansion levels under the two adjustment scenarios, the bulk of the shortfall reflects commercial mortgages.

For the household sector, the correction for the earlier debt excesses and cyclical effects, together, more than fully account for the credit slowdown. In fact, actual household credit expansion over 1989-92 exceeded the amount of credit expansion consistent with the adjusted long-run trend, assuming complete adjustment over three years, by

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$665 billion in 1987 dollars; the excess is nearly 17 percent of total household debt at end-1992. About 90 percent of the excess debt is attributable to home mortgages. Under partial adjustment, the amount of household excess debt drops to less than half that under complete adjustment, but it is more than fully accounted for by home mortgages, with nonmortgage household debt actually showing a moderate shortfall relative to the estimated level. In sum, there has been no correction for the debt overhang for home mortgages. On the contrary, home mortgage debt over 1989-92 continued to advance at a faster rate than the long-run trend rate, apparently unaffected by cyclical developments and by the need for correction of earlier debt excesses.

Alternative measures of the long-run trend rate yield, in some cases, significantly larger or smaller estimates of the debt excess over 1982-89 and of the gap between actual and estimated debt changes over 1989-92. Two general messages of the results in Table 8 hold up, however. First, although the correction process for the debt overhang played a major role in the credit slowdown, it is difficult to explain *all* of the business credit slowdown by appealing to the need for correction. Second, home mortgage debt in recent years has remained immune to the correction process for the earlier debt excesses. One implication of the first point is that some credit supply shifts largely or completely unrelated to the market correction process for the debt overhang may have played an important role in the credit slowdown. Such supply shifts were presumably caused by tighter capital standards and regulatory pressures.

E. The Credit Slowdown Abroad

A number of foreign countries have also experienced credit slowdowns, to varying extents, during the last three years or so. The Hickok/Osler study in this volume examines the foreign experience, focusing on Japan, France, and the United Kingdom. Since a single study cannot be expected to deal with all aspects of the foreign experience, the authors consider only the broad contours of the recent credit experience abroad and the common forces that may have driven that experience.

Using both descriptive analysis and regression results, Hickok and Osler find that for all three countries, the waning of the credit surge of the 1980s contributed importantly to the credit slowdown during 1990-91. The broadly defined process of financial deregulation and innovation, working through expanded access to credit markets, asset valuations and other changes, led to increases in both the demand for and the supply of credit during the mid- and late 1980s. Subsequently, as actual credit changes adjusted to "permanently" higher equilibrium levels, credit growth rates tended to return to more normal levels.

Hickok and Osler also find that for Japan and the United Kingdom, a reversal of the speculative factors played a considerable role in the credit slowdown. Developments in economic activity helped reduce the pace of credit growth in all three countries, but their role appears to have been relatively modest in Japan and the United Kingdom. Finally, bank capital movements seem to be significant in explaining credit movements in Japan and to a lesser extent in the United Kingdom, but they appear not to have made any contribution to credit developments in France.

IV. Credit Supply Problems and Economic Activity

To the extent that the credit slowdown reflects the slowdown in aggregate demand or economic activity, it is a symptom and not a direct cause of the weakness in the economy. Accordingly, any investigation of the consequences of the credit slowdown for nonfinancial economic activity must focus on credit supply problems. In this volume, three

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studies—Mosser, Steindel/Brauer, and Harris/Boldin/ Flaherty—deal with this subject. *Overall*, the three studies clearly indicate that credit supply problems have not been the primary or dominant cause of the recent weakness in economic activity. But, collectively, the studies do suggest that credit constraints are likely to have made at least some contribution to the economic slowdown.

A. Aggregate Demand

Mosser examines the effects of credit supply problems on aggregate demand components while attempting to control for changes in credit demand. She estimates reduced-form equations for several demand components with and without variables representing credit supply restraints. Four different proxies, all based on other studies in this volume, are used for credit supply constraints: (1) regression residuals from various bank loan equations in Wenninger/Lown, representing part of the credit slowdown not attributable to demand factors; (2) regression residuals from various sectoral loan equations in Mosser/Steindel, measuring the gap between actual credit flows and the estimates based on historical relationships between credit and aggregate demand variables; (3) residuals from regressions in Hamdani/Rodrigues/Varvatsoulis, capturing credit availability restraints for small business, purged of cyclical influences; and (4) interest rate spreads between loan rates on business and consumer lending and market rates.

Using data for the 1980-92 period, Mosser performs some Granger-Causality tests to determine whether credit aggregates or credit supply proxies are statistically more significant predictors of future economic activity. Her results tend to favor credit supply proxies. For the more recent period, Mosser finds significant effects of credit supply problems on commercial real estate activity and producers' durable equipment. In particular, the credit supply proxy for small business seems to account for a considerable part of the 1989-92 weakness in nonresidential construction and producers' durable equipment. Even so, Mosser argues that the weakness in these demand components relative to predictions based on normal historical relationships cannot be fully explained by credit supply problems. Doubtless, the widespread sluggishness of economic activity during 1989-92 reflected a broader set of factors than just credit supply problems.

B. Construction Activity

Harris, Boldin, and Flaherty investigate the effects of credit supply problems on the real estate industry. Focusing on the three construction industry sectors—single-family homes, multifamily housing, and nonresidential structures—they provide a comprehensive review of credit and noncredit factors underlying the recent decline in construction activity. Overall, the study finds that credit supply problems are likely to have played only a modest role in the real estate contraction.

For single-family housing, the authors begin by examining predictions of housing activity from several standard models that use mortgage rates, income, and other fundamentals as explanatory variables. Since these models are not able to predict the recent weakness in housing, the authors search for an explanation by focusing on "special" factors or other variables that have been left out of the models. They argue that of the missing variables, demand-side factors such as a generalized effort to reduce debt and an adverse shift in investor psychology rather than narrowly defined credit supply problems explain the bulk of unusual weakness in housing. This view is consistent with the fact that because of the mortgage-backed securities market and other financial innovations, credit supply for home mortgages has not experienced any significant problems.

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The supply of loans to homebuilders has been constrained significantly, but this appears not to have caused a pervasive housing shortage. Even so, credit supply problems may explain part of the recent weakness in housing activity since without credit constraints, the housing supply would have been larger and prices lower. More generally, given the weakness of both credit demand and credit supply, the identification problems make it difficult to rule out a significant role for credit supply difficulties.

Multifamily and nonresidential construction have declined greatly since 1989 and have remained as the two weakest sectors of the economy. According to the Harris/Boldin/Flaherty study, overbuilding in the 1980s (together with the resulting excess capacity) dominates the credit crunch as an explanation for the collapse of activity in both sectors. The study recognizes, however, that these sectors have experienced credit supply problems and that the simultaneous weakness in (and interaction between) credit demand and credit supply makes it difficult to isolate the effect of credit supply constraints. It is likely that in the absence of credit supply constraints, the decline in the nonresidential and multifamily sectors would have been more moderate. Put differently, the credit crunch does not appear to be the dominant cause of the collapse in construction activity, but it may well have played some role in the timing and process of decline.

C. Business Activity Excluding Construction

The Steindel/Brauer study explores the consequences of credit supply problems for business activity excluding construction. Overall, this study provides only limited support for the view that credit supply problems impeded business activity over 1989-92.

Steindel and Brauer consider five different types of evidence. First, they review recent movements in corporate, noncorporate, and manufacturing activity, together with relevant credit flows. The review suggests that the sharp slowdown in credit flows may have been a significant contributing factor to weakness in small business activity and that such firms may have borne a disproportionate share of the shortfall in both output and debt.

Second, the authors look at survey evidence on lending to smaller firms and the connection between credit supply proxies from other studies in this volume and noncorporate business output. This survey evidence does point to a significant credit tightening which may have contributed to weakness in small business activity.

Third, using detailed industry- and firm-level data, the study compares activity for small and large businesses and attempts to infer the role of credit in the recent weakness of small business activity. The focus is on manufacturing businesses, but the analysis does include some nonmanufacturing establishments as well. In most cases, small business activity appears not to have shown any unusual weakness relative to large business activity, and so, by inference, Steindel and Brauer do not find any more support for the effect of credit supply problems on small businesses than on large businesses. But with data on the relevant credit flows unavailable, this type of evidence is entirely indirect and does not necessarily contradict the view that credit supply problems may have contributed to the slowdown in business activity over 1989-92.

A fourth type of evidence considered by Steindel and Brauer focuses on indicators of financial strength. Again using industry- and firm-level data, the authors explore the role of financial factors in the recent weakness of business activity by examining various measures of real economic activity for financially "weak" and "strong" businesses. This evidence is also indirect and yields mixed results.

Finally, using firm-level data, Steindel and Brauer perform formal regression tests to look for the effect of size and debt to asset ratios on employment, inventories, capital

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spending, and spending on research and development for various periods. Once again, the results are mixed.

V. Implications for Monetary Policy

In reviewing the implications of the credit crunch or credit supply problems for monetary policy, this section focuses on two related issues: implications of the credit crunch for the impact of monetary policy actions on economic activity, and consequences of credit supply problems for monetary policy guides, M2, and other financial variables. The section begins with some background information on the main features of the recent credit crunch and on the channels of monetary policy influence on the economy.

A. Overview of Credit Supply Problems

The evidence in this volume is consistent with the view that credit supply problems contributed importantly to the credit slowdown over 1989-92, although demand influences may have dominated overall credit movements. The nature and causes of the 1989-92 credit supply problems were significantly dissimilar to those of most earlier credit crunches. The distinctive features of the most recent episode are summarized below.

First, credit supply problems in the 1989-92 period were widely spread across both bank and nonbank sources of credit. As a result, unlike earlier credit crunches, nonfinancial borrowers were not able to substitute nonbank credit freely for bank credit. In fact, finance companies, life insurance companies, and commercial paper issuance seem to have experienced credit supply problems that were essentially similar to those of banks. Together with a broadly based retrenchment in credit demand, credit supply problems led to a sharp slowdown in all major components of private debt flows.

Second, credit restraints during 1989-92 took the form both of more stringent price terms—higher lending rates relative to funding costs and tighter nonrate loan terms—and of nonprice credit rationing. Although this phenomenon is probably fairly typical of earlier credit crunches, the pervasiveness of nonprice rationing and tighter loan terms over an extended period of time in the recent credit crunch is unusual. Earlier credit crunches were generally short-lived; the 1989-92 crunch period was characterized by persistently high spreads between lending rates and funding costs, especially at depository institutions, increasingly tighter credit standards for applications through much of the credit crunch period, and continued stringent nonrate terms on loans. These persistent credit restraints were reflected, among other things, in large increases in holdings of government securities relative to loans at banks.

Third, significant evidence points to a capital crunch as one of the major causes of credit supply problems over 1989-92. None of the earlier credit crunches were characterized by a widespread weakening of the capital positions of banks and nonbank financial institutions. Broadly, the actual or perceived capital crunch seems to have reflected three underlying forces (in addition to the normal cyclical effects): (1) the need to correct balance sheet problems resulting from the lax lending standards that had prevailed through much of the 1980s and had left balance sheets badly exposed to asset prices and other shocks; (2) increased capital requirements induced by legislative and regulatory measures and by more intensive supervisory oversight; and (3) the weakening of capital positions reflecting declining real estate and other asset values starting about late 1988.

Fourth, market forces seem to have played a critical role in generating the latest credit crunch. To be sure, as noted above, regulatory measures and pressures contributed to the actual or perceived capital crunch but, unlike earlier credit crunches, the current ep-

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isode emerged in an environment of accommodative monetary policy and declining interest rates. More fundamental to the process of credit slowdown appears to have been the need to correct the debt excesses of the mid-1980s, which had become unsustainable over time. Faced with major balance sheet and other difficulties, borrowers and lenders alike responded to market forces, borrowers by lowering their credit demands and lenders by reducing credit availability. In particular, the so-called credit crumble phenomenon—the chain running from asset price declines to capital position weakness to lower capacity and willingness to lend—contributed importantly to the process of credit slowdown.[13] The role of market forces was reinforced and perhaps intensified by the regulatory pressures which highlighted prudential concerns about loan quality and capital positions and argued for the need to strengthen lenders' balance sheets. The capital crunch itself was at least partly a by-product of the correction process as weakening capital positions and mounting loan losses called increasingly greater attention to the need for correction of earlier debt excesses and for additional capital.

The accumulating loan losses, continuing balance sheet problems, and full realization of the debt overhang also led to more conservative lending attitudes—well beyond what could be attributed to the measurable weakness in capital positions—and to a complete reversal of the earlier lax lending standards. To a considerable extent, the pervasiveness of credit supply problems reflected the widespread nature of the correction process, with both bank and nonbank creditors experiencing the need to improve loan quality and repair their balance sheets.

Finally, the debt overhang correction process and its conjunction with a prolonged cyclical weakness in the economy made the already difficult task of identifying credit supply malfunctions from credit demand factors even more difficult. Both borrowers and lenders were deleveraging and restructuring their balance sheets in response to earlier debt excesses and to cyclical weakness. In the process, credit demand and credit supply narrowed simultaneously, but the drop in demand is likely to have overwhelmed the fall in supply. As a consequence, it is very difficult, if not impossible, to detect empirically the contribution of supply-side factors net of demand influences.

B. Channels of Monetary Policy Influence

Monetary policy influences the economy through at least four important channels: the money-interest rate channel (or the "money" channel, as it is commonly known); the credit channel; the asset valuations or balance sheet channel; and the exchange rate channel.[14] The discussion here deals with only the first three, ignoring the exchange rate channel. In the money-interest rate channel, as enshrined in the standard IS-LM model, monetary policy affects aggregate spending by raising (lowering) the cost of funds through changes in the supply of money relative to the demand for money. Specifically, monetary policy actions—open market operations, and so forth—induce changes in bank reserves, money, short-term interest rates and, through substitution and expectational effects, long-term interest rates. Higher (lower) interest rates, in turn, raise (lower) the cost of funds, other things equal.

[13] See Johnson (1991) for a detailed analysis of this phenomenon.

[14] A large number of theoretical and empirical studies on the transmission of monetary policy influence to the economy have appeared since the mid-1980s. For some recent discussions of various channels of monetary policy, see Akhtar and Harris (1987), Bennett (1990), Bernanke (1993), Bernanke and Blinder (1988, 1992), Bosworth (1989), Friedman (1989), Gertler (1988), Gertler and Gilchrist (1992), Gertler and Hubbard (1988), Mauskopf (1992), Mosser (1992), and Romer and Romer (1993).

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The credit channel, which may operate alongside the money-interest rate channel, affects aggregate demand through direct changes in the availability and terms of bank loans. A tightening of monetary policy may reduce the supply of bank loans through higher funding costs for banks or through increases in the perceived riskiness of bank loans. Since the credit channel views bank loans as imperfect substitutes for other assets (government securities, corporate bonds, commercial paper, and the like) in bank portfolios, monetary policy actions that reduce bank reserves and, therefore, deposits will be matched by decreases in both securities and bank loans. As a consequence, borrowers with no access to other sources of credit will be obliged to reduce their spending, while others with nonbank sources of credit, though less affected, will not be immune to monetary policy influence as long as the alternative sources of credit are more expensive or less convenient.

The asset valuations channel of monetary policy influence on the economy works through changes in balance sheet positions. Monetary policy actions that lower interest rates, for example, tend to increase asset values and improve liquidity for firms by lowering interest-to-cash flow ratios. These balance sheet improvements, in turn, may increase business spending by raising the availability of internal funds and improving the access to and the terms on external funds. Lower interest rates may also work to improve household balance sheet positions through debt restructuring and higher asset values, thereby increasing the availability of funds for debt retirement and additional spending. Note that the argument of this channel is that interest rate changes may affect spending by weakening (strengthening) balance sheets or wealth holdings, quite apart from their effects on the cost of funds in the money-interest rate channel.

C. Effectiveness of Monetary Policy

Factors relating to the credit crunch seem to have created significant blockages for the workings of all three channels of monetary policy. Overall, the blockages are likely to have muted the impact of monetary policy actions on economic activity. The empirical size and significance of the blockages are far from clear, however. Whether any of these blockages will turn out to have permanent consequences for the conduct of monetary policy is also not clear at this time.

The credit channel of monetary policy apparently was seriously disrupted over 1989-92. With the decline in the willingness and capacity of banks to lend, monetary policy actions increasing bank reserves were not translated into additional bank lending. Specifically, easing of monetary policy apparently had very little impact on the supply of bank loans over 1989-92. This view is clearly supported by increasingly tighter credit standards, higher (or at least continued high) lending rates relative to funding costs and restrictive nonrate loan terms. With nonbank credit sources also experiencing supply disruptions, frustrated bank borrowers were not satisfied elsewhere. Much academic discussion of the credit channel assumes that nonbank credit alternatives are easily available to many (perhaps most) borrowers. This view clearly runs counter to the recent credit crunch experience. In fact, widespread nonbank credit supply disruptions appear to have added substantially to the severity of the blockage in the credit channel.

The money-interest rate channel of monetary policy also seems to have experienced some blockage during 1989-92. Policy-induced increases in bank reserves did translate into lower short-term open market rates and faster growth of the narrow money, M1. But the response of long-term interest rates and broader monetary aggregates to policy actions was very sluggish and weak throughout 1989-92. The decline in credit supply, as shown in the Hilton/Lown study, contributed importantly to slowing the growth of

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M2. And presumably the shift in credit supply also played some role in maintaining high long-term interest rates by putting upward pressures on rates, other things equal. As a result, monetary policy actions were less effective in lowering the cost of capital, hampering the workings of the money-interest rate channel.

The process of correction for earlier debt excesses may also have weakened the asset valuations or balance sheet channel of monetary policy influence on the economy. Given the actual or perceived need to correct the large debt overhang, lower interest rates may not have induced much additional spending by businesses and households because the improvements in balance sheets and the underlying asset values materialized only slowly. Put differently, easier monetary policy as reflected in lower interest rates may have encouraged households and businesses to repair the perceived weakness in their balance sheets by deleveraging and debt restructuring, without increasing spending significantly.

While credit supply problems during 1989-92 may have been important in reducing the effectiveness of monetary policy, it is difficult to isolate their effects from those of a broad range of other fundamental developments that are likely to have disrupted, weakened, or changed the linkages between monetary policy and economic activity. Mosser discusses a number of these other fundamental developments. Of the factors not directly related to the credit crunch, the following appear to be particularly important:

- the response of long-term interest rates to short-term open market rates may have been weakened by inflation fears or by a high level of investor uncertainty stemming from large federal budget deficits;
- effects of lower interest rates may have been weakened by very high levels of real after-tax interest costs;
- looking from a longer term perspective, financial innovation and deregulation over the last two decades are widely believed to have caused significant changes in both the size and speed of monetary policy effects on various sectors of the economy.

Economic growth in recent years has also been restrained by factors unrelated to both the credit crunch and monetary policy transmission—relatively tight fiscal policy, a military build-down, excess capacity in the construction industry, and low levels of consumer and business confidence. It is difficult to control for these nonmonetary influences in assessing the effectiveness of monetary policy.

Against this background, the quantitative significance of the 1989-92 credit supply problems for the transmission channels of monetary policy is far from clear. As reported by Mosser, econometric forecasting equations, both reduced-form and structural estimates from large models, significantly overpredict real spending from 1989 to 1992. This finding is consistent with the notion that monetary policy actions have been less effective in recent years than in the past. Presumably the overprediction reflects both the credit crunch and other factors, however. Indeed, Mosser is unable to account for all of the overpredictions by making use of credit supply proxies. Moreover, the overpredictions are not limited to sectors that are directly sensitive to monetary policy. Instead, they are widely spread across all sectors, suggesting a general malaise in aggregate demand not captured by economic fundamentals.

Notwithstanding these measurement difficulties, credit supply problems during 1989-92 are likely to have contributed to reducing the effectiveness of monetary policy. Clearly, the credit crunch weakened the credit channel and caused disruptions in credit flows, producing at least some adverse consequences for economic activity. The credit supply shifts are also likely to have hampered the workings of the standard money-in-

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terest rate channel and possibly to have weakened the balance sheet-related contribution of lower interest rates to aggregate spending.

The long-term implications of the credit crunch for the effectiveness of monetary policy are less clear. Recent credit supply problems may well cause durable changes in the workings of monetary policy transmission channels by altering, for example, the relationship between changes in monetary policy and bank loans, between bank loans and deposit flows, and/or between debt and income.[15] But such an outcome is by no means certain. Moreover, with numerous other potential influences on the linkages between monetary policy and economic activity, it may not be possible to isolate any permanent traces of the recent credit crunch on those linkages.

D. Monetary Policy Guides

Disruptions in the linkages between monetary policy and the economy imply adverse consequences for the usefulness of financial variables as monetary policy guides, whether viewed as intermediate targets or simply as information variables. The usefulness of any monetary policy guide depends primarily on two considerations: the strength and predictability of the relationship between the guiding variable(s) and the ultimate objectives of price stability and economic growth, and the ability of the Federal Reserve to define, interpret, and control the guiding variable(s).[16] The recent credit crunch seems to have added to problems on both counts.

Credit supply problems since 1989 have almost certainly contributed to reducing the usefulness of M2 and M3 as policy guides. Hilton and Lown argue that the reduced willingness of depositories to lend was an important factor behind the weakness in deposits, although their work does not fully isolate the effect of credit supply problems from that of noncyclical credit demand factors. Specifically, the authors point out that relatively high lending rates and the pervasiveness of stringent nonrate loan terms and nonprice credit rationing reduced the supply of credit and, together with lower yields on deposits relative to alternative assets, led to weak depository flows. Controlling for cyclical effects, Hilton and Lown estimate that by the middle of 1992, the credit slowdown had lowered M2 growth by about 10 percent. Their regression results indicate that the breakdown of M2 demand equations is at least partially attributable to the exceptional weakness in credit formation; the predictive performance of M2 demand equations improves significantly when direct measures of credit or other factors capturing cutbacks in lending are included as explanatory variables.

Credit supply malfunctions have also affected the relationship between credit aggregates and the economy. None of the studies in this volume is able to account for developments in various credit measures—household, business, bank and nonbank, and so forth—over 1989-92 by using standard historical relations for macroeconomic variables. Of course, the underlying relationships of credit and monetary aggregates to prices and economic activity have not been particularly reliable during the last decade even before the emergence of recent credit supply problems.

The usefulness of interest rates as information variables for monetary policy has also been adversely affected by the credit crunch. With the pervasiveness of nonprice credit rationing and stringent nonrate loan terms, changes in open market rates have had a

[15] If, for example, the recent experience makes banks permanently more risk averse in their lending, monetary policy effects on bank lending would be smaller than before.

[16] See Friedman (1993c) for a recent perspective on the role of financial variables in guiding monetary policy.

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smaller impact on credit conditions and economic activity than would otherwise have been the case. Put differently, disruptions in the credit market mechanisms have made past experience less pertinent as a reference point for understanding the effects of recent interest rate changes on credit conditions and the economy. Similarly, to the extent that credit supply problems influenced the yield curve and various interest rate spreads—such as that between lending rates and funding costs or that between the (riskless) Treasury bill rate and the (risky) commercial paper rate—all these variables became less useful indicators, at least over 1989-92.

By reducing the information content of a broad range of financial variables, the credit crunch has compounded the problems of finding appropriate guides for steering monetary policy. More specifically, credit supply problems in recent years have made it more difficult to use M2 or the federal funds rate (or any other financial variable for that matter) for determining appropriate money and credit conditions relative to the needs of the economy. Even before the latest credit crunch, however, there was no significant agreement on the use of any one or two variables as monetary policy guides. Thus, the recent experience with financial sector developments seems to have moved us further away from a narrow focus on one or two intermediate targets toward the use of a broad set of financial indicators as information variables to steer monetary policy.

VI. Some Concluding Observations

Collectively, studies in this volume offer evidence of a substantial, prolonged, and broad-based contraction in credit supply over 1989-92. This finding strongly contradicts the view that the recent credit slowdown originated solely on the demand side.[17] Research work reported here conclusively demonstrates that demand influences are unable to explain a significant part of the recent credit slowdown or decline in nonfinancial borrowings from bank and nonbank sources. Moreover, the existence of credit weakness across a wide range of nonfinancial borrowings also challenges the notion that the recent credit slowdown was nothing more than the bursting of a speculative bubble in commercial real estate.[18]

The studies in this volume also indicate that the nature and causes of the recent credit supply problems were markedly different from those of earlier credit crunches. In particular, unlike earlier crunches, the credit supply problems during 1989-92 were broadly spread across both bank and nonbank sources of credit, with stringent loan terms and nonprice credit rationing persisting over a relatively long period. Also, unlike earlier episodes, the recent credit crunch was marked by a capital shortage and was driven, to an important degree, by market forces. Set in motion by the widespread balance sheet difficulties of both borrowers and lenders, these market forces led to the correction process for the debt overhang of the 1980s.

The sharp, prolonged, and widespread decline in credit supply over 1989-92 would be expected to have significant adverse consequences for the economy. It is therefore not surprising that the credit crunch has sometimes been blamed for much of the weakness in economic activity since 1989. Yet, the studies in the volume do not support this conclusion. On the contrary, they clearly indicate that credit supply problems were not the primary or dominant cause of the weakness in economic activity over 1989-92. Nevertheless, the studies do suggest, at least collectively, that credit constraints almost

[17] See Meltzer (1991), and Klieson and Tatom (1992) for particularly strong expressions of this view.

[18] See, for example, Jordan (1992).

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surely made some contribution to that weakness and probably played a significant role in slowing the economy before the recession and in impeding the recovery process.[19]

The apparent inconsistency between sharply reduced credit availability and its modest effects on economic activity is not hard to reconcile. The credit crunch has by no means been the only factor depressing the economy. Other factors that contributed significantly to the 1990-91 recession and the subsequent weak recovery include the Gulf war, the defense build-down, relatively tight fiscal policy throughout the period, generally high real long-term interest rates, low levels of consumer confidence, corporate restructuring, and the commercial real estate depression that followed the great build-up of excess capacity during the 1980s. With so many powerful forces slowing economic activity in recent years, one can hardly expect the credit supply problems to dominate the picture. Moreover, the confluence of broad-ranging adverse influences on economic activity and the market driven elements in the credit crunch make it difficult to isolate, empirically, the effects of credit constraints on the economy.

Finally, this collection of studies suggests that credit supply problems over 1989-92 contributed to weakening the influence of monetary policy actions on the economy and to reducing the usefulness of M2 and other financial variables as policy guides. Whether recent shifts in credit supply factors will have any long-term consequences for the conduct of monetary policy is far from clear, however. In the absence of further changes in the regulatory environment, the long-term effect will depend, to a considerable extent, on the durability of recent changes in attitudes toward debt on the part of lenders and borrowers—specifically, whether lenders will continue to follow the recent risk-averse approach to lending and whether the decline in the desired ratio of debt to income will turn out to be permanent. The new conservative attitude toward debt may persist, but such an outcome is by no means certain.

[19] Perry and Schultz (1993) and Friedman (1993b) reach a roughly similar conclusion.

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Economic Activity and the Recent Slowdown in Private Sector Borrowing

by Patricia C. Mosser and Charles Steindel[1]

In early 1990 debt formation in the United States—particularly loans made by intermediaries—slowed sharply. At roughly the same time, the economy entered a cyclical contraction, followed by a period of unusually sluggish growth. The relationship between the slowdowns in activity and debt has been the focus of much debate: Did the sluggish economy "cause" a slowdown in credit formation via credit demand, or was slow economic growth brought about by credit problems, particularly by restrictions in credit supply?

While such identification questions can rarely be answered definitively, this paper looks at these issues in the context of the long-run relationships between credit flows and activity. In particular the paper draws on two closely related empirical facts: (1) Private debt formation goes up and down with movements in economic activity (see Wojnilower, 1980, 1985); and (2) the ratio of debt to output also has a cyclical component. By focussing on long-term credit/activity relationships, the paper attempts to measure the fraction of the recent decline in private nonfinancial borrowing that may be attributable to economic activity, as opposed to purely financial factors (such as borrowing to finance mergers and acquisitions [M&A] or leveraged buyout [LBO] activity) or to temporary supply or "credit crunch" phenomena in debt markets.

The paper is organized into four sections. The first offers an impressionistic review of the historical relationship between private debt formation and aggregate economic activity. The second focuses on the linkages between business borrowing and business activity, particularly in the corporate sector, and possible structural changes in business spending which may have affected the credit/real activity relationships. The third carries out a similar analysis for the household sector. The fourth section touches on developments in the growth of mortgages. The broad conclusions of the paper are:

- Historical statistical relationships between business sector borrowing and a small number of measures of business activity and between household borrowing and spending fail to explain much of the movement in borrowing over the last decade. In the mid-1980s, borrowing was substantially greater, and in the early 1990s, sub-

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stantially less, than the nonfinancial activity fundamentals predicted. Swings in the fundamentals appear to account for considerably less than half of the decline in short-term business borrowing from the mid-1980s through the early 1990s. In the consumer credit market, shifts in the fundamentals may explain about half the fall-off in borrowing.

- In the early 1990s several sectors of economic activity normally linked to debt formation were weak, even given the overall softness of the economy. These sectors include consumer spending on discretionary items, capital spending on noncomputer items, and inventory investment. Only in the case of inventories can a case be made that this spending weakness was largely independent of credit market developments.
- The combination of a shortfall in borrowing based on historic debt/activity relationships and apparently related weakness in debt-sensitive spending suggests that a significant fraction of the decline in lending was traceable to a contraction in the overall supply of credit coupled with reduced demand for purely financial lending (such as the decline in M&A and LBO).
- In business and household mortgage markets, relationships between borrowing and nonfinancial activity were less stable. Swings in borrowing and activity were fairly well linked over the 1980s, but the causation from credit supply to activity, or from activity to credit demand was difficult to discern.

I. Economic Activity and Private Sector Borrowing

The growth of outstanding credit market debt owed by private U.S. nonfinancial entities slowed dramatically in the early 1990s (Table 1). From 1983 to 1989 growth of this debt averaged 10.9 percent (annual rate, not compounded), while from 1990-I through 1992-II growth averaged a meager 3.5 percent. The slowdown was particularly dramatic for nonfinancial business, corporate and noncorporate. Household debt growth also slowed sharply to less than half the rate of the late 1980s.

The slowdown in debt growth, however, did not reverse the debt buildup of the 1980s. The ratio of private nonfinancial debt to GDP—which was near its early 1970s level as late as 1983—rose sharply through 1990 and showed only modest declines thereafter as the slow growth of nominal GDP offset the slowdown of debt growth (Chart 1). The debt-to-GDP ratios of major private sectors—households and nonfinancial businesses—behaved in a roughly similar fashion.

Although much attention has been paid to the buildup and collapse of real estate lending, Table 2 and Chart 2 show similar patterns in private debt excluding mortgages.

Table 1: Growth of Private Nonfinancial Debt
Percent Change, Annual Rate

	Total[a]	Households	Business	Corporate	Noncorporate
1984-89	10.9	12.0	9.3	11.2	7.4
1990-92-II	3.5	5.4	1.1	2.0	-0.5
1991-IV Outstandings[b]	8434.5	3938.6	3593.3	2273.9	1319.4

a. Includes state and local governments.
b. In billions of dollars.

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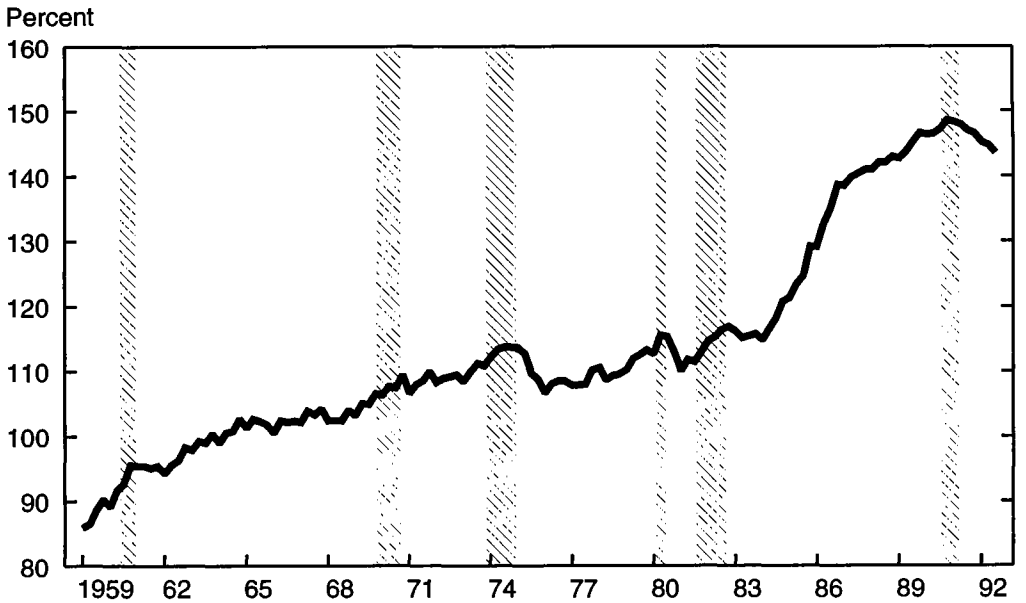
Chart 1: Private Nonfinancial Debt to GDP



Note: Shaded areas represent recessions.

The removal of mortgages makes little difference to the overall story; the buildup of debt in the 1980s remains striking as does the subsequent retrenchment. In Table 3 we look at the behavior of some of the most critical components of nonmortgage debt: consumer credit, long-term business and corporate debt, and short-term business and corporate debt. Short-term debt is further subdivided into bank loans and other. Much of the weakness in debt growth from 1989-92 was due to outright declines in consumer credit and bank loans to business, but there was also a dramatic slowdown in other nonbank short-term lending to business.

Charts 1 and 2 illustrate the relationship of debt formation to the business cycle. Other things equal, a faster pace of economic activity tends to increase both the supply of and demand for funds in the credit markets. In particular, this cyclical element may reflect the close relationship between the demand for business and household credit and the more cyclically sensitive components of real activity. For example, investment in real estate, which is extremely cyclical, is very intimately connected to the debt markets, while household spending on groceries, which is relatively acyclical, has a tenuous connection to debt formation.

Table 2: Growth of Private Nonfinancial Debt Excluding Mortgages
Percent Change, Annual Rate

	Total[a]	Households	Business	Corporate	Noncorporate
1984 to 1989	10.2	8.3	9.9	10.9	6.0
1990 to 1992-II	2.7	1.5	1.8	2.5	-1.5
1991-IV Outstandings[b]	4397.2	1058.7	2435.9	2057.0	378.9

a. Includes state and local governments.
b. In billions of dollars.

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In addition, the charts highlight the boom/bust nature of debt formation during the 1980s and the early 1990s. In the 1980s expansion, debt grew very rapidly relative to aggregate economic activity, while early 1990s saw an unusual drop in debt growth. Although suggestive, by themselves these facts do not establish that debt movements were "caused" by shifts in underlying supply and demand factors. Conceivably, shifts in the composition of output first toward and then away from debt-sensitive activity could account for the wide swings in debt growth.

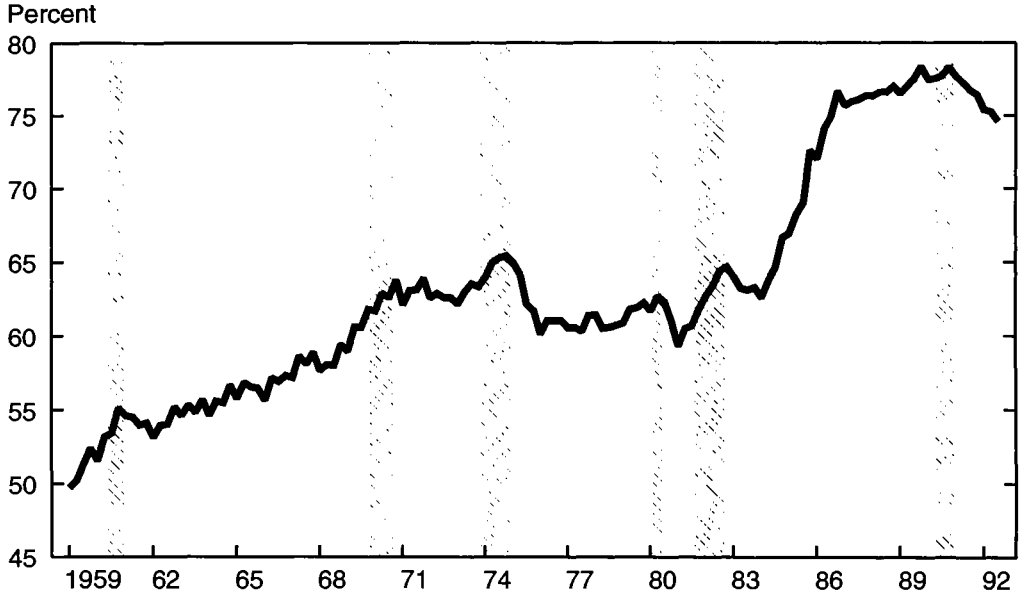
In light of the large differences in credit linkages across output components, the remainder of this paper focuses on specific sectors of real activity and movements in closely linked types of borrowing. In particular, we first examine non-real-estate borrowing and debt-sensitive activity (capital spending, inventories, and the more discretionary elements of consumption). Near the end of the paper, we discuss trends in mortgage lending and their relationship to nonfinancial activity, but we forgo discussion of activity in real estate markets, which is handled in another paper in this study.

II. Developments in Nonmortgage Business Borrowing and Spending

Nonfinancial business debt covers a wide spectrum: bonds, mortgages, bank and thrift loans, loans from finance companies and governments, commercial paper, and bankers acceptances. Charts 1 and 2 showed the strong cyclical element in debt formation in the nonfinancial sector, with the ratio of debt to GDP typically growing during expansions and falling during recessions. This trend was accentuated in the 1980s and early 1990s. Tables 1 and 2 illustrate the marked deceleration in borrowing by nonfinancial business, while Table 3 documents the very pronounced slowdown in short-term business debt.

Just as it is unreasonable to assume a fixed relationship between overall economic activity and debt growth, so too is it implausible to expect a fixed relationship between business activity and business debt growth. Certain types of business activity tend to be more dependent on credit markets than others. For example, the demand by business for nonmortgage debt is presumably related to business spending on inventories and fixed

Chart 2: Private Nonfinancial Debt Excluding Mortgages to GDP



Note: Shaded areas represent recessions.

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capital. Although it is conceptually possible for firms to finance tangible capital formation solely through a combination of cash flow and financial asset liquidation, it is extremely unlikely to occur: tangible assets are obviously ideal for (implicitly or explicitly) collateralizing debt. Arguably, relationships between nonfinancial demand and business debt growth could be examined at an even more disaggregated level. For example, the demand for bank loans would likely be associated with inventory accumulation.

Moreover, there is good reason to confine formal statistical analysis to the corporate sector, at least when discussing nonmortgage borrowing. A wider range of data are available for the nonfinancial corporate sector than for the noncorporate sector (for instance, cash flow for noncorporate business is inadequately measured), and credit growth in the noncorporate sector is very heavily influenced by real estate lending and government programs for small business and farms. Chart 3 shows that recent trends in noncorporate credit growth parallel those in the corporate sector; thus generalizations drawn from analysis of corporate debt creation can likely be applied to the business sector as a whole.

One complication in examining the relationship between corporate borrowing and activity is that the composition of the corporate sector's liabilities is subject to frequent sharp changes for reasons that are not well understood and have little to do with economic activity.[2] Since corporations are free to issue and retire equity, and in turn to retire and issue debt with the proceeds, there is some reason to look at the relationship between nonfinancial activity and a broad measure of liability issuance broader than just borrowing. The institutional changes in financial markets in the 1980s such as the growth of the commercial paper, high-yield bond, and derivative markets, reinforce this argument because they have blurred the distinctions between debt types and indeed between debt and equity.

[2] The Modigliani-Miller theorem holds that under certain circumstances, the demand for different types of liabilities by a rational, profit-maximizing corporation will have no connection to its nonfinancial activity. Merton Miller (1978) has claimed that even under some "real-world" circumstances the theorem will apply for individual corporations, although investor behavior will ultimately force the corporate sector as a whole to some equilibrium capital structure.

Table 3: Growth of Selected Debt Categories
Percent Change, Annual Rate

			Long-Term Debt			Bank Loans			Other Short-Term Debt		
	Consumer Credit	Nonfinancial Corporate Long-Term Debt, Excluding Mortgages	Nonfinancial Business	Corporate	Noncorporate	Nonfinancial Business	Corporate	Noncorporate	Nonfinancial Business	Corporate	Noncorporate
1984-89	8.8	13.0	10.2	12.8	8.0	6.2	7.2	3.9	10.3	12.4	7.7
1990-92-II	-0.8	5.8	2.4	4.4	-0.5	-2.6	-2.6	-2.7	0.5	-0.3	0.9
1991-IV Outstandings[a]	796.7	1165.9	2323.4	1382.9	940.5	677.2	530.5	146.8	592.7	360.6	232.2

a. In billions of dollars.

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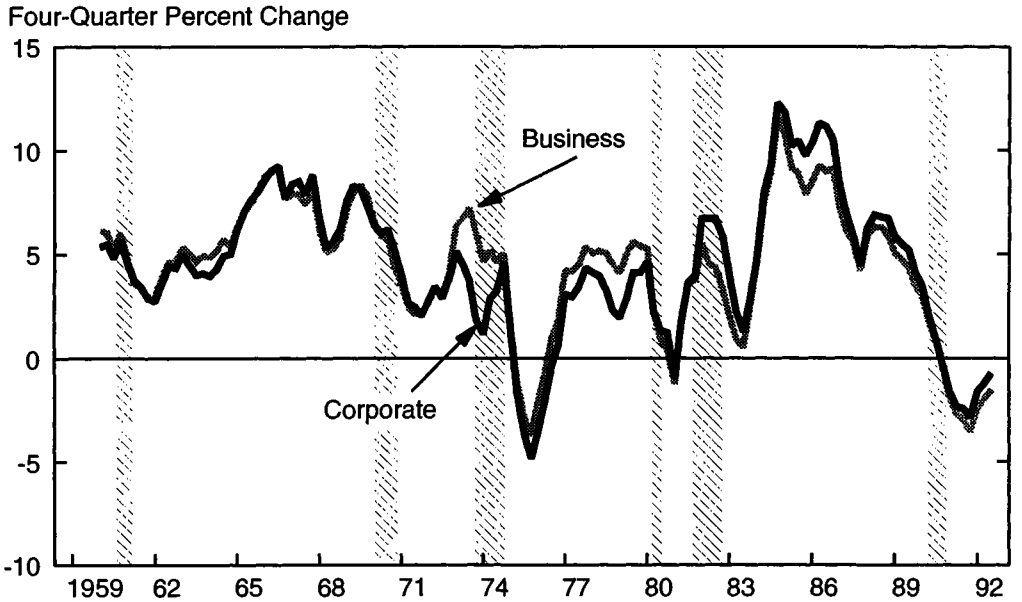
Chart 3: Nonfinancial Business and Corporate Debt Excluding Mortgages



Note: Shaded areas represent recessions.

As a result, our strategy is to look at the relationship between business activity, specifically inventory and capital spending, and a number of liability measures for the nonfinancial corporate sector. We focus most of our attention on statistical models excluding interest rates as determinants of demand. We do so for several reasons. There is ample theoretical and empirical evidence (Stiglitz and Weiss 1981, Jaffee and Stiglitz 1990) that nonprice credit rationing is commonly used to sort out bad credit risks. In such an environment, the "equilibrium" interest rate does not have a clear relationship with the quantity of credit, in part because credit is allocated by means other than price.[3] A second argument is the empirical one that increases in interest rates may depress the demand for credit mainly through the indirect channel of depressing the level of debt-sensitive activity.

We turn now to the details of the estimation procedure. As noted above, financial and economic theory has not yet provided a satisfactory framework for building econometric models of the relationship between economic activity and balance sheet changes. Some empirical models (Taggart 1977, Hendershott 1977, Auerbach 1985) have explored these relationships using stock-adjustment models. The rationale for such models is the hypothesis that households and businesses have desired long-run ratios of the stock of financial assets or liabilities to flow measures of economic activity. In the short run, the actual borrowing adjusts slowly to the long-run equilibrium. Unfortunately, these models have not proven to be very stable—a finding that recalls the long history of similar models of the demand for money.

Instead of looking at stock-flow relationships between the level of debt and activity, we explore *flow-flow* relationships between borrowing—the change in debt—and activ-

[3] A somewhat related but less technical argument advanced by Wojnilower (1980, 1985) is that the demand for credit in the United States is insensitive to interest rates, and more importantly, that credit demand (which is determined by real activity) exceeds supply at all "normal" interest rates. Wojnilower contends that changes in credit supply availability drive credit flows and thus activity, almost irrespective of interest rates.

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ity. At a disaggregate level, we think it is likely that there are systematic flow-flow relationships stemming from customary methods of finance for certain types of activity.[4] Breakdowns in such relationships—sizable errors in the simulated equations—may be evidence of unusual factors at work in credit markets. Also, as a practical matter, flow-flow models are simple to discuss (one is relating dollars of activity to dollars of borrowing), and in the absence of substantive theoretical or statistical evidence in favor of alternative formulations, we prefer a simpler specification.

For corporate borrowing, we begin by using measures of current-dollar inventory and fixed capital spending as major sources of demand. In addition to these spending measures, corporate cash flow is likely to affect corporate borrowing. The relationship here would tend to be more complicated than that between borrowing and spending on inventory and capital. Higher cash flow implies less direct need to tap capital markets, suggesting a negative relationship between borrowing and cash flow, but offsetting this could be an association between higher cash flow and a greater ability to borrow. In other words, a negative coefficient on cash flow would suggest that demand effects outweigh supply effects, while the opposite conclusion would be drawn from a positive coefficient.

The first measure of borrowing we examine is bank and thrift lending to nonfinancial corporations. Equation 4.1 (Table 4) summarizes the model. The equation has a very intuitive structure; corporate borrowing from intermediaries is negatively related to cash flow and positively related to fixed capital and inventory spending. The residual standard error of the equation is about $20 billion, quite large compared with the mean of the series.

[4] The distinction between the stock-flow and flow-flow specifications of debt demand can be reconciled at an abstract level. Suppose the true underlying demand relationship is between stocks of debt and stocks of income-producing capital (which can include human as well as physical capital). This true relationship can be alternatively and equivalently restated as one between stocks of debt and flows of income (assuming a fixed relationship between flows of income and stocks of income-producing assets) or, if we take first differences, as one between borrowing and changes in the stock of income-producing assets, or investment.

Table 4: Determinants of Nonfinancial Corporate Borrowing

				Interest Rate Terms						
Borrowing Category	Cash Flow	Plant and Equipment Spending	Inventory Investment	Cash Flow	Plant and Equipment Spending	Inventory Investment	ρ	S.E.	DW	$\bar{R}^2$
4.1 Bank and thrift loans[a]	-3.67 (.084)	.401 (.077)	.450 (.117)					22.1	1.81	.231
4.2 Short-term debt[b]	-.531 (.145)	.663 (.136)	1.297 (.192)				.134 (.123)	33.8	2.00	.498
4.3 All debt	-0.72 (.188)	.448 (.176)	.825 (.216)				.385 (.114)	34.0	2.20	.736
4.4 Short-term debt[b]	-.793 (.479)	.715 (.442)	3.041 (.745)	.048 (.045)	-.025 (.037)	-.165 (.071)	.057 (.125)	33.4	1.99	.508

Notes: All data in billions of dollars, seasonally adjusted annual rates. Standard errors in parentheses. Estimation period: 1959-I to 1992-II.

a. Nonfarm nonfinancial corporate bank loans and S&L loans.
b. Nonfarm nonfinancial corporate bank loans, S&L loans, finance company loans, trade debt, and commercial paper.

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Chart 4 shows the four-quarter moving average of loan extensions plotted against the four-quarter change predicted by equation 4.1. From 1984 through 1988, borrowing was about $10 billion to $20 billion a year higher than predicted by cash flow, fixed capital, and inventory spending. In relative terms, business borrowing was about 25 to 50 percent higher than the activity fundamentals predicted. Thereafter the situation changed: in 1991 corporations on net liquidated loans from banks and thrifts at a pace about $35 billion less than predicted by the fundamentals. Roughly speaking, the fundamentals suggest that by 1992 borrowing should have been positive at $10 billion to $20 billion—comparable to levels seen in the aftermath of the 1981-82 recession. Instead, net borrowing from banks and thrifts remained negative.

Because many firms may substitute one type of corporate borrowing for another, equation 4.2 broadens the focus to a larger debt aggregate.[5] Added to bank and thrift loans are finance company borrowing, commercial paper issuance, and trade debt. In a qualitative sense, equation 4.2 is very similar to 4.1. The differences between the two seem explicable—the greater sensitivity to capital spending may reflect the inclusion of finance company lending (much of which is lease financing of equipment), and the greater sensitivity to inventories may reflect the inclusion of trade debt. The standard error of the equation is larger than that of 4.1, reflecting the greater average size of the borrowing aggregate. However, the $\bar{R}^2$ of 4.2 is higher than 4.1, suggesting that some of the noise in 4.1 reflects substitution into and out of the lending categories included in 4.2 but excluded from 4.1.Chart 5 repeats for 4.2 the exercise shown in Chart 4. The results are similiar: borrowing was larger than predicted in the middle 1980s, but smaller than expected in more recent years. As recently as late 1989 the actual and predicted levels of short-term borrowing matched. Although the fundamentals suggest some softening in credit growth thereafter, the actual slowdown was much larger, with the model

[5] Remolona and Wulfkeheler (1992), however, argue that there is a surprising degree of segmentation between bank and finance company lending.

Chart 4: Bank and Thrift Loans
Actual versus Predicted

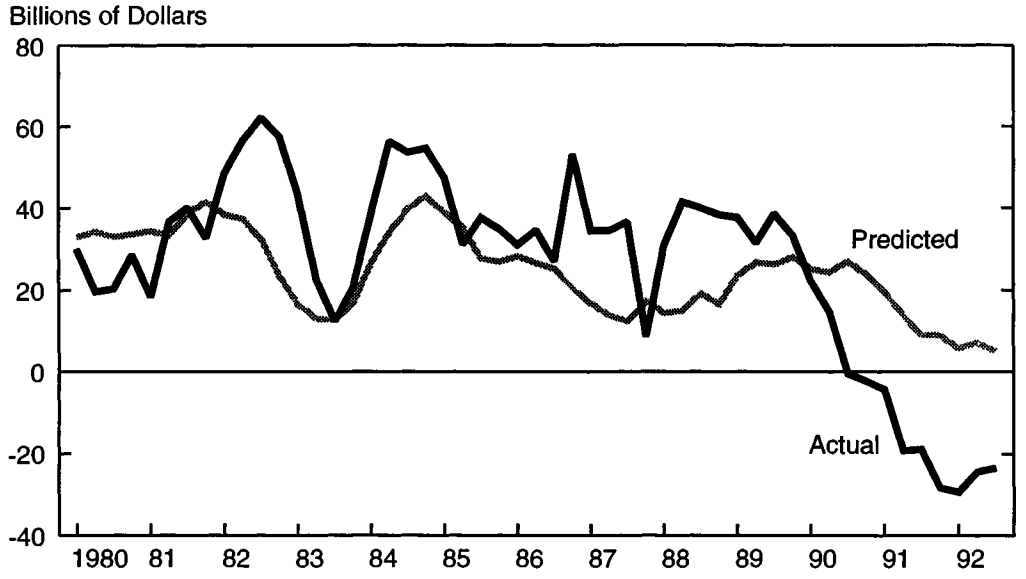

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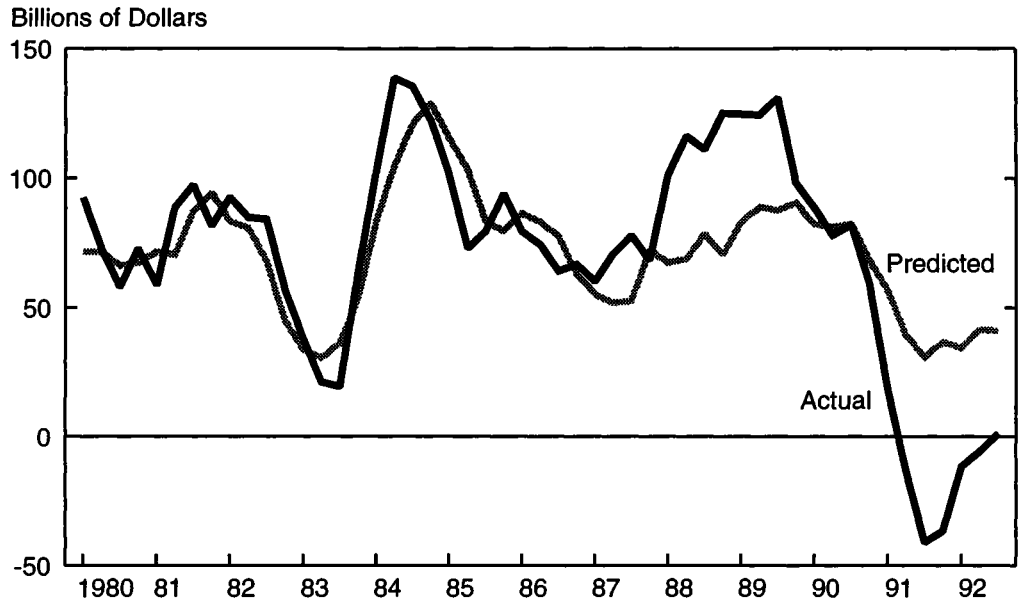
Chart 5: Short-Term Borrowing
Actual versus Predicted



overpredicting borrowing by as much as $75 billion. In fact, during 1991 the model predicted a positive level of borrowing about equal in magnitude to the actual rate of liquidation of short-term debt. In early 1992 the overprediction was still about $40 billion—roughly comparable to the error in the bank and thrift loan equation.

Equation 4.3 expands the borrowing aggregate to include bond issuance (both standard corporate and tax exempt). In a qualitative sense, the results are similar to equations 4.1 and 4.2, with a negative coefficient on cash flow and positive coefficients on the spending aggregates. However, the coefficient on cash flow is close to zero, suggesting that issuance of longer term debt may reflect forces other than demand conditions: firms with strong cash flow may feel more confident about issuing long-term debt (a demand effect that is not associated with a cyclical need for funding). Equally likely, however, is the positive effect of strong cash flow on a firm's credit ratings and thus its ability to attract long-term funds (a supply effect). Simulation of this equation showed once again, that borrowing was greater than predicted in the mid-1980s and substantially less than predicted in 1989-91.

For a variety of reasons, detailed analysis centers on the behavior of equation 4.2. Equation 4.2 fits better than 4.1 because it covers a substantially broader aggregate: short-term fluctuations from bank and thrift lending toward other short-term assets are subsumed into the specification with the broader aggregate.[6] The specification using an even broader aggregate, equation 4.3, is superior in terms of overall fit, but is less clearly reflective of aggregate demand factors.

The superiority of the short-term debt equation to the total debt equation is illustrated in Table 5. This table shows the coefficients on cash flow, plant and equipment spending, and inventories, for equations 4.2 and 4.3 when they are estimated over sample periods ending in 1979-IV (before the 1980 credit controls and the two recessions of the

[6] Equation 4.2 was reestimated without trade debt (which is not a component of credit market debt as usually reported). The specification with trade debt was markedly superior on econometric grounds.

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early 1980s), 1983-IV (after the 1981-82 recession and just before the surge in debt formation of the mid-1980s), 1988-IV (after the debt surge and before the debt slump), and the previously reported 1992-II. The relative stability of the coefficients in the short-term debt equation is evident. Equation 4.2 appears to be picking up a stable long-run relationship between borrowing and activity. The most obvious interpretation is that equation 4.2 represents the fundamental or long-run influence of nonfinancial factors on the demand for short-term credit. The shifts in the coefficients for the total debt equation suggest that the relative importance of nonfinancial influences and other effects (such as corporate desire to restructure balance sheets between short-term and long-term debt and between debt and equity) change erratically.[7]

[7] Formal statistical tests are generally supportive of the hypothesis that the structure of the short-term borrowing equation has been stable, while the structure of the overall debt equation appears to have shifted in the late 1980s. Stability of coefficients does not mean that an equation *fits* particularly well, it merely means that the influence of the factors considered does not change.

A large number of other specification checks were done on equation 4.2. It is arguable that corporations have few options on the amount of short-term debt issuance, given cash flow, plant and equipment spending, and inventory investment. Thus, the good fit and stability of 4.2 might come from estimating a near identity. However, removing cash flow from 4.2 does not greatly affect the equation's overall explanatory power, the pattern of its residuals, or the stability of the remaining coefficients. Heteroskedasticity in the residuals could be suspected; however, scaling the variables in the regression by GDP made no meaningful difference in the coefficients.

Table 5: Shifts in Activity Coefficients in Business Borrowing Equations

	Cash Flow	Plant and Equipment Spending	Inventory Investment
Short-term borrowing (equation 4.2 specification)			
Sample period:			
1959-I to 1979-IV	-.875 (.231)	.966 (.198)	1.490 (.258)
1959-I to 1983-IV	-.562 (.156)	.703 (.130)	1.344 (.199)
1959-I to 1988-IV	-.294 (.133)	.497 (.120)	.883 (.192)
1959-I to 1992-II (equation 4.2)	-.531 (.145)	.663 (.136)	1.297 (.192)
All borrowing (equation 4.3 specification)			
Sample period:			
1959-I to 1979-IV	-.742 (.179)	1.021 (.154)	1.332 (.221)
1959-I to 1983-IV	-.600 (.124)	.867 (.103)	1.419 (.163)
1959-I to 1988-IV	-.159 (.144)	.301 (.130)	.632 (.197)
1959-I to 1992-II (equation 4.3)	-.072 (.188)	.448 (.176)	.825 (.216)

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We argued above that interest rate effects may not be important in explaining debt growth when activity variables are taken into account. Equation 4.4 corroborates this view. Interest rate effects are incorporated in the short-term borrowing model of equation 4.2 by adding variables that are the product of the measures of activity and the prime lending rate to the basic equation. The logic behind this specification is a simple demand story: higher short-term interest rates lower the sensitivity of borrowing to activity. At higher rates, a smaller fraction of inventory and fixed investment is debt financed, while a higher fraction of cash flow goes to retire short-term debt. As hypothesized, the signs of these interactive terms are opposite to those on activity: short-term rates affect short-term borrowing in a way consistent with a simple demand hypothesis.[8]

Nonetheless, the addition of interest rate variables makes no real difference in explaining credit movements over the last decade. Despite formal statistical evidence that interest rates directly affect the demand for short-term business credit (over and above their effects on activity), the mid-1980s underpredictions of debt growth and the more

Footnote 7 continued

A variety of other borrowing aggregates--including the addition of equity issuance--were regressed on the basic activity variables. None proved superior to the aggregate used in equation 4.2 in terms of the criteria of readily interpreted coefficients or stability. In any event, all models of borrowing screened showed a consistent sharp swing toward overestimation in the 1989-91 period. Some models estimated with end points in 1988 captured the level of borrowing in the mid-1980s correctly but then grossly overestimated the levels of the subsequent period, while others swung from large underestimates in the mid-1980s toward overestimates afterwards.

[8] An attempt to capture substitution between short- and long-term debt by adding long-term rates to the model failed.

Table 6: Actual and Predicted Short-Term Borrowing, 1985-92
Billions of Dollars

	Actual	Predicted	Actual less Predicted
1982	56.6	44.8	11.8
1983	63.3	53.4	9.9
1984	122.2	129.1	-6.9
1985	93.9	79.3	14.6
1986	66.5	63.0	3.5
1987	68.3	71.9	-3.6
1988	125.0	70.4	54.6
1989	98.3	90.5	7.8
1990	59.5	68.3	-8.8
1991	-36.5	36.7	-73.2
1992 (H-I)	-8.7	37.8	-46.5
1983 to 89 Average	91.1	79.7	11.4
1990-92 H-I Average	7.5	49.6	-42.1

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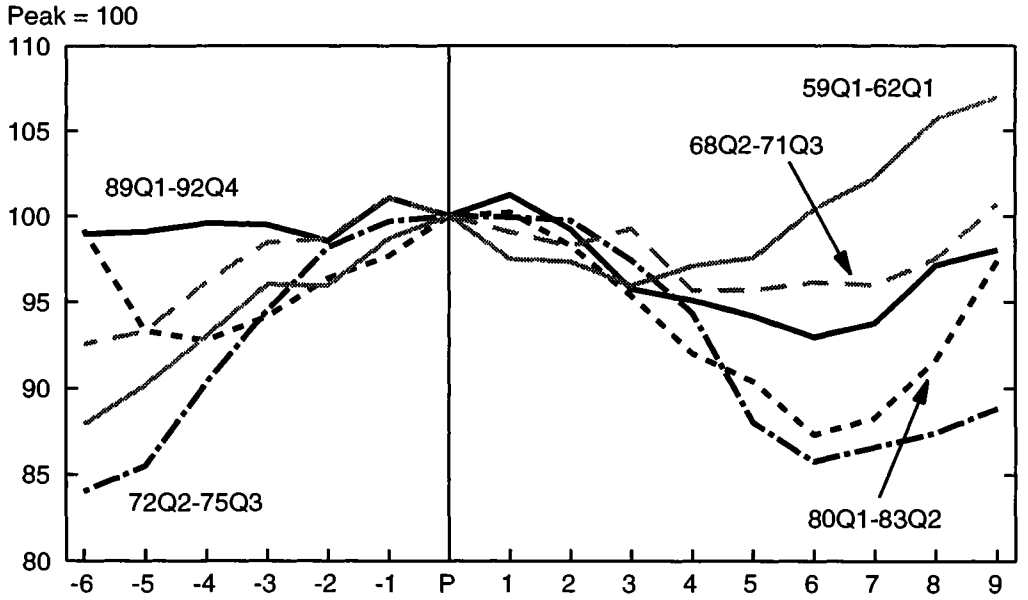
recent overpredictions were equally large for the models with and without interest rate effects.

Table 6 looks more closely at the actual year-to-year movements in short-term borrowing and those predicted by equation 4.2. The swings in borrowing from 1982 to 1986 are well captured by the model; however, the surge in borrowing from 1986 to 1988 is understated. The decline in borrowing began in 1989, but equation 4.2 called for an increase in that year. (The equation still underpredicted the level of borrowing.) Equation 4.2 did predict a sharp decline in borrowing in both 1990 and 1991, but the actual drop was much larger.

From the peak borrowing years of 1987-88 to 1990-91, corporate short-term borrowing declined $100 billion. The factors summarized in equation 4.2 explained only about 25 percent of this drop. The annual data in Table 6 tell a similar story for both sides of the borrowing cycle: from the 1986 trough through the 1988 peak and back down to the 1991 trough the fundamental demand factors account for about a quarter of the movement in borrowing. In 1992, borrowing appeared to be returning to the fundamentals, but the gap was still large.

We have documented that short-term lending to business in the early 1990s fell far below what would have been predicted on the basis of the historical relationship between credit growth and business activity. The shortfall followed a period in the mid-1980s when lending was well above this historical relationship. We now investigate what factors may have contributed to this breakdown. One possibility is a simple exogenous shift in the demand relationship: the debt sensitivity of fixed and inventory investment may have increased, and the debt sensitivity of cash flow decreased. This hypothesis is consistent with the underprediction of borrowing during the expansion of the 1980s and overprediction of borrowing in the early 1990s. A second possibility is an upward and then downward shift in credit supply. Finally, both credit supply and demand may have shifted up (in the mid 1980s) and then down (in the late 1980s) for reasons largely unrelated to real economic activity. For instance, the boom/bust cycle in M&A and LBO activity may reflect such exogenous shifts in credit markets.

Chart 6A: Real Business Fixed Investment



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One way to distinguish between these possibilities is to look directly at the behavior of the activity variables. A change in the structure of the underlying credit demand from firms—for example, deleveraging as part of overall corporate restructuring—is likely to be reflected in firms' nonfinancial decisions as well as their financial ones. Furthermore, if restructuring is gradual, the changes in activity are likely to be gradual, hence gradual changes in the pattern of business activity around 1989-90 could not plausibly be charged to credit market constraints. Alternatively, if the slowdown reflected a restriction in the supply of credit, then one might see a sudden emergence of unusual weakness in activity. Finally, if the cycle in credit creation was driven by shifts in purely financial supply and demand factors, real activity might be unaffected.

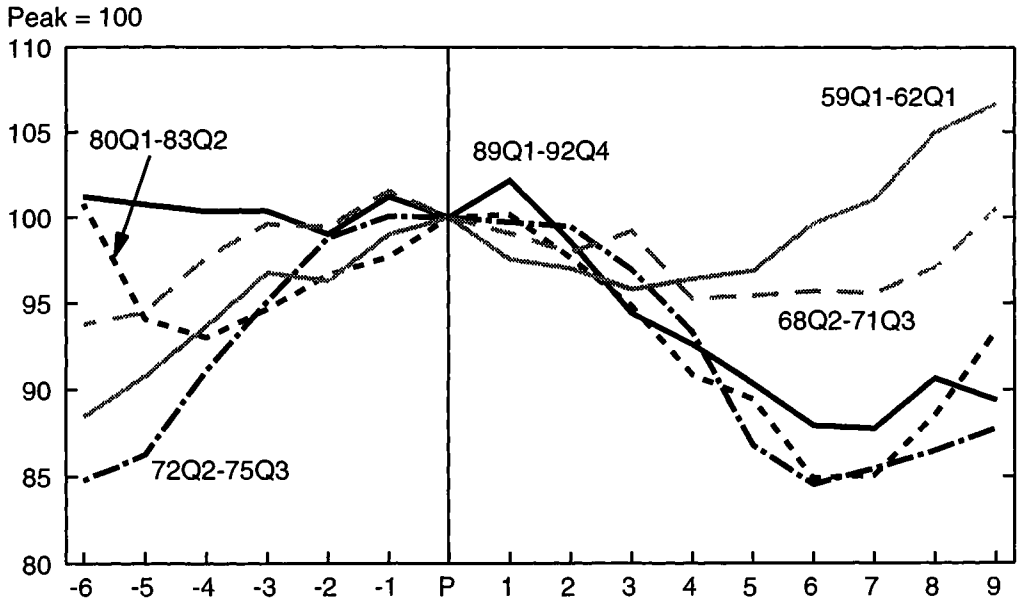
The next section examines recent movements in two measures of business activity that are closely linked to credit growth—fixed investment and inventory spending. Unusual weakness in these categories of spending may indicate that cutbacks in credit supply were restricting both the volume of borrowing and activity. If unusual weakness is not apparent—or can plausibly be tied to developments independent of credit markets—the implications for interpreting the slowdown in borrowing are less clear. Conceivably, a gradual slowdown in activity may be consistent with a reduction in the demand for debt. The third alternative discussed above—simultaneous shifts in both the supply and (purely financial) demand for debt—does not have any straightforward implications for activity.

Developments in Fixed Investment

A widespread impression exists that fixed investment held up quite well during the 1990-91 recession and its aftermath. This impression is only partly true. The decline in constant-dollar fixed nonresidential investment in 1989-91 was less than was typical for periods around recessions—even around mild recessions (Chart 6A). The overall strength, however, hides some weaknesses.

First, the strength of investment was largely due to a surge in investment in comput-

Chart 6B: Real Business Fixed Investment Less Information Processing Equipment



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ers and other forms of information-processing equipment. Removing computers leaves real investment rather weak for a recessionary period, especially one with a relatively high rate of capacity utilization (Chart 6B). This is more-or-less true even if we also take out investment in commercial real estate (Chart 6C). The traditional parts of investment suffered a decided slump.

Second, the strength was in constant-dollar terms, not in current dollars. Overall, current-dollar investment as a share of national output was low, and after 1989 its de-

Chart 6C: Real Business Fixed Investment less Information Processing Equipment and Commercial Construction

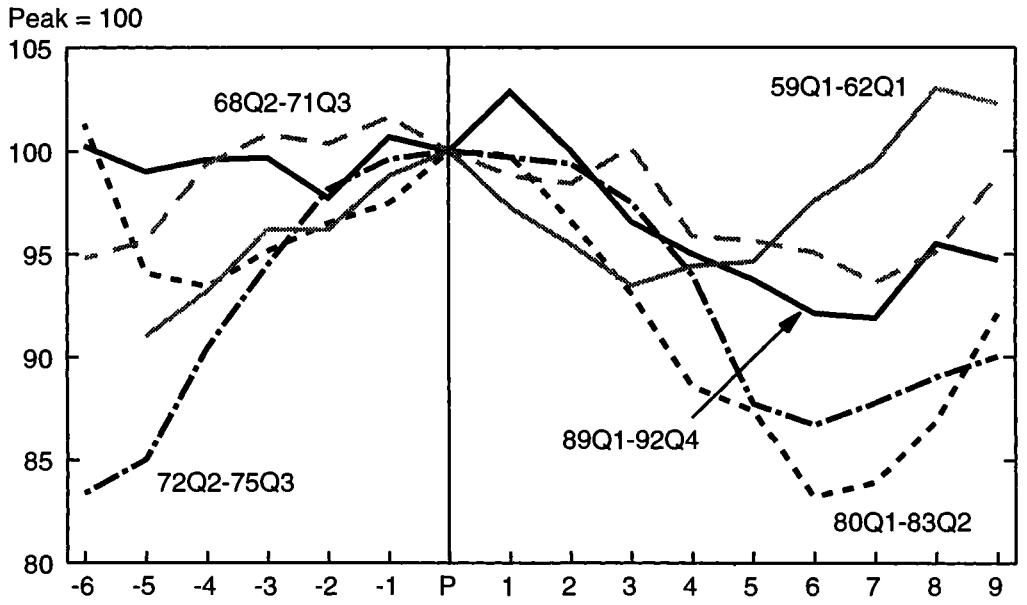
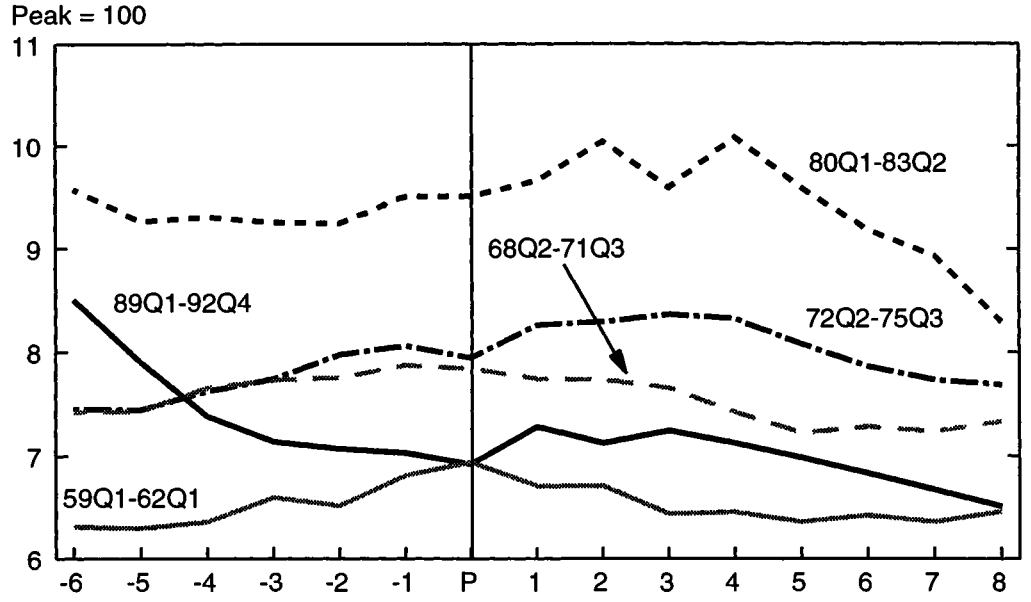


Chart 6D: Nonfinancial Corporate Investment as a Share of GDP



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cline was in line with that seen in earlier recessions and their aftermaths. These patterns appear to hold for the large share of current-dollar investment accounted for by nonfinancial corporations (Chart 6D).[9]

What appears to have happened in the early 1990s was a surprisingly sharp cutback in capital spending budgets relative to the mild economic decline. The real impact of the cuts was blunted by the shift in the composition of capital spending toward computers (whose prices were falling rapidly) and away from traditional, longer lived, and more expensive types of capital. The abrupt shift in the composition of investment is at least consistent with a restriction in the supply of credit.[10] Such a supply cut could cause businesses to turn their attention toward more easily financed (and lower cost) investments such as computers, while reducing spending on longer lived and more specialized types of capital goods connected with long-term business expansion and modernization plans.

Developments in Inventory Investment

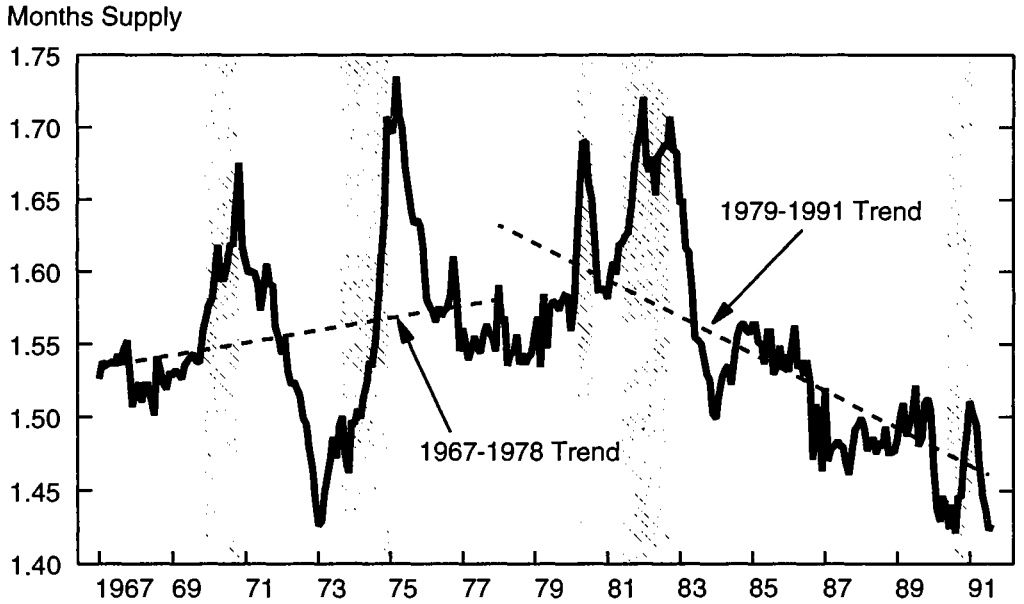
To a much greater extent than fixed investment, inventory investment experienced large, fundamental shifts during the 1980s that were largely independent of the recent financial distress. The most obvious manifestation of these changes was a very flat inventory cycle during the latest recession. During previous recessions, inventory investment accounted for more than three-quarters of the decline in real GDP, but in 1990-91, it accounted for less than half of the drop in output.

Although the small inventory cycle in 1990-91 might have resulted from tight credit supply conditions, the structural changes in inventory behavior appear to predate the

[9] The detailed breakdown of investment by category is not available quarterly for nonfinancial corporations.

[10] This argument does not establish causality from credit supply to investment, however. The investment shifts might be attributable to some other nonfinancial factor, while shifts in purely financial demand for debt, possibly accompanied by supply changes, account for the cycle in borrowing.

Chart 7A: Inventory to Sales Ratio: Manufacturing and Trade



Note: Shaded areas represent recessions.

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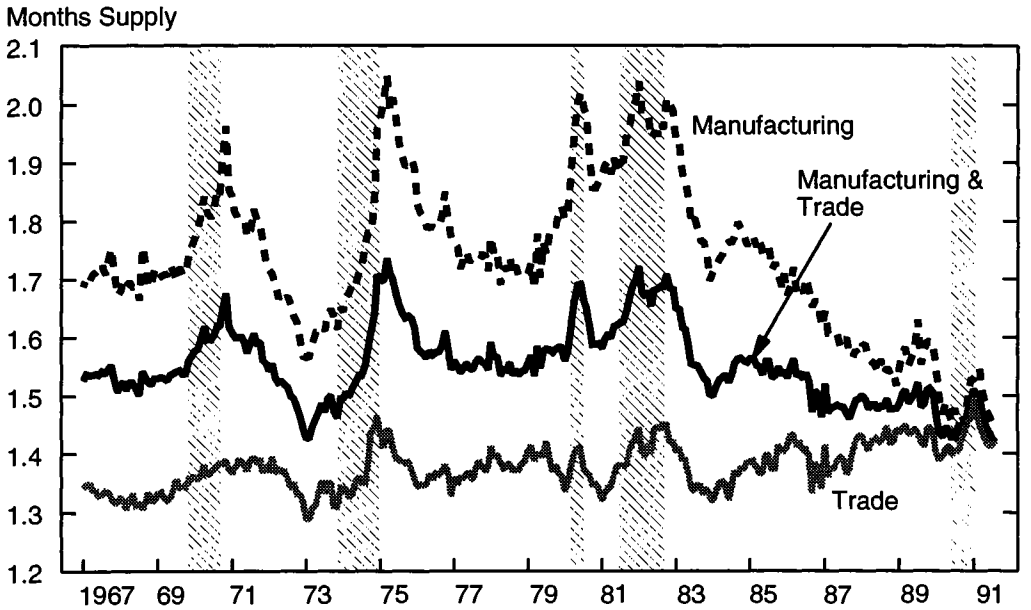
Chart 7B: Real Inventory to Sales Ratios



Note: Shaded areas represent recessions.

"credit crunch." Chart 7A, which shows the monthly inventory-to-sales ratio for manufacturing and trade firms, suggests that the unusual inventory behavior during the recession was an extension of structural changes in inventory behavior, particularly a downward trend in the stock/sales ratio, that started in the early 1980s.[11] Furthermore, changes in manufacturing inventory behavior were entirely responsible for both the downtrend in stocks in the 1980s and the smaller cycle more recently.

In manufacturing, the introduction of "just-in-time"[12] and similar inventory control systems during the 1980s resulted in more effective and more frequent inventory control. For example, the percent of firms ordering production materials hand-to-mouth (less than a week in advance) quadrupled, from 5 percent through most of the 1970s to over 20 percent by 1991 (Chart 8A).[13] These innovations reduced both the average level and the volatility of inventories, and thus can explain both the decline in manufacturing inventory-to-sales ratios and the smaller inventory cycle in 1990-91.

[11] Recent revisions to constant-dollar inventory and sales data have moderated this downtrend. Upward revisions to manufacturing inventories over the 1980s and a sharp downward revision (of questionable origin) to manufacturing shipments starting in 1990 raised recently published inventory-to-sales ratios relative to those reported in Chart 7A. The revised data suggest that structural change in inventories was quite pronounced in some industries but was less dramatic for all manufacturing.

[12] As its name implies, just-in-time (JIT) is a production management technique advocating minimal inventories, frequent deliveries, and near-constant monitoring of production and inventory. Although JIT (which works best when suppliers and buyers are geographically close), may not be applicable to all U.S. manufacturing, most manufacturers have shortened their order leadtimes by managing stocks more efficiently.

[13] Anecdotal evidence suggests that the 20 percent of firms where JIT has become pervasive are in durables manufacturing. Not coincidentally, these industries, which historically have very cyclical demand and large inventory cycles, experienced much smaller inventory swings in the latest recession.

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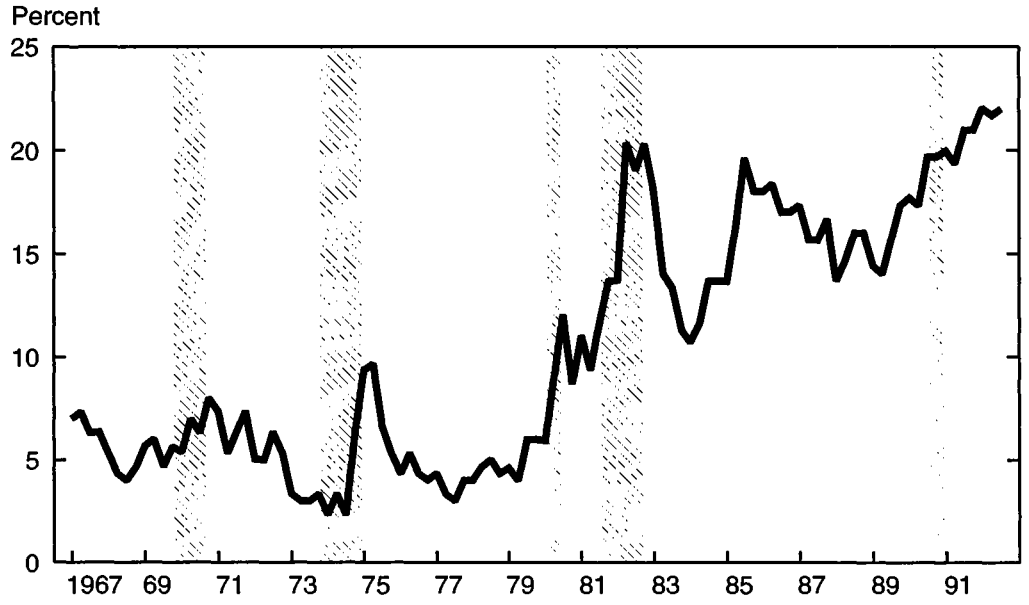
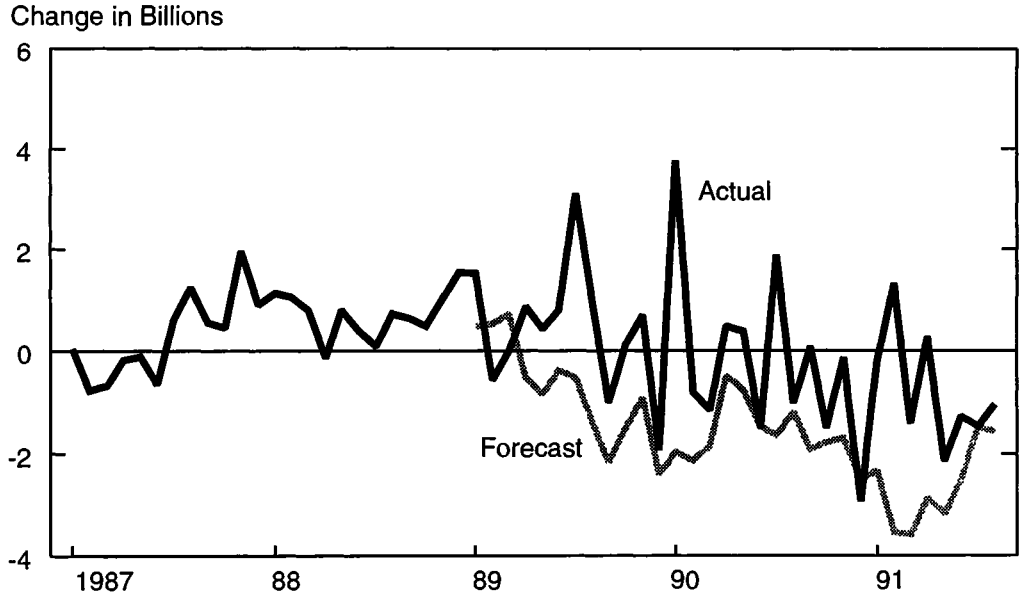
If the small inventory cycle was due to structural changes as opposed to credit restrictions, then a "real" model of inventory behavior, that is, one without any credit or interest rate variables, should overpredict the small inventory cycle in the latest reces-

Chart 8A: Average Leadtimes for Production Materials
Percent Reporting "Hand to Mouth"



Source: National Association of Purchasing Managers. Shaded areas represent recessions.

Chart 8B: Dynamic Forecast of Manufacturing Inventory Investment Stock Adjustment (Error Correction) Model
1980-88 Estimate



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sion. Chart 8B shows dynamic forecasts for 1989-91 from such an inventory model for manufacturing.[14] Forecasted values for 1989-91 are consistently *lower* than actual investment, exactly the opposite of what one would expect to find if credit supply problems were hindering inventory investment.

While the move toward better inventory management appears to have been independent of credit supply shifts, it probably caused a downward shift in the demand for credit. The decline in corporate borrowing in 1989-91, however, was several times the size of the decline in inventory investment, and thus inventory changes alone were insufficient to explain the weakness in business borrowing. Moreover, the downward shift in inventory investment started in the early 1980s, but for much of subsequent decade corporate borrowing was considerably higher than would be explained by nonfinancial factors. Thus the connection between better inventory management and lessened credit demand appears to be only a small portion of a much larger credit puzzle.

III. Developments in Household Borrowing and Spending

The bulk of household borrowing is done in the mortgage market. Households do, however, borrow to finance purchases of automobiles and other big-ticket items, and during the 1980s, households increasingly used charge and credit cards to finance spending on a wide variety of goods and services. This section examines the determinants of a major category of nonmortgage household borrowing—installment and "other" (single-payment) consumer credit. This borrowing includes the most important types of nonmortgage household credit—automobile loans and credit card debt.

[14] The real inventory model used for forecasts in Chart 8B is an error correction model, which may be interpreted as a slight variation on the standard stock adjustment model. In this model, inventory investment is determined by the gap between actual and target inventories (which are modelled as a function of sales) and by lagged investment and sales changes. In addition, measures of JIT orders were included to account for the structural changes over the 1980s.

Chart 9: Consumer Installment Credit Share of Disposable Income

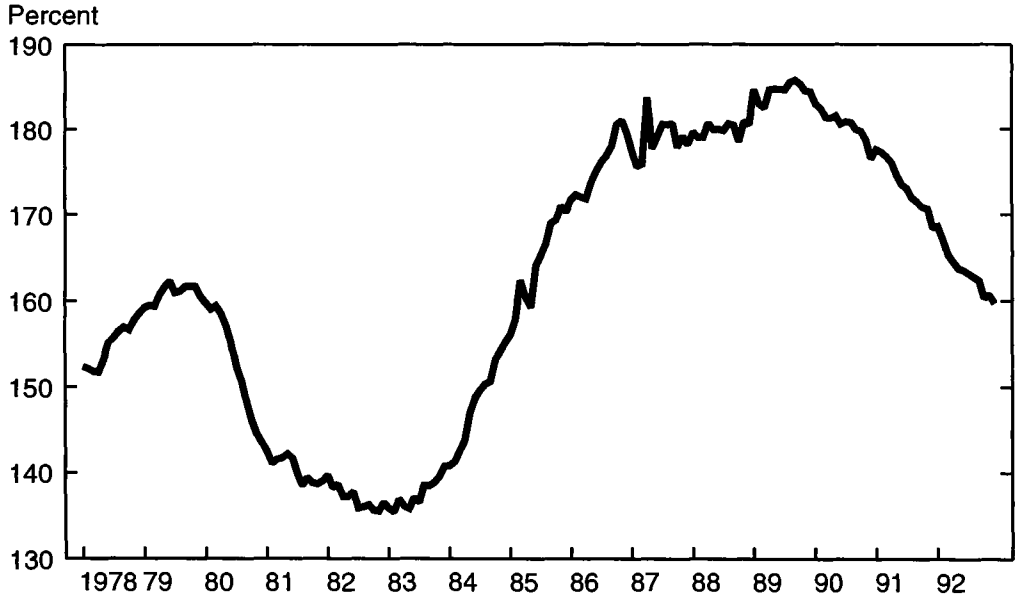

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Table 7: Determinants of Consumer Credit Borrowing

Disposable Income	Discretionary Spending	ρ	S.E.	DW
-.204 (.026)	.634 (.076)	.940 (.040)	8.71	1.92

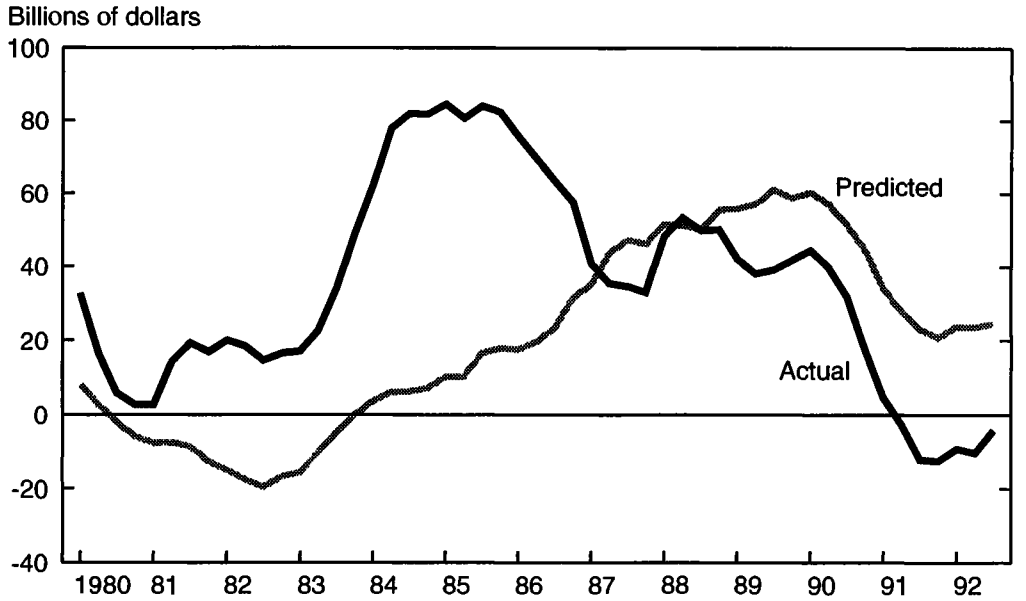
Notes: All data in billions of dollars, seasonally adjusted annual rates. Standard errors in parentheses. Estimation period: 1959-I to 1992-II.

The sharp rise in the ratio of installment credit to disposable income in the 1980s and its subsequent retrenchment (Chart 9) have been described as symptomatic of a household spending "binge" and "hangover" that inspired a return to more frugal habits. The plunge in personal saving after 1984 and its modest revival after 1988 are also said to be symptomatic of this phenomenon. As in the business sector, these large swings may reflect credit demand shifts due to fundamental factors, credit supply constraints, or exogenous credit changes related to desired leverage.[15] The model in Table 7 attempts to explain household borrowing in the consumer credit market by means of the fundamental factors of income and spending. The income measure used in the equation is disposable personal income. The spending measure is consumer spending on discretionary goods and services unrelated to home purchases. As in most of the business borrowing equations, interest rate effects are excluded.

The equation tells us that historically a $1 increase in household income is associated with about a $.20 decline in borrowing, while a $1 increase in discretionary spending is

[15] In the household sector, unlike the business sector, exogenous shifts in credit demand, such as the desire to increase and then reduce leverage, probably have substantial effects on activity, because households have limited access to credit markets and no way to substitute "debt" for "equity."

Chart 10: Consumer Credit
Actual versus Predicted



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associated with roughly a $.60 increase in borrowing. The signs of the coefficients suggest that the equation is explaining credit demand phenomena. The standard error of the equation is considerably smaller in magnitude than those for the corporate sector, but this occurs in part because household borrowing is smaller in magnitude than business borrowing. Furthermore, the equation has a high degree of serial correlation, implying that the right-hand side variables explain much less of the variance in the level of borrowing than the reported standard error suggests. In fact, it is probably more correct to think of this equation as explaining changes in, rather than the level of, borrowing.[16]

Chart 10 shows the four-quarter moving averages of actual and predicted household borrowing. In essence, the story for household borrowing is much the same as for corporate borrowing: borrowing was stronger than that predicted by fundamentals in the mid-1980s, more or less coincided with predicted levels in the late 1980s, and then fell short of predicted levels in 1989-91.

Table 8 compares the actual level of consumer credit borrowing with that predicted by the equation in Table 7. Consumer borrowing rose very sharply in the early 1980s, peaking in 1984-85. From 1986 through 1989, annual borrowing fluctuated erratically around $45 billion. Thereafter, borrowing fell off substantially, and by 1991 consumer credit was being liquidated. Credit liquidation ended by mid-1992. Not surprisingly, the equation missed the 1984-85 peak and instead predicted a smooth rise in borrowing until 1989. As consumption weakened from 1989 to 1991, the model predicted about a

[16] Reestimation of this equation over different sample periods produces little change in the coefficients. The coefficients on spending and income for the 1959-79 sample period, in fact, are virtually the same as for the 1959-92 period (the estimate of serial correlation, however, changes somewhat, and there is evidence that the sensitivity of borrowing with respect to both income and spending was higher in the 1980-88 period than either before or after).

Table 8: Actual and Predicted Consumer Credit Borrowing, 1982-92
Billions of Dollars

	Actual	Predicted	Actual less Predicted
1982	16.5	-16.9	33.4
1983	48.9	-0.1	49.0
1984	81.7	7.1	74.6
1985	82.3	17.9	64.4
1986	57.5	31.4	26.1
1987	32.9	46.1	-13.2
1988	50.1	55.6	-5.5
1989	41.6	58.8	-17.2
1990	17.5	44.4	-26.9
1991	-12.5	20.8	-33.3
1992 (H-I)	-7.8	24.4	-32.2
1983-89 Average	56.4	31.0	25.5
1990-92 H-I Average	0.4	31.0	-31.0

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$40 billion drop in borrowing. The equation captured about three-quarters of the *decline* that took place over that period, but it consistently overestimated the *level* of borrowing. The model also tracked the change in borrowing in the first half of 1992; however, the predicted level of borrowing was again sharply at variance with the actual.

Broadly speaking, the general pattern of consumer borrowing showed a sharp uptrend in the mid-1980s followed by a long-lived decline, with a particularly sharp decline in 1990-91. The nonfinancial fundamentals worked against the decline in the latter part of the 1980s and worked to accentuate the 1990-91 plunge. After 1989, a large share of the decline in borrowing—perhaps more than half—can be attributed to movements in the nonfinancial fundamentals, but it is clear that for the entire 1988-92 period, economic fundamentals systematically overestimated the level of borrowing.[17]

As in the case of the business sector, we now examine consumer spending in the early 1990s for any abnormal changes that might have been associated with the shortfall in borrowing. The unusual sluggishness in consumption was a major contributor to overall economic weakness from 1989 to 1992. Compared to previous business cycles, the more discretionary elements of consumption not related to home purchase were quite sluggish from 1989 to 1992, comparable only to the period around the deep and pro-

[17] The weakness in installment borrowing might have been an artifact of changes in the tax laws. The Tax Reform Act of 1986 legislated a gradual elimination of the interest deductibility of nonmortgage debt. Other things equal, this change should have put some downward pressure on nonmortgage borrowing (the expansion of home-equity lending is a manifestation of this phenomenon). Conceivably, the severe weakness of nonmortgage borrowing from 1990 through 1992 merely reflected the adjustment of borrowing patterns to the new tax regime. As a rough check on the tax effect, the analysis was redone using a consumer borrowing measure expanded to include a measure of credit extensions on home equity lines. Although this captures some of the tax substitution effect, it is not perfect because post-tax reform funds raised from standard mortgage borrowing could also have been shifted to nonhousing use (when buying a house, a household might borrow enough to also buy a car). Nonetheless, the reestimated equation produced coefficients very similar to those shown in Table 7 and the inclusion of the home equity variable did not greatly change the tracking ability of the model in the late 1980s and early 1990s; the actual decline in household borrowing was still larger than predicted.

Chart 11A: Real Discretionary Consumption

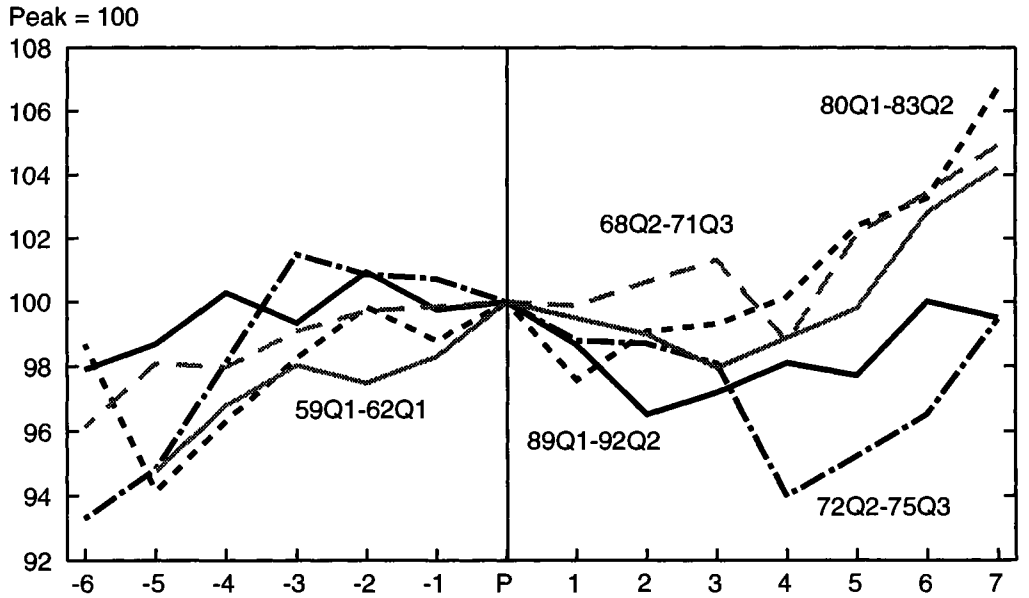

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Chart 11B: Real Consumption

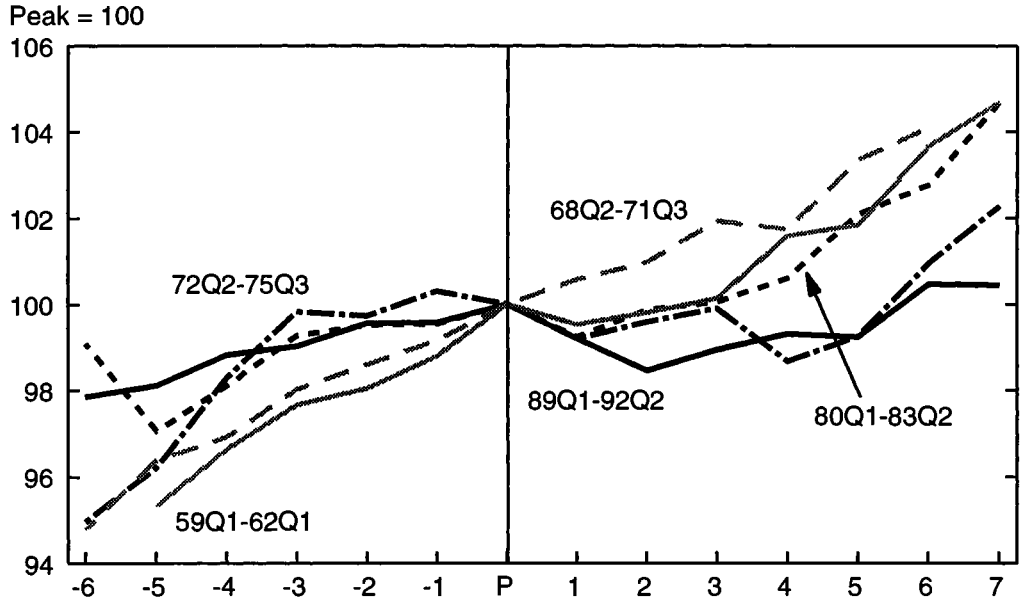
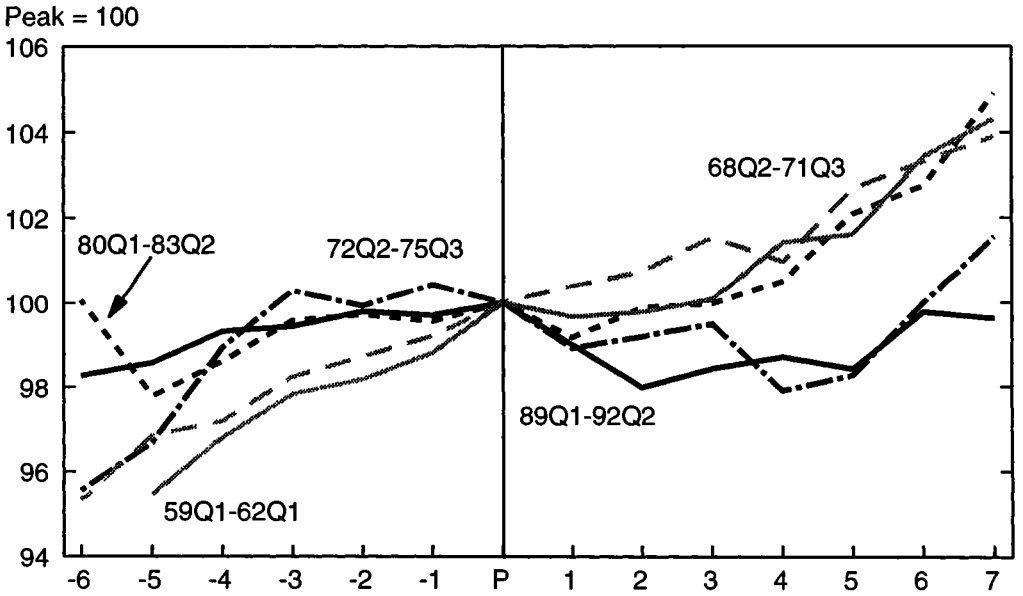


Chart 11C: Real Nonmedical Consumption



longed 1973-75 recession (Chart 11).[18] Overall consumption was weak too, particularly if medical care is removed.

The weakness in consumer spending over most of the 1990-92 period is little understood. Pronounced declines in indexes of consumer confidence and unusually small job gains in the early stages of the 1991-92 recovery are often cited as sources of weakness.

[18] Discretionary consumption is measured as durable spending excluding major appliances, home furnishings, and medical durables, plus spending on restaurants, clothing, nonbusiness travel, other recreation, and welfare and charity.

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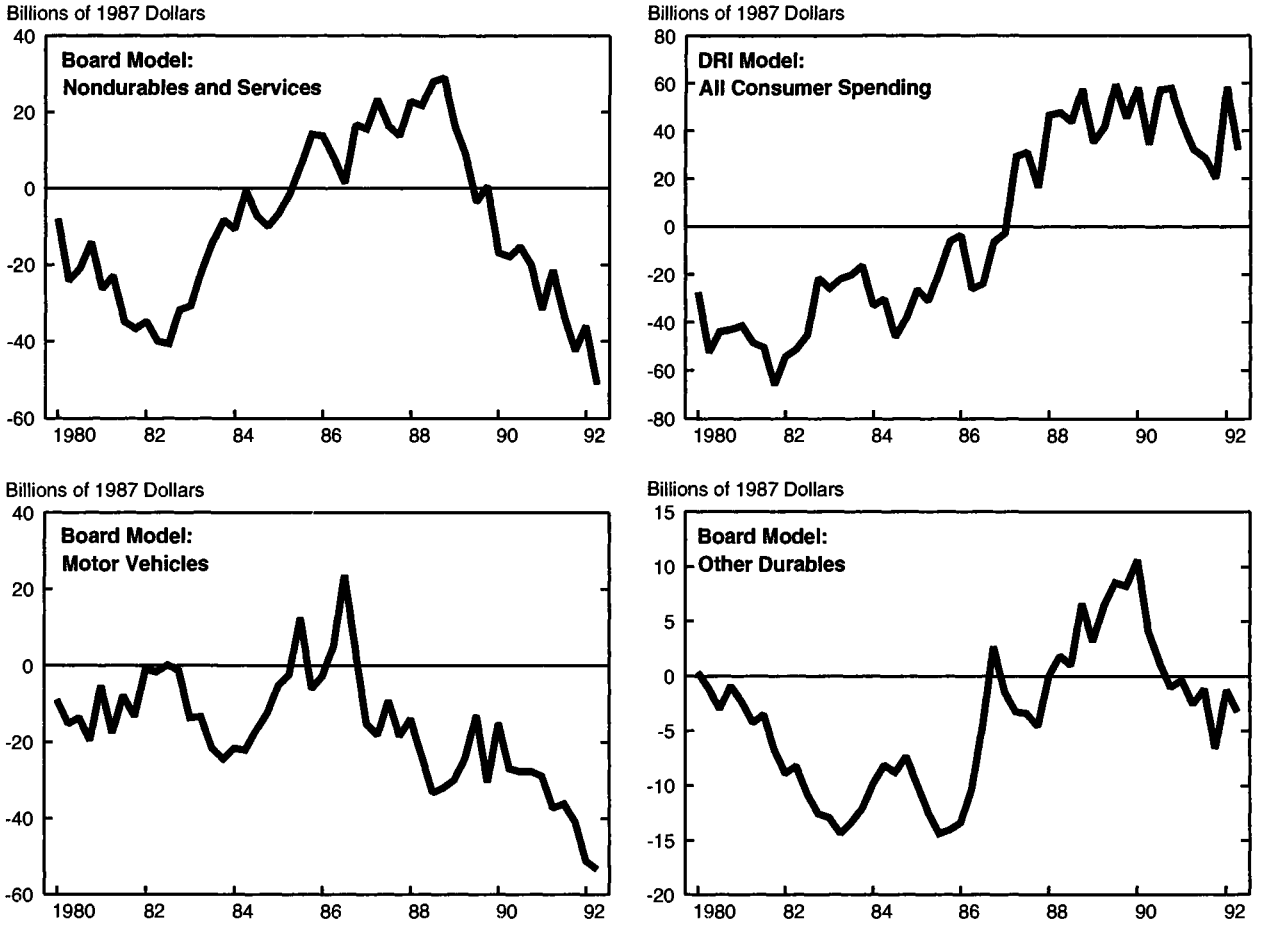
Chart 12: Actual less Predicted Real Consumer Spending
Billions of 1987 Dollars, Seasonally Adjusted Annual Rate



Even taking these factors into account, consumption was weak. Furthermore, there were some positive developments—such as the strength of the stock market—which in the past were associated with strong spending.

Statistical analysis of consumer behavior can be used to summarize much of the evidence on the weakness in consumer spending. A recent version of the consumer sector of the Federal Reserve Board model, where spending is essentially determined by income and wealth, showed that real consumer spending on nondurable goods and services swung from being $20 billion greater than predicted in 1989 to about $50 billion less than predicted by early 1992 (Chart 12). Spending on motor vehicles, both in level and growth, was also substantially less than predicted.

Unfortunately, it is unclear whether these large spending errors are closely linked (either as cause or effect) to changes in debt markets. For one thing, if consumer spending were as strong as the Board model predicted, the personal saving rate would have been near zero.[19] In addition, it is arguable that the Board model—perhaps because of its close linkage to the stock market and interest rates—is misspecified and thus is misreading behavior. Indeed, the Board model had comparable overestimates of spending in the

[19] Of course, if consumption had been as strong as the model predicted, there would have been favorable effects on personal income and saving.

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Table 9: Growth of Private Mortgage Debt
Percent Change, Annual Rate

	Total Nonfinancial	Households	Total	Corporate	Non-corporate	Farm	Nonfarm Non-corporate
1984-89	12.0	13.7	8.9	13.0	8.0	-5.3	10.2
1990-92-II	4.4	7.2	-1.0	-3.0	-0.5	-0.8	-0.4
1991-IV Outstandings[a]	4037.3	2879.9	1157.4	217.0	940.5	83.2	857.3

a. In billions of dollars.

1981-82 recession. Further, consumer spending models (such as that of Data Resources Incorporated [DRI]) that include consumer confidence measures did not overpredict.[20]

Given the weakness in consumer confidence and the softness in the job market, the extent to which the consumer spending and the consumer borrowing shortfalls can be traced to a cutback in the supply of credit to the household sector as opposed to a change in the psychology of the consumer toward lower spending *and* credit demand is unclear.[21]

[20] It is likely that the Board model overstates favorable stock market and interest rate development when consumer confidence is shaken by weak job markets; the DRI model (which is heavily dependent on the confidence index measures) *underestimated* spending in the early 1990s. Moreover, the Board staff reports that a recent reestimation of the Board model with revised data does a better job of tracking consumer spending on nondurable goods and services, although the model continues to overestimate spending on durable goods.

[21] Even if consumers faced few direct restraints on their borrowing, but weak job formation due to credit supply constraints on *firms'* activity might have indirectly restrained consumer spending.

Chart 13A: Leverage on Owner-occupied Housing

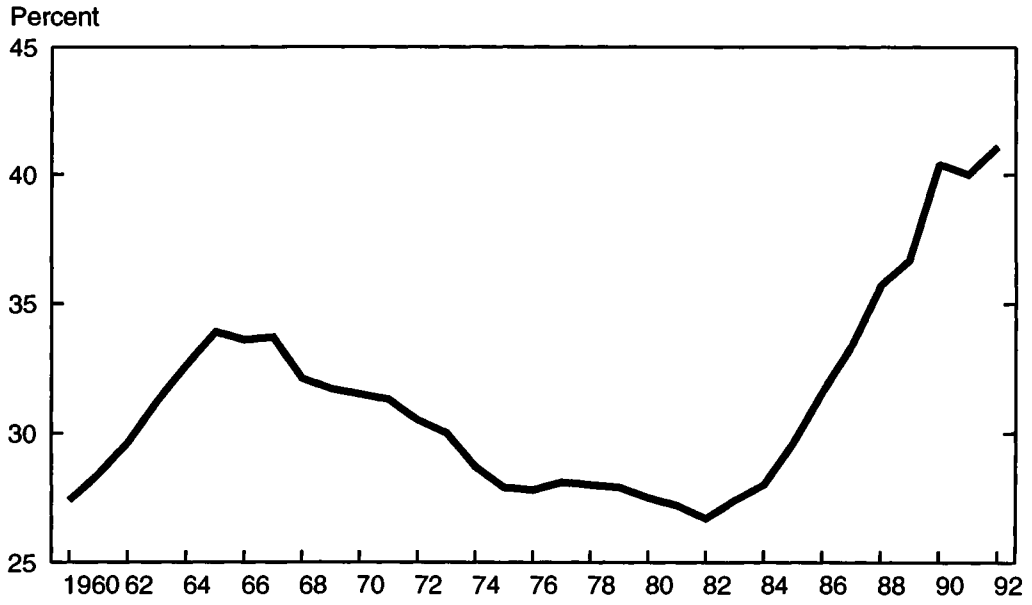

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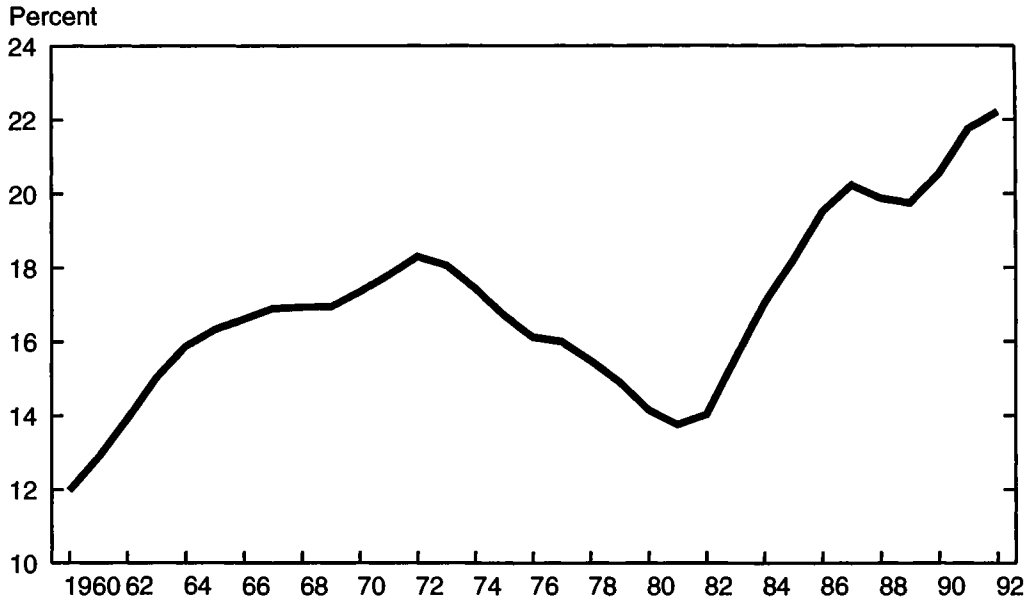
Chart 13B: Leverage on Nonfinancial Business Real Estate



IV. Mortgage Borrowing

This section examines trends in mortgage borrowing by the nonfinancial sectors of the U.S. economy. The actual trends in activity in residential and nonresidential construction are discussed elsewhere in this study; suffice it to say that in 1989-92 residential construction was sluggish, and the nonresidential sector was extraordinarily weak.

Table 9 shows the growth of total, household, and business mortgage borrowing. Home mortgage borrowing grew rapidly in the mid-1980s; growth slowed after 1989, but no more so than other components of debt. Nonfinancial mortgages are quite another story, with extraordinary growth in the mid-1980s and outright declines in the 1990s. Chart 13 shows leverage trends, both the ratio of home mortgages to the stock of residential real estate (13A) and the ratio of nonfinancial mortgages to the stock of nonres-

Table 10: Determinants of Private Mortgage Borrowing

	Constant	Construction Spending	Cash Flow	Prorietors' Income	Noncorporate Capital Consumption	Disposable Income	ρ	R^2	S.E.
10.1 Nonfinancial business	21.250 (7.695)	1.582[a] (.289)	-.035 (.120)	-.401 (.120)	-.817 (.496)		.721 (.086)	.791	14.2
10.2 Household home mortgages	-31.467 (3.671)	1.854[b] (.122)				-.031 (.006)		.918	24.5

Notes: All data in billions of dollars, seasonally adjusted annual rates. Standard errors in parentheses. Estimation period: 1959-I to 1992-II.

a. Spending on nonresidential buildings, other nonresidential structures, plus nonhousehold residential structures.
b. Household spending on residential construction.

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Table 11: Shifts in Activity Coefficients in Mortgage Equations

Business Mortgages				
	Construction Spending	Cash Flow	Proprietors' Income	Noncorporate Capital Consumption
Sample period:				
1959-I to 1979-IV	.447 (.172)	.054 (.108)	.120 (.143)	.082 (.436)
1959-I to 1983-IV	.065 (.256)	.166 (.089)	.085 (.115)	.029 (.362)
1959-I to 1988-IV	1.023 (.297)	-.101 (.106)	-.124 (.115)	-.173 (.476)
1959-I to 1992-IV (equation 10.1)	1.582 (.289)	-.035 (.120)	-.401 (.120)	-.817 (.496)
Home Mortgages				
	Construction Spending	Disposable Income		
Sample period:				
1959-I to 1979-IV	1.307 (.054)	-.019 (.004)		
1959-I to 1983-IV	1.391 (.047)	-.023 (.003)		
1959-I to 1988-IV	1.875 (.143)	-.035 (.008)		
1959-I to 1992-II (equation 10.2)	1.854 (.122)	-.031 (.006)		

idential real estate (13B).[22] Leverage on residential real estate increased in the 1980s, stabilizing in the early 1990s. Leverage also increased sharply in the 1980s on business real estate; furthermore, the upward trend continued in the early 1990s as the retirement of mortgage debt failed to keep up with a continuing decline in values.[23]

Table 10 presents basic econometric models of business and household mortgage borrowing. Business mortgage borrowing is modeled to depend on nonhousehold private spending on structures (excluding utility and energy structures), nonfinancial corporate cash flow, proprietors' income, and noncorporate depreciation.[24] Household

[22] These data value structures at replacement cost and land using an estimated market value.

[23] The continued uptrend in this sector is notable since farm real estate and mortgages are included: the leveraging of farm property fell steadily after 1985 as debt was retired and values recovered.

[24] As noted above, there is no measure of cash flow for noncorporate business. Proprietors' income cannot be equated with after-tax profits both because it is gross of income tax and because the owner of an unincorporated business has great discretion over the fraction of its income stream that is recorded as profit-type income as opposed to wages paid to the owner or insiders.

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Table 12: Actual and Predicted Business Mortgage Borrowing, 1982-92
Billions of Dollars

	Actual	Predicted	Actual less Predicted
1982	42.6	62.9	-20.3
1983	74.6	46.6	28.0
1984	91.8	57.7	34.1
1985	94.0	81.0	13.0
1986	99.1	60.0	39.1
1987	64.7	52.3	12.4
1988	55.5	51.5	4.0
1989	51.1	53.7	-2.6
1990	20.2	54.5	-34.3
1991	-17.6	5.8	-23.4
1992 (H-I)	-41.6	-10.9	-30.7
1983-89 Average	75.8	57.5	18.3
1990-92 H-I Average	-7.3	21.9	-29.2

mortgage borrowing is determined by disposable income and household spending on residential structures. As in the corporate borrowing equations, interest rate effects are detected statistically, but add little to the models' explanatory power or tracking ability.

In both equations 10.1 and 10.2, $1 of construction spending is associated with more than $1.50 of mortgage borrowing. A coefficient greater than 1 may reflect an association between construction spending and increases in the values of, and turnover on, existing property. In equation 10.1, increases in noncorporate depreciation and proprietors' income are associated with large declines in mortgage borrowing, while the relationship with corporate cash flow is near zero. Increases in disposable income are also associated with declines in home mortgage borrowing (equation 10.2).

Table 11 shows that equation 10.1 coefficients, both on income and spending, are unstable over time. In fact, during the 1959-83 period none of the fundamental variables had a significant effect on borrowing. Clearly, and not surprisingly in light of the 1980s boom-bust cycle, commercial mortgage borrowing is heavily influenced by factors other than spending and income fundamentals. Table 11 also shows signs of instability in the home mortgage model (equation 10.2), although they are less pronounced than for the business mortgage market.

The instability in these models makes it difficult to interpret their tracking abilities. Table 12 shows that the year-to-year performance of equation 10.1 reflects the turbulence in this market. Only a small fraction of the runup in mortgage borrowing from 1982 to 1986 is explained by nonfinancial fundamentals, and actual levels of borrowing in 1983-86 are understated by as much as 40 percent. Nonetheless, the fundamentals do track a large portion of the collapse in mortgage borrowing in the late 1980s. The fundamentals suggest that borrowing should have fallen from $81 billion in 1985 to $6 bil-

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Table 13: Actual and Predicted Home Mortgage Borrowing, 1982-92
Billions of Dollars

	Actual	Predicted	Actual less Predicted
1982	50.6	61.1	-10.5
1983	118.9	136.2	-17.3
1984	138.1	173.8	-35.7
1985	156.3	176.3	-20.0
1986	251.1	222.7	28.4
1987	260.3	234.1	26.2
1988	261.8	241.3	20.5
1989	251.9	252.1	-0.2
1990	223.8	196.4	27.4
1991	147.6	157.0	-9.4
1992 (H-I)	168.0	175.9	-7.9
1983-89 Average	205.5	205.2	0.3
1990-92 H-I Average	182.2	176.5	5.6

lion in 1991—a $75 billion decline. The actual decline over this period was about $110 billion. Still, the timing of the actual decline does not track the decline in fundamental demand. In particular, the sharp decline in borrowing in 1990 cannot be explained by the fundamentals, and the cumulative equation errors from the 1980s are not erased by the end of 1991.

Even if we acknowledge that fundamentals capture the broad contours of the decline in commercial mortgage borrowing, it would not be correct to infer that real activity caused the drop in borrowing. This is one sector of the economy where causality is likely to be in the opposite direction: credit flows are likely to be major determinants of activity. Indeed, the instability in Table 11 suggests that equation 10.1 summarizes more than just the influence of fundamentals on credit demand. A more rigorous analysis of the impact of credit market changes on activity is needed in this sector to address the issue of the relative importance of real activity and credit market factors.

Table 13 shows that, overall, equation 10.2 does a good job of explaining the runup in home mortgage borrowing in the late 1980s and its slump from 1988 to 1991. Only in 1984 was the difference between the actual and predicted levels of borrowing as large as 20 percent. As in the case of commercial mortgage lending, however, it would be improper to infer that the tracking ability of the home mortgage equation implies that nonfinancial demand factors caused the drop in borrowing, because of the instability of the estimated relationships and the likelihood that credit market factors strongly affect demand. The most we can infer in both mortgage markets is that the declines in borrowing are correlated with the declines in activity. Of course, this conclusion leaves open the possibility that shifts in credit supply helped cause the declines in activity.

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V. Conclusion

Private sector borrowing in the early 1990s was quite weak, in dollar terms, relative to the 1980s and—based on historical trends—relative to fundamental income and spending patterns. At the same time, several of the fundamental determinants of borrowing—certain categories of fixed and inventory investment, and most categories of consumer spending—were unusually weak given the overall cyclical context. The simultaneous weakness in both borrowing and spending strongly suggests that the credit slowdown did not result from a downshift in credit demand arising from purely financial factors. The natural question arises of whether borrowing was weak because spending was weak (low credit demand), or vice versa (reduced credit supply).

In the market for short-term corporate debt, nonfinancial activity factors accounted for no more than one-quarter of the reduction in borrowing. At the same time, spending (in current dollars) on fixed capital and inventories was also weak due to ongoing shifts in inventory management techniques and in the composition of capital spending toward high-tech equipment. These changes may have been part of the process of restructuring U.S. business, and it is plausible to suppose that a downward shift in the demand for credit was also part of that process. The shortfall in credit, however, was significantly larger than could be explained by the restructuring process, and the weakness in both spending and borrowing seemed too abrupt to be charged solely to a long-run restructuring process. Thus supply constraints in the credit markets, perhaps along with a downward shift in credit demand for purely financial reasons, seem to account for much of the shortfall in business borrowing.

In the consumer credit market, fundamental nonfinancial activity variables account for perhaps half of the decline in borrowing from 1989 to 1992. Most of this period also saw unusual weakness in household spending. While credit supply constraints could have generated the both shortfalls, the plethora of explanations for the weakness in consumption suggests that much of slowdown in borrowing was due to demand factors excluded from our analysis. For example, extraordinarily slow job growth and low confidence readings suggest that a shift in consumer psychology to less spending and less borrowing also occurred.

The evidence is much harder to interpret for business and household mortgage borrowing. Declines in fundamentals such as construction spending superficially account for the bulk of the borrowing decline in both categories; however, the relationships from which we draw these inferences are quite unstable and are harder to interpret than those above. The much closer links between credit and activity in these sectors suggest that separate credit supply and demand influences are much more difficult to identify. A more in-depth examination of these sectors is provided by Harris, Boldin, and Flaherty in this volume.

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The Role of the Banking System in the Credit Slowdown

by Cara Lown and John Wenninger[1]

This paper explores the role of the banking system in the recent credit slowdown. In the first section we briefly consider the economic developments leading up to the bank lending slowdown and argue that the slowdown was the result of four basic forces set in motion by the high inflation and high interest rates of the late 1970s. This first section also contains a review of banking industry performance leading up to the bank lending slowdown. We show from several indicators of bank performance that a slowdown in bank lending was emerging as a strong possibility by the late 1980s. The second section examines recent credit flows, analyzing the decline in bank lending both by lending and by regional distribution. In the third section, we investigate the demand- and supply-side causes of the slower growth in bank lending. We find that only home mortgage lending has been stronger in this cycle than in earlier cycles; all other categories of bank lending have been weaker. However, the sluggish growth in commercial and industrial (C&I) lending may reflect in part better inventory management, and may not be entirely related to an increased reluctance of banks to lend. We also show that the increase in the banking system's investment portfolio seems to be following, at least in part, a normal cyclical pattern. Some special features of this current cycle may have added to the normal cyclical buildup in the banking system's holding of government securities, making it difficult to conclude that supply-side considerations are behind the increased holdings.

However, turning to other supply side considerations, we find several indicators of reduced willingness to lend by the banks, including extremely wide interest rate spreads, the results from the various surveys, a sizeable increase in the percentage of loans requiring collateral, and slower loan growth at banks with inadequate capital. This section also contains a brief overview of the possible role of bank regulators in precipitating the slowdown in bank lending from the supply side. The final section of the paper contains an econometric evaluation of the recent sluggishness in bank lending. We present some evidence that conventional reduced-form time series equations for bank lending break

[1] We would like to thank Akbar Akhtar for helpful comments on many drafts of this paper. Martina Heyd and Joseph LaVorgna provided research assistance and Marie Krynicky prepared the manuscript.

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down during the most recent recession. In addition, our cross section results suggest that problems in the banking industry contributed to weaker loan growth during the 1990-91 period, but not during the 1988-89 period.

I. Events Leading up to the Slowdown in Bank Lending

The recent slowdown in bank lending can be traced to four primary causes, all of which have their origins, at least in part, in the high-inflation, high-interest-rate environment of the late 1970s and early 1980s:

1) deregulation and innovation
2) the large buildup in debt burdens
3) the savings and loan crisis
4) a series of shocks to the banking industry stemming from losses on LDC loans, agricultural loans, energy lending, and finally real estate loans and loans for highly leveraged transactions.

Because these four factors are highly interrelated, it is difficult to discuss their contributions in isolation. We will begin with a general discussion of the first three factors and then turn our attention to the banking industry.[2]

The high rates of inflation in the late 1970s, building on a trend of higher peak rates of inflation in each successive business cycle, seemed to leave open the possibility that high inflation could return at some time later in the 1980s. Indeed, for much of the 1980s, core inflation, as measured by the consumer price index excluding food and energy, seemed stuck in the 4 to 5 percent range, creating doubts about the resolve of the monetary authorities to reduce inflation over time through monetary control. In addition, the record budget deficits also added to the unease about the possible return of inflationary pressures. These expectations increased the willingness of firms and consumers to raise their debt burdens and to invest heavily in nonfinancial assets, primarily commercial and residential real estate, but also in the stock market. From 1981 to 1986, commercial real estate also benefited from special tax incentives, an advantage that helped to create a substantial oversupply of commercial buildings by late in the decade.[3]

On the lending side, expectations of rising asset prices and intense competition for earnings, both domestically and internationally, prompted many lenders—banks, thrifts, insurance companies and others—to lend on an expected asset (collateral) appreciation

[2] A longer run historical perspective can also be found in Jerry L. Jordan, "The Credit Crunch: A Monetarist's Perspective," Federal Reserve Bank of Chicago's Annual Conference on Bank Structure and Competition, May 7, 1992; and Edward J. Frydl, "Overhangs and Hangovers: Coping with the Imbalances of the 1980s," Federal Reserve Bank of New York, *Annual Report*, 1991. More detailed reviews of financial developments in the 1980s can be found in Thomas Simpson, "Developments in the U.S. Financial System since the Mid-1970s," *Federal Reserve Bulletin*, January 1988; and M.A. Akhtar and Betsy Buttrill White, "The U.S. Financial System: A Status Report and a Structural Perspective," in C. Imbriani, P. Roberti, A. Torrisi, eds., *Il Mercato Unico Del 1992: Deregolamentazione E Posizionamento Strategico Dell'Industria Bancaria in Europa*, Bancaria Editrice S.p.A., Rome 1991, pp. 515-42.

[3] For a detailed analysis of the tax law changes, see James Poterba, "Tax Reform and the Housing Market in the Late 1980s: Who Knew What, and When Did They Know It?", *Real Estate and the Credit Crunch*, Federal Reserve Bank of Boston Conference, September 16-18, 1992. For an analysis of why real estate is susceptible to strong cycles even in the absence of tax incentives or disincentives, see Lynn Browne and Karl Case, "How the Commercial Real Estate Boom Undid the Banks," *Real Estate and the Credit Crunch*, Federal Reserve Bank of Boston Conference, September 16-18, 1992. These authors refer to the real estate cycle as a "hog cycle," or "overbuilding" caused by an inelastic short run supply curve and elastic long run supply curve" combined with multiyear leases that distort price information.

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basis or on anticipated cash flow rather than actual cash flow and other measures of financial strength. This change in lending practices applied not only to real estate lending, but also to loans for highly leveraged transactions to acquire "undervalued assets."

The high rates of inflation in the late 1970s were also responsible for an increased emphasis on financial innovation and deregulation, which lasted through much of the 1980s. These innovations not only enabled consumers and business to manage money more efficiently and to earn market rates of return on their investments, but also to take on increasingly large debt burdens and in some cases to access the money and capital markets directly.[4] Finally, innovation, deregulation and improved information technology created an environment in which there was far more intense competition for banks on both the deposit and the lending side, resulting in reduced profitability and reduced value of the banking franchise.

The regulatory response was not only to eliminate Regulation Q ceilings on the liabilities of banks and thrifts, but also to give the thrift institutions—already greatly weakened by the high interest rates—expanded asset powers without increasing supervision, capital requirements, or lowering deposit insurance coverage.[5] This regulatory response enabled thrifts, with little experience outside the home mortgage lending area, to invest heavily in risky assets, including commercial real estate. Here again, financial innovation played a role. On the liability side, brokered deposits, issued in insured units of $100,000, enabled weak thrifts to tap the national money market with a managed liability. On the asset side, the high yields on junk bonds seemed very attractive to recently deregulated thrifts at the same time that it became relatively easy for other types of lenders to originate and sell mortgage loans, the traditional thrift asset, reducing the need for a specialized home mortgage lender. The end result, of course, was the massive "thrift bailout" of the late 1980s and early 1990s, which focused the attention of the public on the health of the nation's financial intermediaries (in terms of where "the next problem" might be) and created a more cautious lending environment.

Against this background of innovation, deregulation, inflationary expectations, heavy debt burdens, a weak thrift industry, and substantial overbuilding in the commercial real estate market, we review the performance of the banking industry. Table 1 presents some selected indicators of commercial bank performance before and after 1988 that may have had some impact on the willingness of banks to lend after 1988. The first two columns show that by the late 1980s, consolidation in the banking industry was becoming more apparent. The number of institutions began to shrink rapidly, and average assets held per institution increased steadily. In addition, the percentage of unprofitable banks hit a peak in 1986-87 (column 3). The fourth column shows the large increase in the number of failed banks by the late 1980s, a number that peaked at 220 in 1988.

[4] Henry Kaufman has argued that inflation (or inflationary expectations) by itself is too simple an explanation for the rapid growth of debt in the 1980s. He also points to a shift in attitude toward debt, financial innovation (including securitization), deregulation, financial internationalization, the tax structure, and the practice of debt prudence. Kaufman's views are summarized in "Debt: The Threat to Economic and Financial Stability," in Federal Reserve Bank of Kansas City, *Debt, Financial Stability and Public Policy*, August 27-29, 1986, pp. 15-26; and presented in more detail in Henry Kaufman, *Interest Rates, the Markets, and the New Financial World* (New York: Times Books), 1986. Not everyone shares this view, however. Benjamin Friedman takes the position that "at least for the present, ...the most honest answer of why all this [debt acceleration] has happened in the 1980s is that nobody really knows" ("Changing Effects of Monetary Policy on Real Economic Activity," Federal Reserve Bank of Kansas City, *Monetary Policy Issues in the 1990s*, August 30-September 1, 1989, p. 70).

[5] For more detail on the thrift crisis, see Edward Kane, *The S&L Mess: What Really Happened?* Boston, MA: MIT Press, 1985; and Lawrence White, *The S&L Debacle: Public Lessons for Bank and Thrift Regulation* (New York, NY: Oxford University Press, 1991).

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Moreover, by the late 1980s, asset quality problems beyond the less developed country (LDC) lending problems encountered early in the 1980s were becoming very apparent. For example, the annual review of "Recent Developments Affecting the Profitability and Practices of Commercial Banks" in the Federal Reserve Bulletin for 1986 notes:

- Moreover, loan losses continued to rise, and the sharp drop in oil prices and associated dislocations in the energy sector, as well as continuing weakness in agriculture and overbuilding in commercial real estate, all point to lingering—and possibly worsening—problems with asset quality for many banks.

Reflecting these problems, the table (column 5) shows that compared with the early 1980s, the period beginning in 1987 saw a dramatic downward shift in banks' average return on assets. The 1987-88 period also saw a substantial weakening in equity capital positions for banks, a development that led regulators to encourage higher capital ratios and larger loan loss provisions. As Table 1 (column 7) indicates, loan loss provisions increased dramatically after 1986, and equity capital ratios fell sharply until 1989, when the capital positions of the banking system began to improve. The return on assets was quite weak on average from 1987 to 1991; a considerable number of banks remained on

Table 1: Selected Measures of Bank Performance
All U.S. Insured Commercial Banks

	Number of Banks[a]	Assets[b]	Percent Unprofitable Banks	Number of Failed Banks	Return on Assets (In Percent)	Return on Equity (In Percent)	Loss Provision (Percentage of Assets)	Equity Capital (Percentage of Assets)	FDIC Problem Banks	
									Number	Assets[b] (In Dollars)
1981	14,208	1,940	5.22	7	.76	13.10	.26	5.83	196	n.a.
1982	14,123	2,101	8.27	34	.7	12.10	.40	5.87	326	n.a.
1983	14,075	2,245	10.58	45	.67	11.24	.48	6.00	603	n.a.
1984	13,952	2,401	13.06	78	.64	10.59	.57	6.01	800	n.a.
1985	14,398	2,593	17.09	118	.70	11.07	.70	6.21	1,098	174
1986	14,202	2,799	19.79	144	.63	9.84	.81	6.25	1,457	286
1987	13,701	2,962	17.66	201	.09	1.40	1.30	6.08	1,559	329
1988	13,134	3,097	14.65	221	.80	12.98	.58	6.06	1,394	305
1989	12,727	3,234	12.50	206	.49	7.59	.98	6.26	1,092	188
1990	12,373	3,391	13.43	159	.49	7.57	.96	6.31	1,012	342
1991	11,954	3,434	11.59	108	.53	7.86	1.02	6.57	997	528
1992	11,499	3,497	6.75	100	.92	12.80	.77	7.06	787	408

Sources: *Federal Reserve Bulletin* and FDIC Quarterly Banking Profile.

a. The data for the number of banks before and after 1985 are not comparable. The Board staff revised this series recently but only as far back as 1985. The result was to add 350 to 400 banks to the total. Hence, there was no "peak" in the number of banks in 1985 but probably a continuous downward trend throughout the period shown in the table.

b. Dollars amounts are in billions.

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the FDIC's problem bank list during that time, and by 1990 larger banks were emerging as the distressed banks.

Profits fell further in 1990 from the low levels of 1989, and the banks were under pressure to increase their loan loss provisions as more and more loans became nonperforming. In 1990, however, the loss provisions were for commercial real estate lending and merger-related credits rather than loans to developing countries, agriculture, or the energy sector as had been the case earlier in the 1980s. Bank equity prices declined, investors demanded larger risk premiums on subordinated debt, and some large banks had difficulties in funding themselves in the interbank market. Banks restricted their growth in anticipation of the new capital standards, maintained wide margins on loans, tightened credit standards, increased loan securitization, and cut operating costs.[6] At the same time, the banks were also aware that the excesses of the thrift industry were being resolved on a massive scale, perhaps reducing the size of the industry by one-third or more; this process focused public attention on the soundness of other financial intermediaries and may have made banks more cautious.

In sum, this review of the performance indicators in Table 1 suggests that the banking system was suffering severe distress in the late 1980s that could well have contributed to reduced credit availability from the supply side. Not until 1992 were there some indications that the problems at banks had stabilized. Banks increased their equity and debt issuance, stopped tightening their credit standards, and in some cases, gave signs of easing. Moreover, with the credit ratings of many LDCs greatly improved, it appeared that some large banks had over reserved for losses in LDC loans, and these "excess reserves" could be transferred to support other troubled loans. In the next three sections of this paper, we assess more fully the role of the banking system in the recent slowing of credit.

II. Recent Trends in Bank Credit Flows

Table 2 shows the broad credit flows over the 1960-91 period, with the time since 1980 broken into three-year intervals to capture some of the shifting trends during the 1980s. From 1960 to 1979, total debt increased at about the same rate as GDP, while depository credit grew about 1.0 percentage point more rapidly than GDP. In 1980-82, these trends began to change. Total debt accelerated and began to grow more rapidly than GDP, while depository credit—primarily at thrift institutions—slowed sharply as home mortgage lending came to a virtual halt. But as the economic recovery progressed and consumers and corporations became more willing to take on debt, total debt as well as bank and thrift credit accelerated sharply. In the 1983-85 period, the growth of total debt exceeded GDP by 4 percentage points, depository credit growth exceeded GDP by 2 percentage points, and nondepository credit exceeded GDP growth by more then 6 percentage points. Nondepository credit growth has continued to exceed GDP growth by a wide margin (4.5 to 5.5 percentage points). Depository credit, on the other hand, decelerated sharply as thrift credit went into an outright decline in the 1989-91 period. Relative to the peak growth rates of the 1983-85 period, total debt decelerated 7.0 percentage points, nondepository credit about 5 percentage points, and depository

[6] A more detailed review of the problems banks encountered during the 1980s can be found in the testimony of John LaWare before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate, June 10, 1992.

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credit 11 percentage points.[7]

The trends in bank and thrift credit, as indicators of the supply of and demand for credit, have been distorted by several developments in the 1980s. The decline in thrift credit probably does not have economic consequences commensurate with its size. With a large share of single-family mortgages being securitized and sold in the capital markets, mortgage money has remained available to consumers at market prices even as the thrift industry has downsized. In addition, in the case of failed thrifts, the remaining assets have either been funded and held by the Resolution Trust Corporation, or sold to banks or other financial intermediaries.

Similarly, banks have securitized and sold a large fraction of their assets in recent years, and the slowdown in bank credit in the table could understate the availability of bank-originated credit. Moreover, the continued rapid growth of nondepository credit relative to GDP suggests that much more credit is being held outside the banking system than in the past as financial innovation has permitted greater access to the capital markets by corporations.

Table 3 contains a breakdown of total bank lending by U.S. chartered banks and foreign banks. The table shows that all categories of bank lending at U.S. chartered banks grew rapidly in the mid-1980s, and mortgage lending continued strong through the late 1980s. All types of U.S. bank lending slowed sharply in the 1989-91 period, and C&I lending went into a decline, reflecting not only supply-side restrictions but also the slower pace of economic activity. However, it appears that some of the reduction in lending by U.S. banks was picked up by the foreign banks (right side of Table 3). Although the lending by foreign banks did slow, the rate of increase remained substantial, suggesting that the foreign banks continued to be active lenders during much of this

[7] For alternative reviews of recent credit flows, see Fred Furlong, "Financial Constraints and Bank Credit," Federal Reserve Bank of San Francisco *Weekly Letter*, May 24, 1991; and Steven Strongin, "Credit Flows and the Credit Crunch," Federal Reserve Bank of Chicago, *Chicago Fed Letter*, November 1991; and Robert Parry, "The Problem of Weak Credit Markets: A Monetary Policymaker's View," Federal Reserve Bank of San Francisco *Weekly Letter*, January 3, 1992.

Table 2: Credit Flows (1960-91)
Average Growth Rates

	(1)	(2)	(3)	(4)= (1)-(2)	(5)	(6)	(7)	(8)	(9)	(10)= (1)-(9)
	Nominal GDP	Total Debt	Private Debt	GDP less Total Debt	Depository Credit	Bank Credit	Bank Lending	Thrift Credit	Non-depository Credit	GDP less Non-depository Credit
1960-79	8.6	8.3	9.5	0.3	9.6	9.3	10.5	10.1	7.2	1.4
1980-82	7.6	9.2	8.2	-1.6	6.3	7.6	6.6	4.0	12.3	-4.7
1983-85	9.1	13.3	12.4	-4.2	11.1	9.9	10.0	13.1	15.3	-6.2
1986-88	6.8	9.8	9.9	-3.9	8.0	7.4	8.9	8.9	11.2	-4.4
1989-91	4.8	6.1	5.1	-1.3	0.1	4.8	4.1	-8.7	10.1	-5.4

Source: Flow of Funds and Commerce Department.

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credit slowdown period.[8] These trends are much the same if the calculations are made in real rather than nominal terms.

The pace of bank lending has also showed considerable variation across regions, suggesting that credit restraints were more severe for some regions and less severe for others (Table 4). The decline in total lending over the 1989-92 period was the sharpest in the New England, Mid-Atlantic, and Pacific regions, which account for about one-half of all lending nationwide. In these three regions, C&I lending showed sharp declines, as did real estate and consumer lending. C&I lending declined in all regions during the 89-92 period, while consumer lending declined in all of the regions except two. Table 4 also shows that residential and commercial real estate lending were not equally affected. Total real estate lending (commercial and residential) was cut back much more sharply during the 1989-92 period than residential lending, indicating that commercial real estate lending was more sharply reduced. In the final section, we will more carefully explore differences in regional lending by looking at regional differences in capital, loan-loss reserves, and employment growth.

III. Nature and Causes of the Slowdown in Bank Lending

In this section, we explore the slowdown in bank credit from both demand- and supply-side perspectives. We conclude that both sides seem important, a finding that complicates the effort to quantify the causes of the bank lending slowdown.

Demand-Side Explanations

Chart 1 compares depository lending in this recession with lending in past recessions. In earlier recessions, depository credit grew rapidly until the peak in GDP, and then continued to grow but at a slower pace after the peak. In contrast, not only did depository lending fail to increase in the period leading up to the most recent recession, but it has also declined sharply since the peak in business activity.

[8] These statistics probably understate the growth of lending by foreign banks because the lending activity through the offshore offices of foreign banks to U.S. corporations is not adequately captured in the statistics. For more information, see Robert McCauley and Rama Seth, "Foreign Bank Credit to U.S. Corporations: The Implications of Offshore Loans," Federal Reserve Bank of New York *Quarterly Review*, Spring 1992, pp. 52-65.

Table 3: Components of Bank Lending
Average Growth Rates

	U.S.-Chartered Commercial Banks				Foreign Banking Offices in U.S.		
	Total Loans	Mortgages	Consumer	C&I Loans	Total Loans	Mortgages	C&I Loans
1960-79	9.2	8.8	9.2	9.2	16.9	-	28.1
1980-82	7.2	6.4	0.8	10.7	12.1	65.4	11.1
1983-85	10.3	11.7	15.2	7.3	9.8	6.3	8.3
1986-88	7.5	14.2	7.7	2.8	21.4	48.5	20.5
1989-91	2.9	7.9	0.9	-1.8	15.9	31.5	11.0

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Table 4: Commercial Bank Lending by Region
Annualized Growth Rates, in Percent

	New England	Mid-Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Total loans									
1985-87	25.4	11.7	9.4	3.9	16.4	10.4	-6.2	3.2	3.3
1987-89	9.0	8.6	8.6	5.3	12.7	8.1	-8.0	5.4	12.9
1989-92	-13.0	-22.3	0.0	1.7	-0.4	3.2	-1.2	-0.9	-19.3
C&I									
1985-87	19.6	12.1	13.1	4.0	12.5	12.6	-10.5	0.6	5.3
1987-89	14.0	9.8	10.0	8.7	5.3	5.9	-5.2	-3.1	8.5
1989-92	-21.0	-29.5	-4.7	-2.5	-5.9	-0.5	-6.0	-7.6	-25.4
Real estate total									
1985-87	34.6	22.9	15.3	13.9	25.5	19.8	0.3	9.0	8.9
1987-89	11.5	15.2	13.9	10.5	17.5	14.0	-10.4	1.8	20.9
1989-92	-9.5	-14.8	6.4	10.4	3.8	8.4	2.0	2.7	-14.5
Real estate 1-4 families									
1985-87	28.2	19.5	10.6	10.7	27.1	20.3	3.0	9.1	0.6
1987-89	12.4	13.4	11.2	11.3	19.5	15.6	1.2	3.2	24.8
1989-92	-4.5	-6.0	9.1	16.6	10.3	12.3	1.4	10.3	-17.8
Consumer and others									
1985-87	-4.9	2.6	4.5	8.5	16.6	6.3	-10.2	5.2	-2.4
1987-89	14.6	6.0	5.3	1.6	14.2	5.8	2.6	20.9	4.7
1989-92	-16.3	-19.0	-7.0	-1.8	1.6	-0.4	2.2	-2.9	-19.3
Percentage of total loans as a national total									
1985-87	8.4	27.5	13.9	6.2	13.9	3.8	9.2	3.5	13.5
1987-89	9.5	28.2	14.0	5.8	15.3	3.8	6.7	3.3	13.4
1989-92	9.0	23.7	16.0	6.6	18.0	4.6	6.4	3.6	12.1

New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont; **Mid-Atlantic**: New Jersey, New York, Pennsylvania; **East North Central**: Illinois, Indiana, Michigan, Ohio, Wisconsin; **West North Central**: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota; **South Atlantic**: Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia; **East South Central**: Alabama, Kentucky, Mississippi, Tennessee; **West South Central**: Arkansas, Louisiana, Oklahoma, Texas; **Mountain**: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming: **Pacific**: Alaska, California, Hawaii, Oregon, Washington.

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Bank lending (Chart 2) does not show as pronounced a change as depository credit. It grew more slowly prior to the peak in business activity than it had in past cycles, and it has remained flat since the peak (as noted earlier, a large part of the slowing of total depository credit had come from the restructuring of the thrift industry). For perspective, Chart 3 shows a cyclical comparison similar to that in Charts 1 and 2 for nominal GDP. These three charts indicate that the cyclical differences in depository lending and bank lending are significantly more pronounced than the cyclical differences in GDP, suggesting that the weaker lending observed in this recession is not just related to the performance of GDP.

Of the components of bank lending, consumer loans appear to have followed a pattern quite similar to that of total lending relative to past cycles (Chart 4). Consumer loans were weaker than average preceding the peak in GDP and have declined somewhat since the peak. Once again, the relative weakness in consumer loans appears greater than is the case for GDP. The wide margins that banks have maintained between their consumer lending rates and the rates paid on consumer small time deposits appears to have prompted many consumers to use the proceeds of maturing CDs to pay down credit card and other bank debt.[9] (The effects of the credit slowdown on the liability side of the banking system's balance sheet is covered in the Hilton-Lown paper contained in this volume.)

C&I lending at banks has been declining slowly during this entire period (Chart 5), breaking with the usual pattern of growing fairly rapidly during the period before the peak in GDP and then slowing, though continuing to grow, after the peak. Comparing this result to Chart 3, we cannot explain the weakness in C&I loans just by the unusual behavior of GDP in this cycle. In addition, if we examine C&I loans to the corporate and noncorporate business sectors (Charts 6 and 7), it appears that the smaller firms in

[9] An analysis of the behavior of small time deposits during the credit slowdown and the implications for M2 can be found in John Wenninger and John Partlan, "Small Time Deposits and the Recent Weakness in M2," Federal Reserve Bank of New York *Quarterly Review*, Spring 1992.

Chart 1: Depository Lending

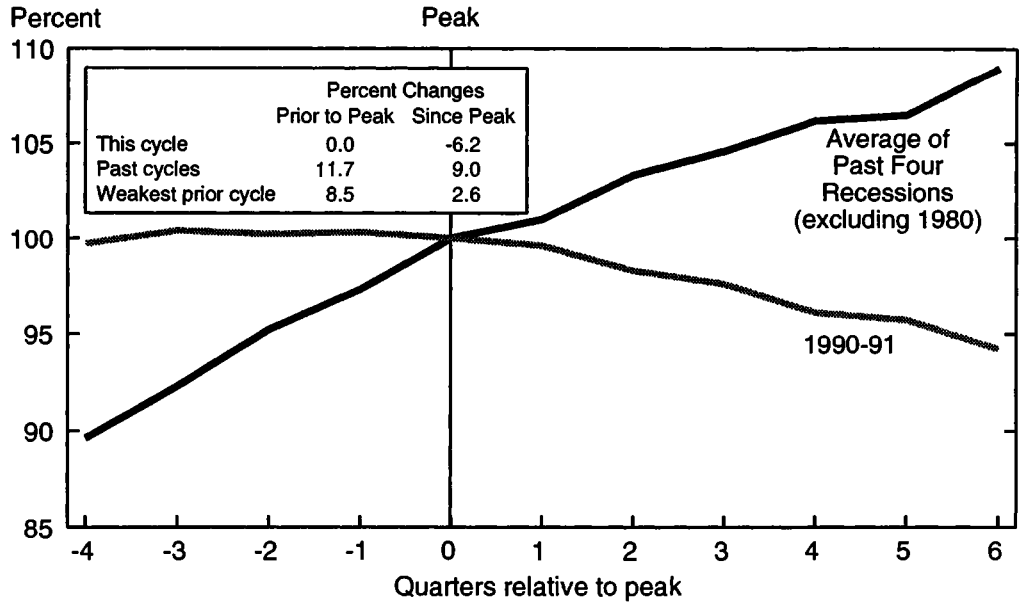

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Chart 2: Bank Lending

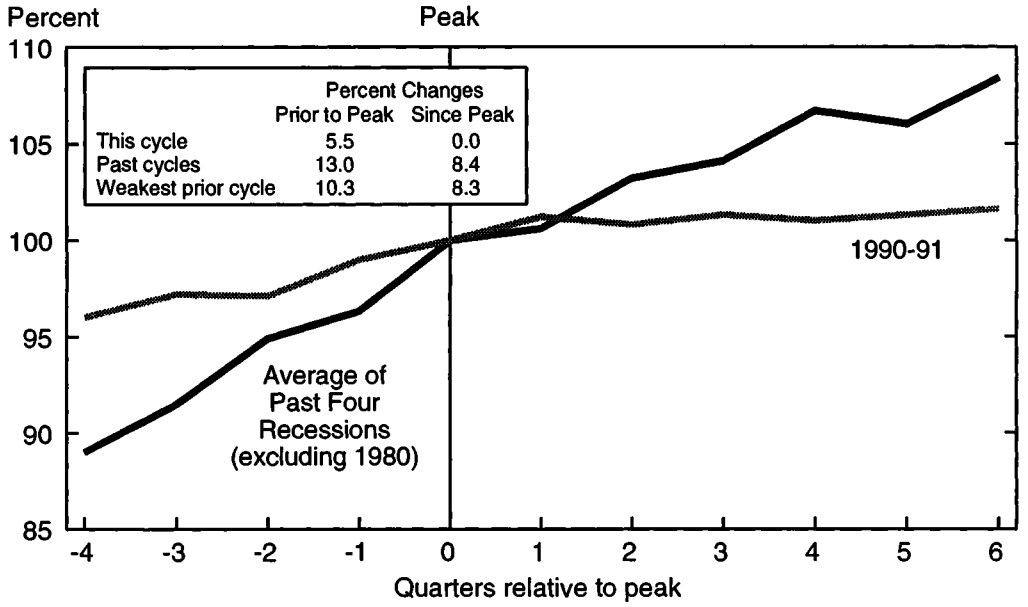

Chart 3: Nominal GDP

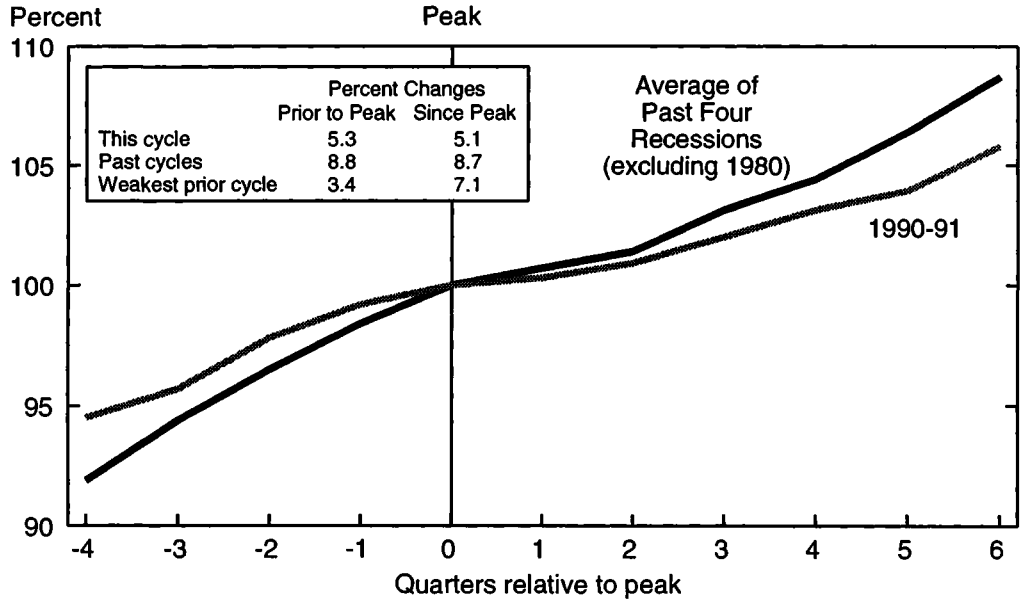

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Chart 4: Consumer Loans at Commercial Banks

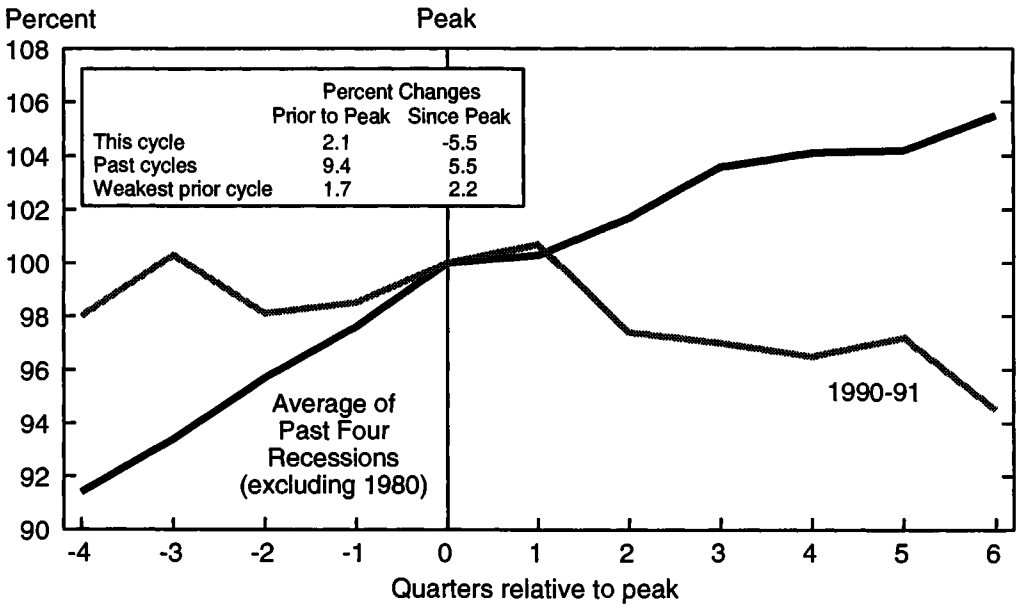

Chart 5: C&I Lending

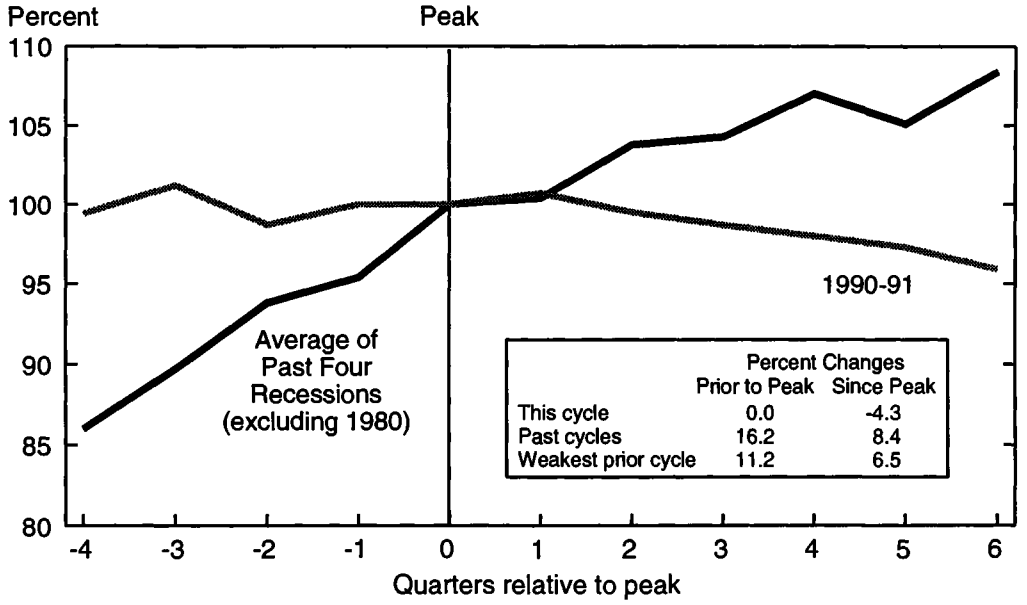

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Chart 6: C&I Lending to Corporate Business

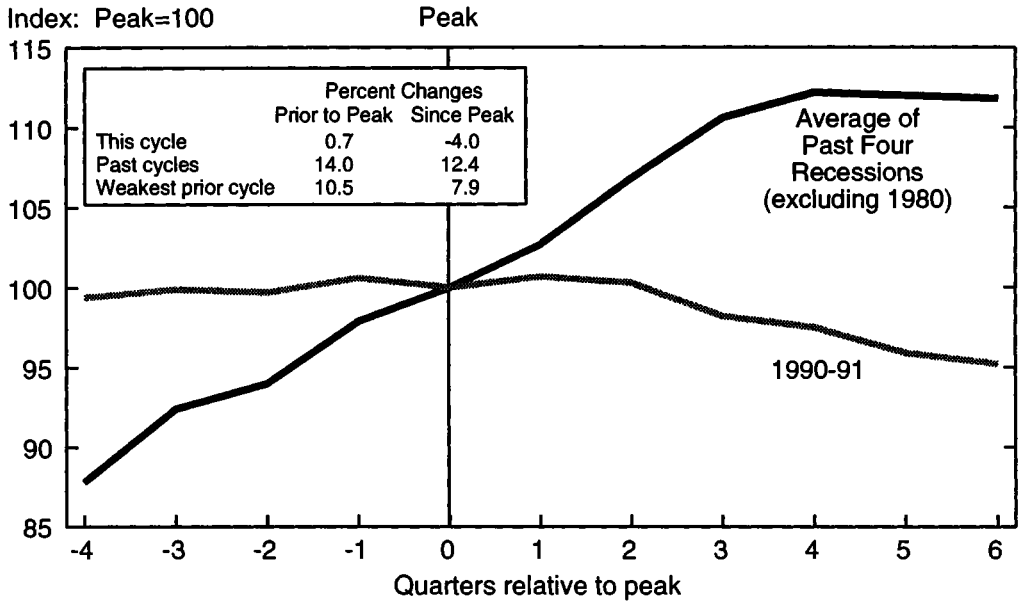
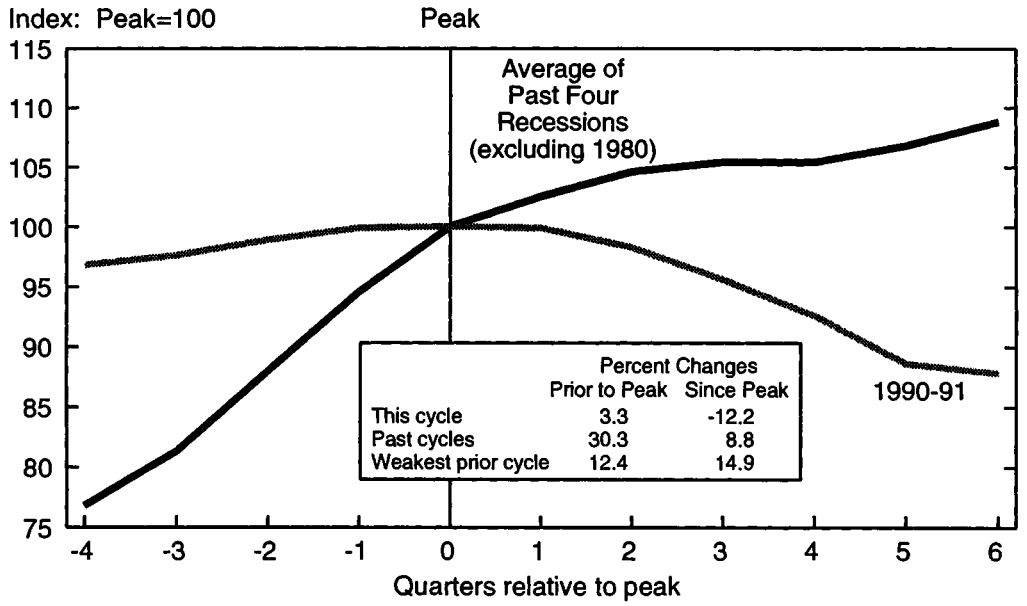


Chart 7: C&I Lending to Noncorporate Business



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the noncorporate sector (which are more reliant on bank credit) may have experienced a sharper reduction in their access to bank credit since the peak in the business cycle than did larger incorporated business firms.

Loans to finance inventories appear to have been an important determinant of C&I lending over the business cycle in the past, and this relationship seems to hold in the most recent cycle as well (Chart 8). Chart 8 shows that the growth rates of inventories and C&I loans have been slowing sharply since 1989. However, it is not clear from the chart whether lower levels of desired inventories are reducing the demand for bank loans or whether the unavailability of bank loans is forcing firms to operate with less inventory. Some analysts have argued that better inventory management was an important demand-side determinant of the weakness in C&I lending by banks.[10]

Now important might this improved inventory management be in explaining the weakness in C&I lending? In Chart 9, we show a cyclical comparison of the ratio of business inventories to sales.[11] Over this most recent cycle, this ratio has ended up about 7 percentage points below the normal pattern; in other words, the level of nominal inventories is about $75 billion less than would be expected on the basis of the pattern in past cycles.

It is more difficult to judge how weak business loans are relative to a "normal cyclical pattern." Chart 10 compares C&I loans in the most recent cycle with the average of past cycles. It suggests that C&I lending is about 37 percentage points weaker, which amounts to about $288 billion. The $75 billion lower level of inventories is about 25 percent of $288 billion. Thus it appears that better inventory management did have some impact on C&I lending, but it only explains a relatively small fraction of the overall weakness.

Alternatively, in Chart 11 we compare the ratio of C&I lending to business sales in the most recent cycle with the ratio for earlier cycles. Lending, relative to the level of business activity, appears to be about 24 percentage points weaker, or $187 billion less than in previous cycles. This cyclical comparison suggests that the $75 billion shortfall in inventories would amount to about 39 percent of the unusual weakness in C&I lending. These orders of magnitude, 25 to 39 percent, are intended to be just rough estimates of the possible role of inventories from the demand side and could overstate the impact from the demand side to the extent that banks systematically cut back on business lending during the crunch period, including lending to finance inventories.[12]

[10] An analysis of the role of inventories in the recent credit slowdown can be found in Kevin Kliesen and John Tatom, "The Recent Credit Crunch: The Neglected Dimension," Federal Reserve Bank of St. Louis *Review*, September/October 1992, pp. 18-36. For evidence of improved inventory management, see Dan Bechter and Stephen Stanley, "Evidence of Improved Inventory Control," Federal Reserve Bank of Richmond *Economic Review*, January/February 1992, pp. 3-12.

[11] By indexing each cycle relative to the peak quarter, we can eliminate any longer run trend in inventories and focus more directly on how businesses have managed inventories in this most recent cycle relative to earlier cycles. The data released on inventories relative to sales during the late 1980s and early 1990s showed a pronounced downward trend, and the increase in this ratio during the recession looked rather small compared with the increase in past recessions. Initially, it appeared that better inventory management was reducing the demand for C&I loans by a substantial amount. Subsequent revisions to the data significantly increased the level of inventories relative to sales, and now it appears that inventories were probably not as important in explaining the weakness in business lending as we originally believed.

[12] In addition, not all inventories are financed at banks; some are financed in the commercial paper market or at finance companies. If we repeat the above exercise but include business lending at finance companies and nonfinancial commercial paper along with C&I lending at banks, inventories can account for 15 to 29 percent of the cyclically unusual weakness in total short-term business credit.

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Chart 8: Business Inventories and C&I Loans

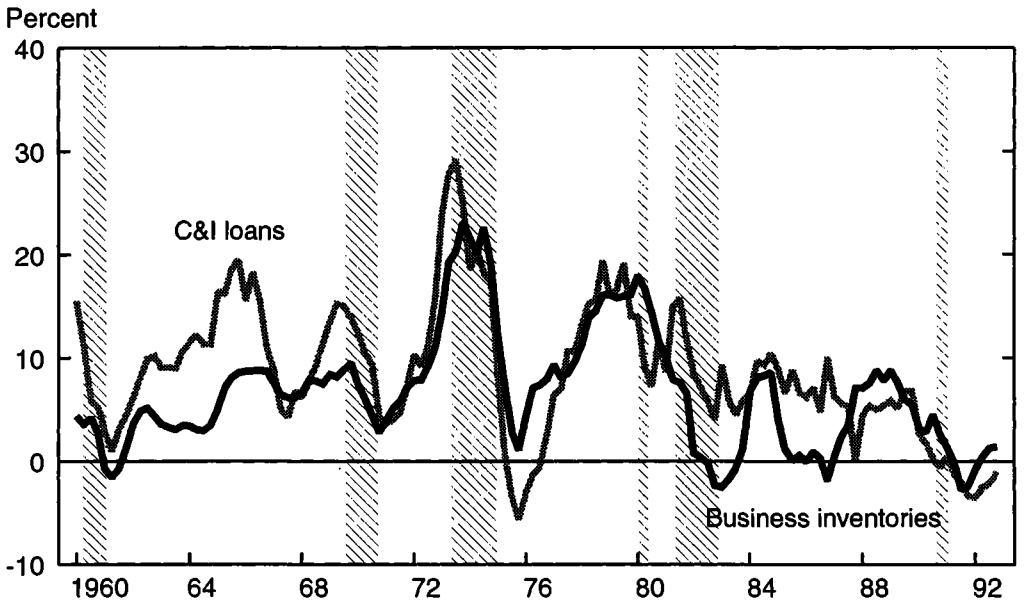

Chart 9: Ratio of Inventories to Final Sales

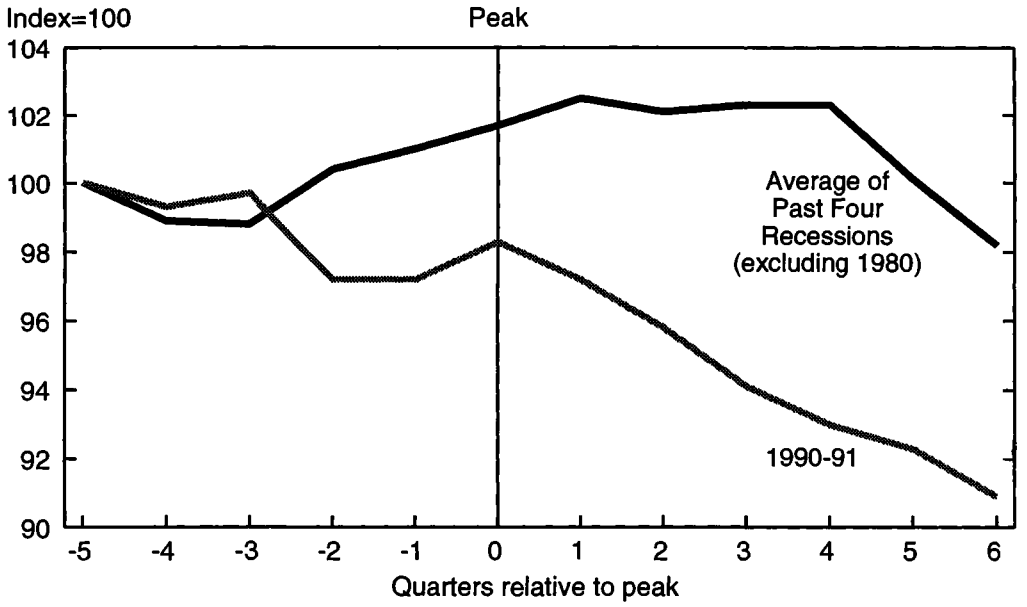

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Chart 10: C&I Loans

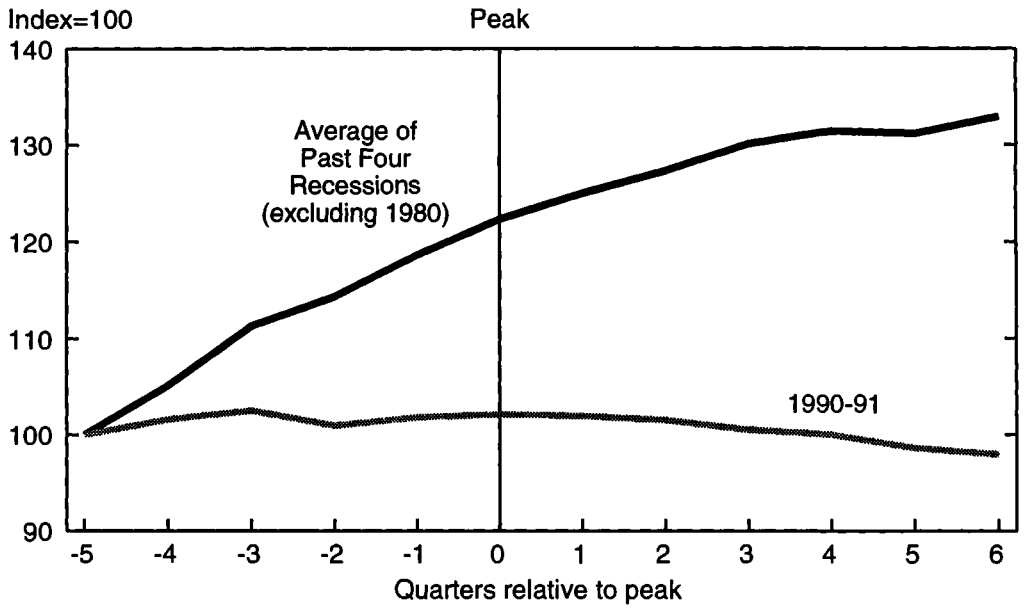
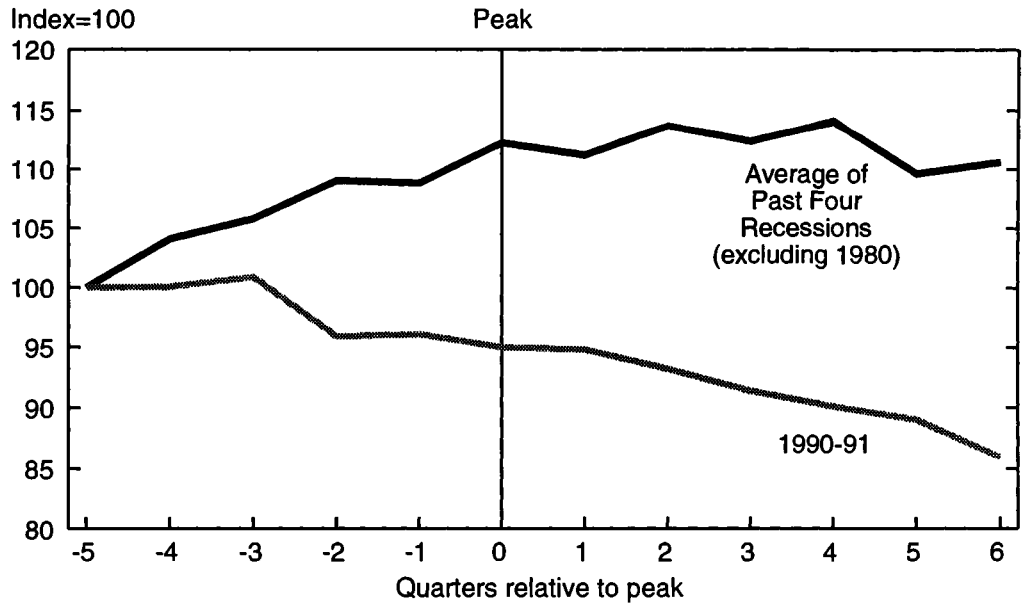


Chart 11: Ratio of C&I Loans to Final Sales of Business



Source: Commerce Department.

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Real estate lending, in contrast to C&I lending and consumer lending, appears to have followed a rather typical cyclical pattern during the most recent cycle (Chart 12). Although banks have reduced their commercial real estate lending in this cycle, they have been able to continue to make consumer mortgage loans, unconstrained by the Regulation Q ceilings or state usury ceilings that often bound them in earlier cycles.

Similar conclusions can be drawn from Charts 13 and 14, which contain cyclical comparisons for the components of real estate lending. That is, home mortgage lending has been relatively strong over this most recent business cycle, while other real estate lending has been flat and considerably weaker than in past cycles (and cannot be explained entirely by the unusual pattern in GDP growth in this cycle).

In sum, the charts in this section suggest the following conclusions: bank lending has been unusually weak in this most recent cycle and has been decelerating sharply since the mid-1980s. C&I loans are probably contributing to this trend in two ways from the demand side. More firms are now able to access the credit markets directly, and better inventory controls may have reduced the demand for bank loans. Consumer loans have also contributed to the slowing in bank lending, but in this case it appears that consumers are using low-yielding time deposits to pay down high-cost consumer debt. Real estate lending does not appear unusually weak in total, in large part because in this deregulated banking environment, home mortgage lending has held up quite well relative to past cycles, even as banks have cut back sharply on their commercial real estate lending.

Supply-Side Considerations

Over the past three years, analysts have pointed to several indicators of a credit crunch in the banking sector, that is, indicators of supply-side constraints on lending. Two of the most frequently cited indicators have been the wide spreads between bank lending rates and bank funding costs in both the corporate and consumer sectors (Charts 15 and 16). Both of these rate spreads are close to or above their previous record levels, suggesting a reduced willingness on the part of banks to lend. In other words, if the weak credit growth was demand driven, we would expect to see these rate spreads narrow as banks cut loan rates relative to funding costs to attract new business. Hence, these rate-spread charts tend to suggest that the lending slowdown at banks was, at least in part, supply driven.

Survey results also have been consistent with the notion that banks were less willing to lend during this period (Charts 17, 18, 19, 20, and 21). Both lenders and borrowers reported tighter credit standards, particularly in the 1990-91 period. These tighter credit standards applied to firms of various sizes—small, medium and large—and were applied to C&I loans, commercial real estate loans of all types, and land and development loans. The responses of the bankers, however, are not very helpful in determining the start of the credit crunch because the survey was discontinued from 1984 to 1989. Nonetheless, the percentage of banks reporting tighter standards remained above zero well into 1991, suggesting that the "credit crunch" was not brief. In most of the charts, however, the tighter credit standards of 1990-91 do not seem to be the highest recorded in recent decades; equally tight or tighter standards were in effect in the late 1970s, when monetary policy was very restrictive.

Banks became more reluctant to lend in part because of increases in charge-off rates and delinquency rates on all types of bank loans, including consumer loans, C&I loans, and real estate lending (Chart 22). These problem loans tended to weaken bank capital positions, and as Chart 23 demonstrates, lending tended to weaken more (or decline

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Chart 12: Real Estate Loans at Commercial Banks

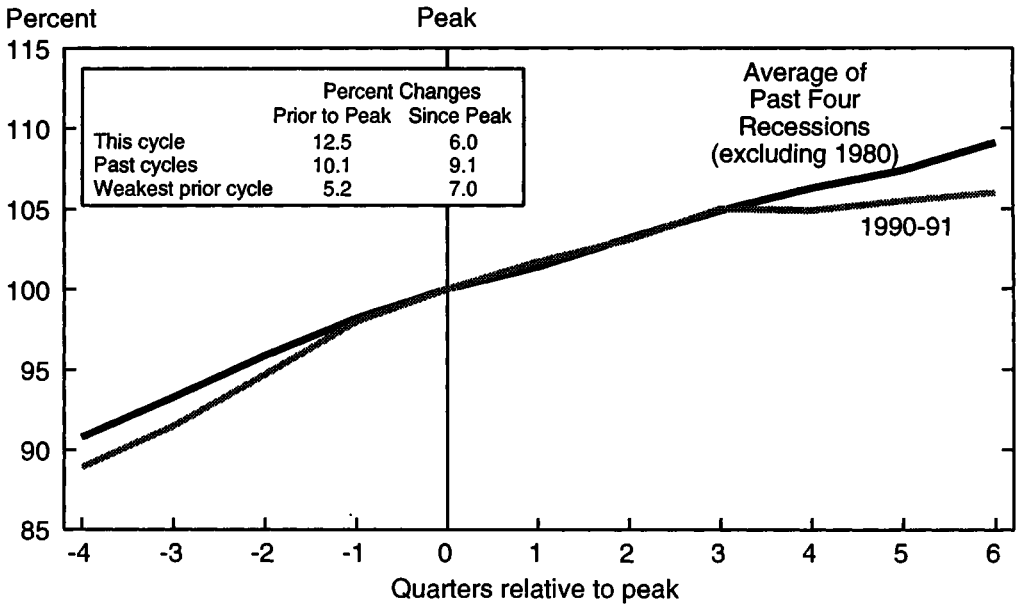

Chart 13: Home Mortgage Lending at Banks

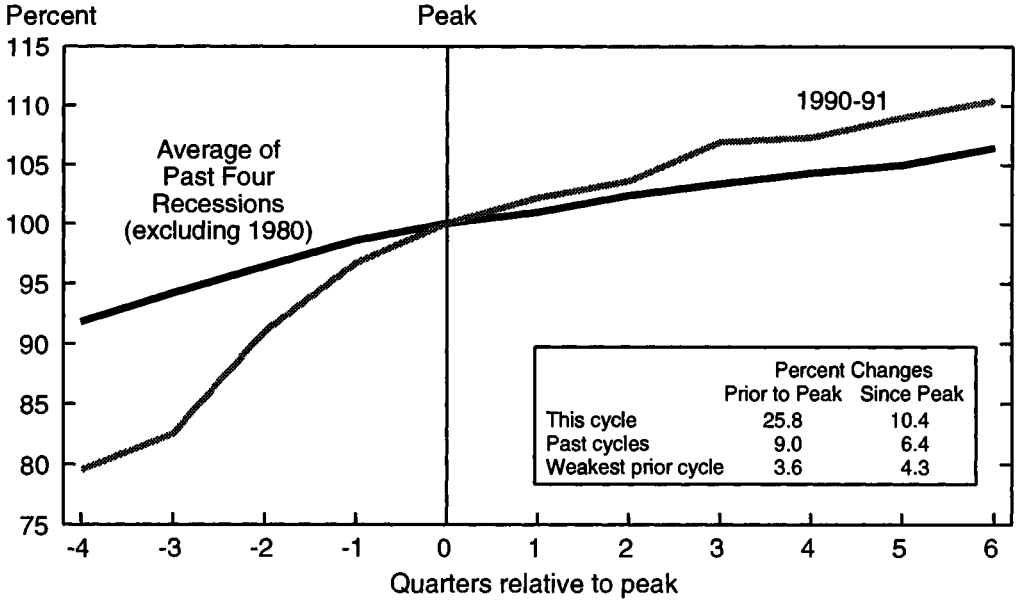

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Chart 14: Other Real Estate Lending at Banks

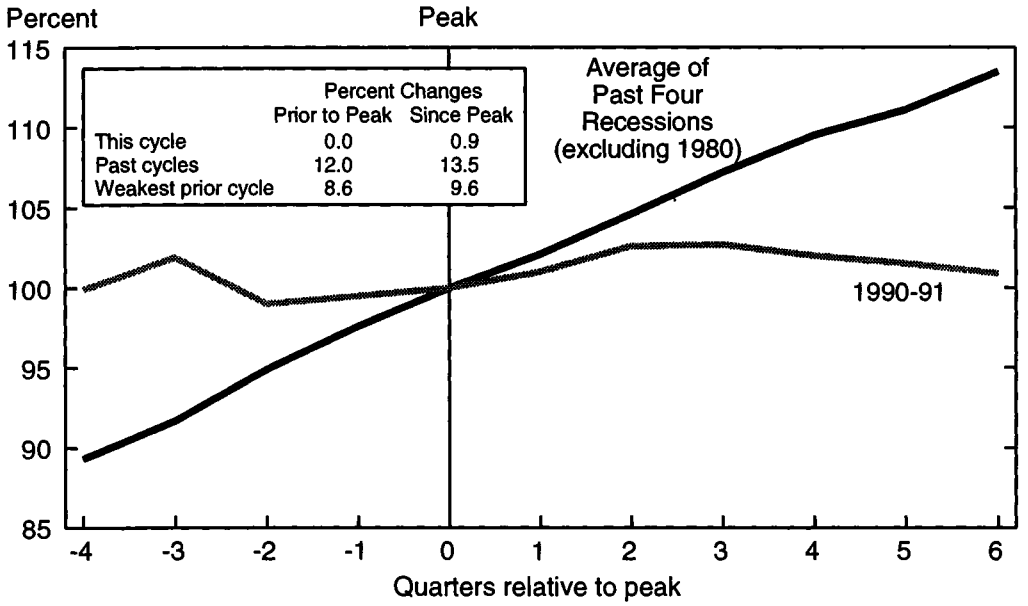

Chart 15: Prime Rate Less Federal Funds
Fourth Quarter Moving Average

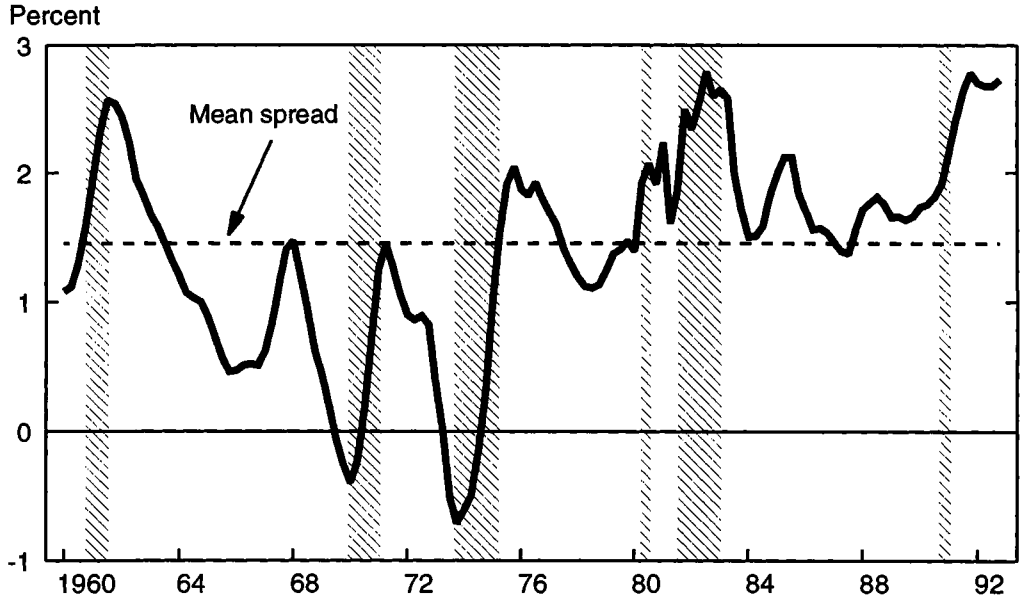

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Chart 16: Spread Between Personal Loan Rates and the 6-Month CD Rate

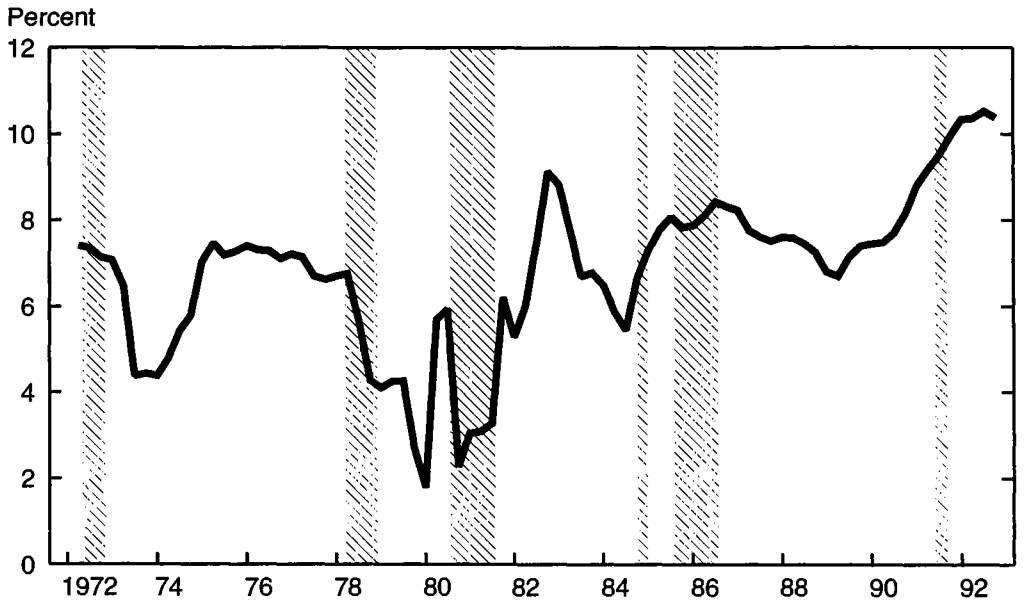
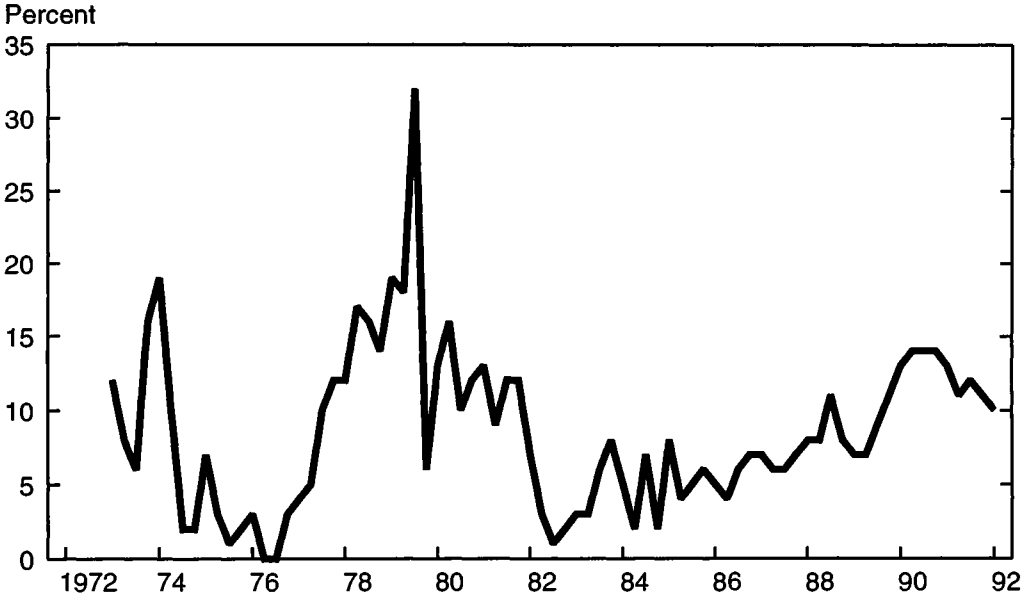


Chart 17: Borrower Surveys of Credit Availability
Net Percent Reporting "Loans Harder To Get" Than Previous Quarter



Source: National Federation of Independent Businesses.

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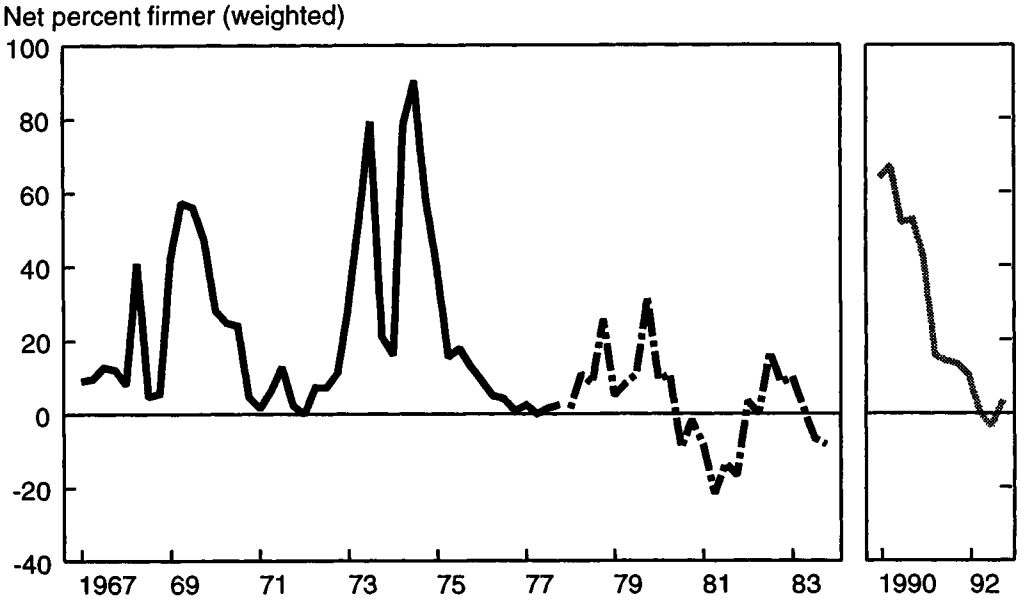
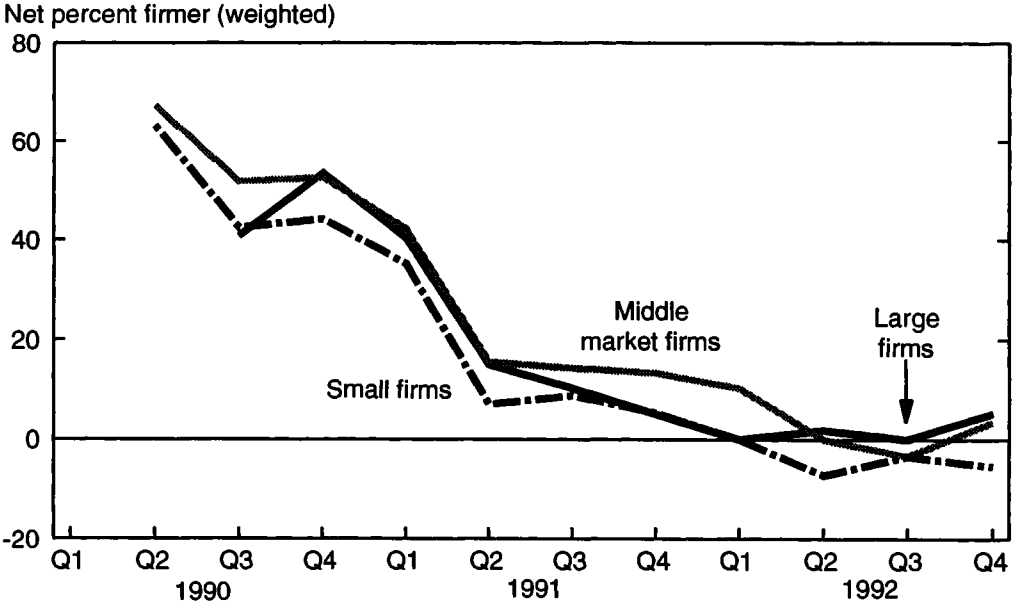
Chart 18: Lender Surveys of Credit Availability
Net Percent Reporting Firmer Standards than Previous Quarter



Source: Senior Loan Officer Survey, Federal Reserve Board.
1967-77, "Standards for Loan to Nonfinancial Businesses"
1978-83, "Standards to Quality for the Prime Rate"
1990-92, "Standards for Loans to Middle Market Firms"

The Senior Loan Officer Survey results are transformed into an index, "net percent firmer," by weighting individual response as follows: considerable firmer (200%), moderately firmer (100%), unchanged (0%), moderately easier (-100%), and considerably easier (-200%).

Chart 19: Standards of Creditworthiness for C&I Loans



Source: Senior Loan Officer Survey, Federal Reserve Board.

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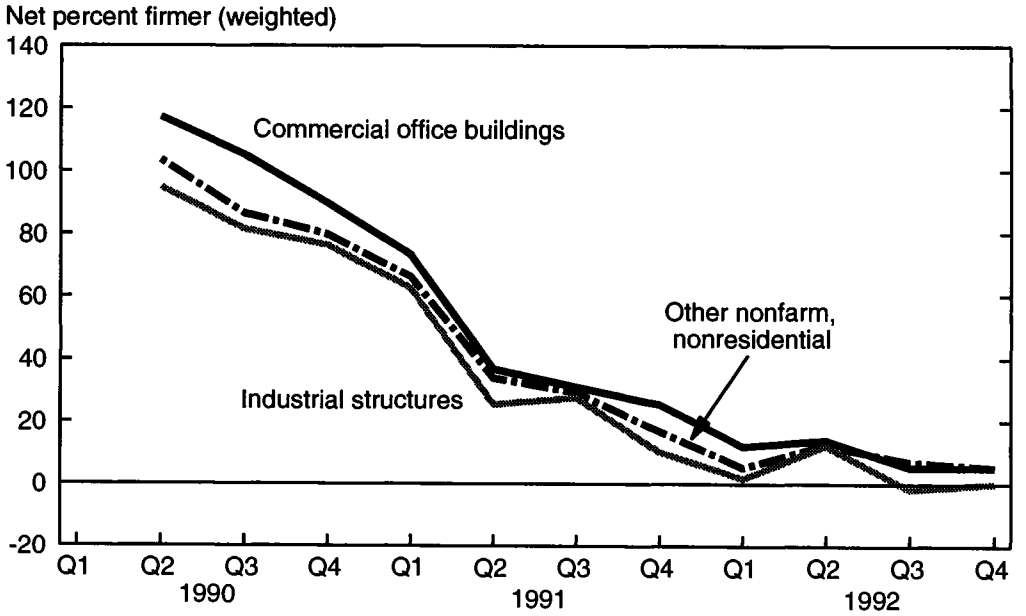
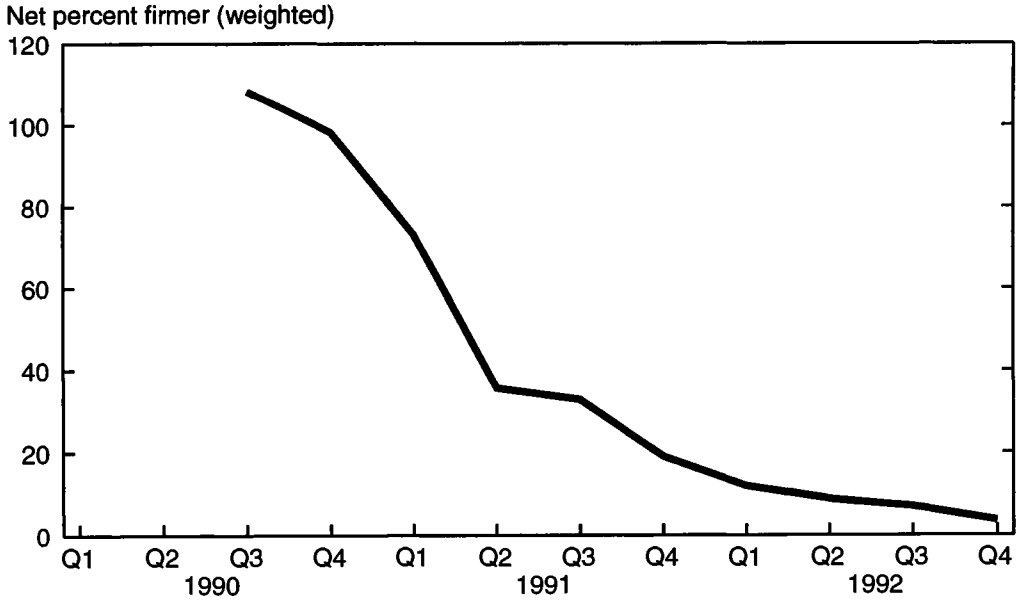
Chart 20: Credit Standards for Real Estate Loans



Source: Senior Loan Officer Survey, Federal Reserve Board.

Chart 21: Credit Standards for Land and Development Loans



Source: Senior Loan Officer Survey, Federal Reserve Board.

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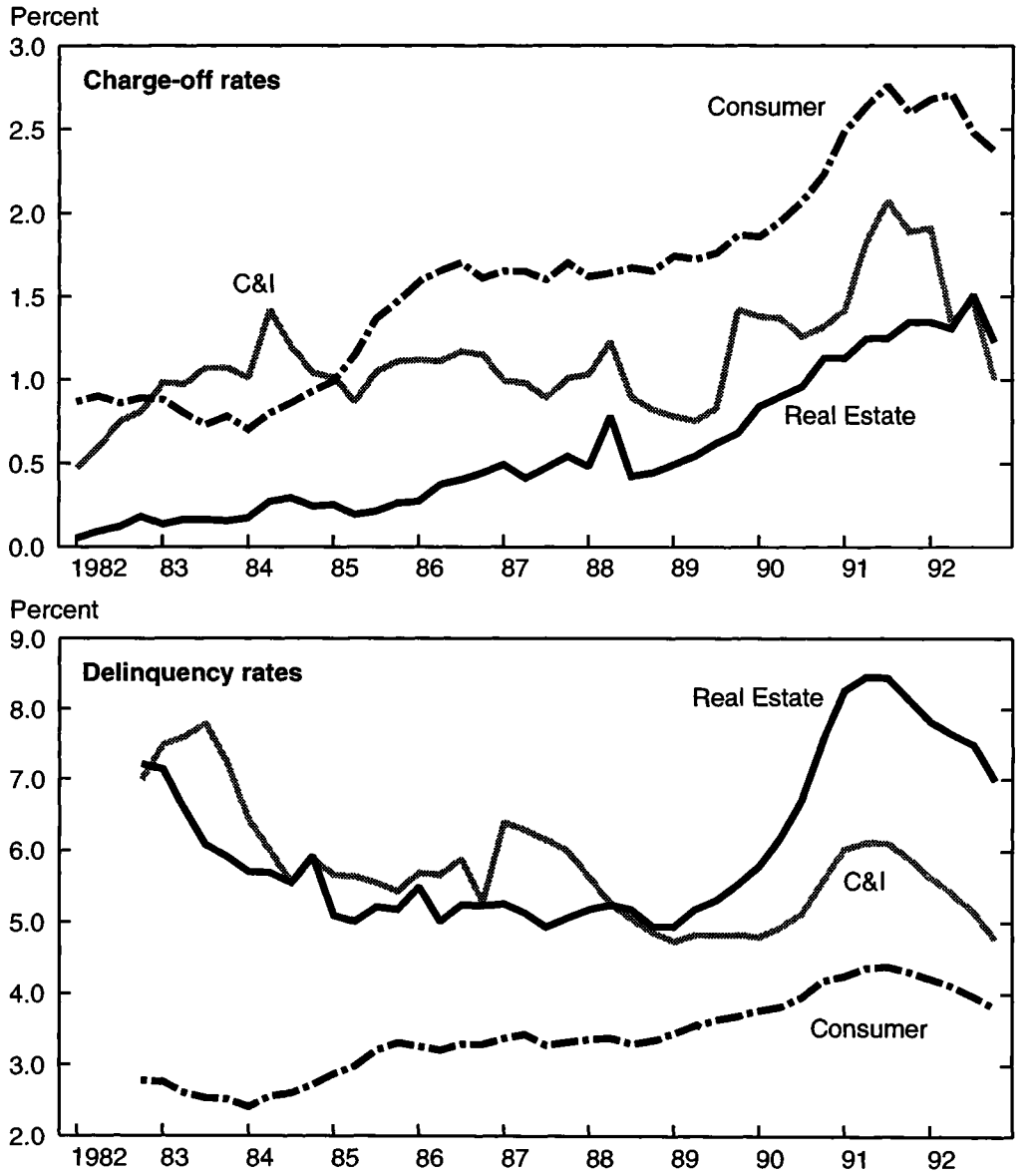
more) over time at those banks with poorer capital positions.[13] Again, this evidence is consistent with a finding that supply-side factors were behind the bank credit slowdown, and it suggests some possible role for the regulators (discussed later in this section).

[13] One should use caution in interpreting this chart as evidence of the seriousness of the crunch at capital-constrained banks. First, some borrowers did have the ability to switch from weak banks to strong banks during this period, thereby inflating the strong-bank numbers and reducing the weak-bank numbers with no real change in aggregate lending. Second, some part of the relatively better performance of the strong banks stems from the acquisition of weaker banks, again leading to an overstatement of the impact of their relative performance on aggregate credit availability. Finally, the distribution of bank assets across capital classifications is not uniform. Well capitalized banks have just under 65 percent of all assets, adequately capitalized slightly more than 33 percent, and undercapitalized banks just under 2 percent.

Chart 22: Charge-Off and Delinquency Rates on Loans by Medium and Large Insured Commercial Banks, by Type of Loan 1982-1992



Source: Federal Reserve Board.

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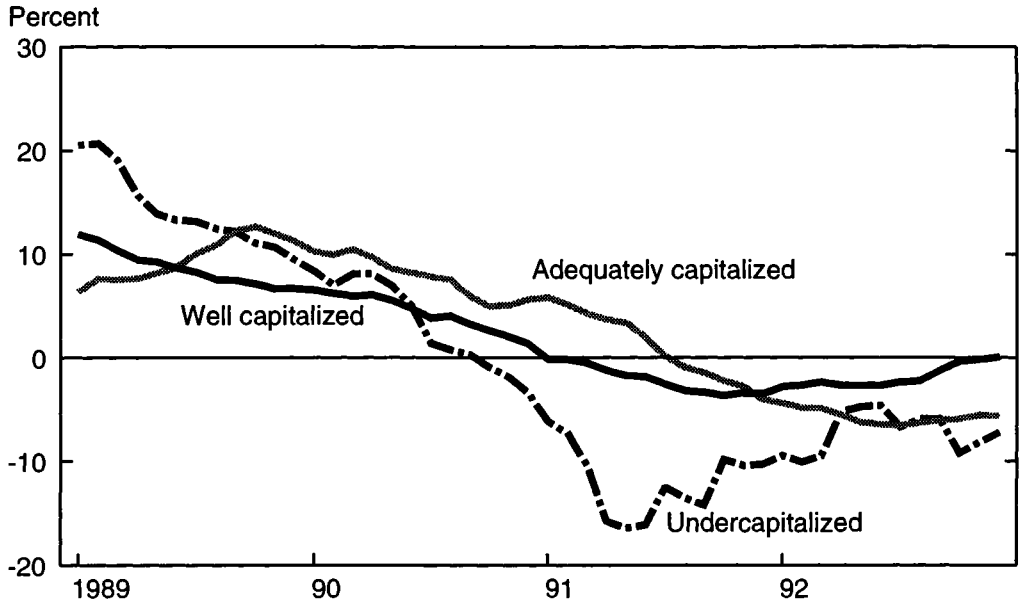
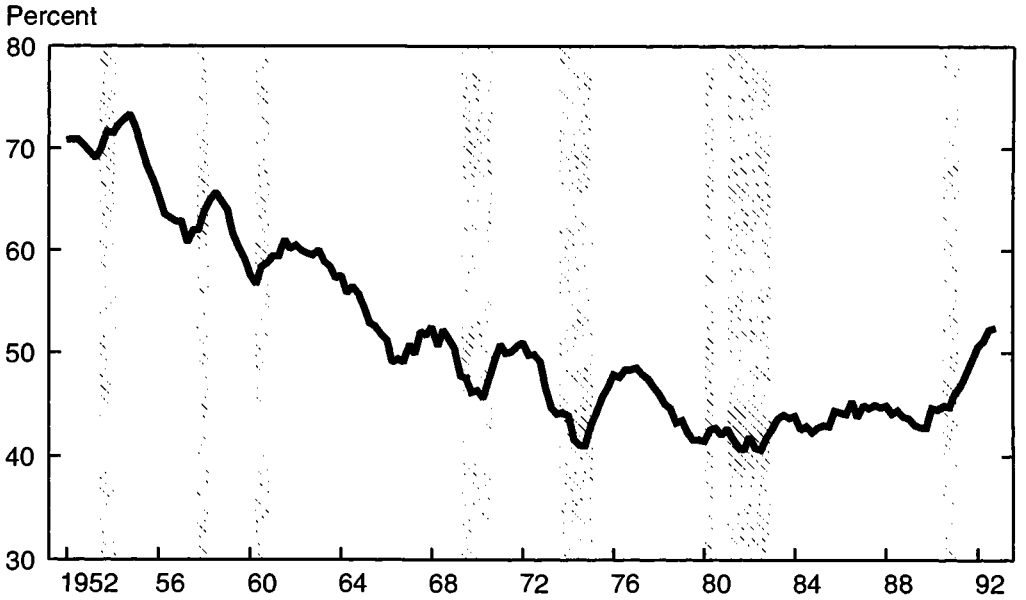
Chart 23: Loans at Weekly Reporting Banks Selected by Capital Status*
Growth from Twelve Months Earlier



Source: Federal Reserve Board.
Note: Capital Status is determined as of Call Report for 9/30/92. Includes undercapitalized, significantly undercapitalized, and critically undercapitalized banks.

Chart 24: Security Holdings of Banks as a Percent of Security Holdings of Banks Plus C&I Loans



Source: Flow of Funds.

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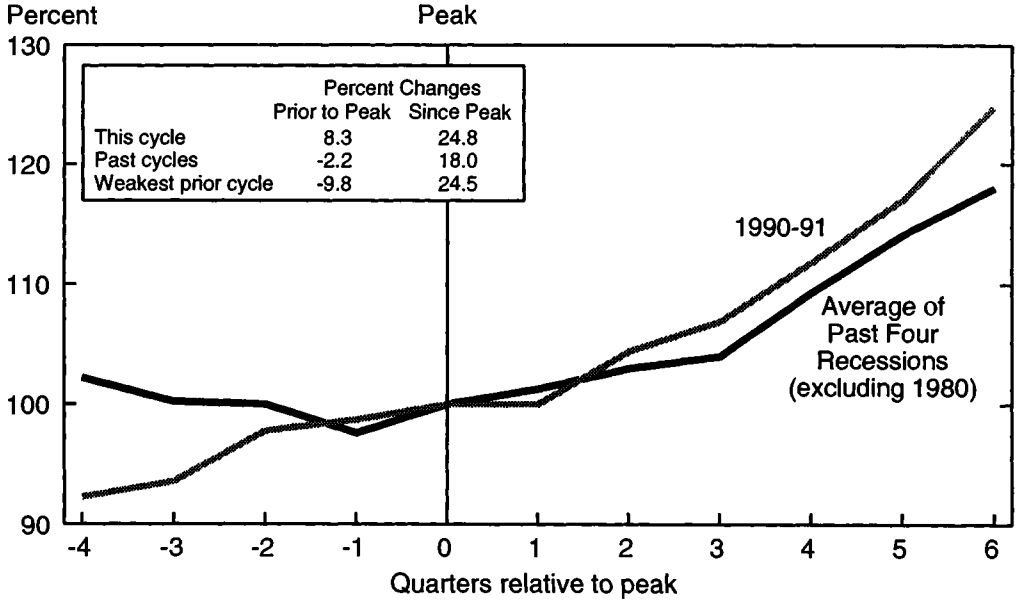
Chart 24 shows another indicator of the increased reluctance of banks to lend during this period: banks sharply increased their holdings of securities as a share of C&I loans plus securities. On the basis of this chart and the comparison contained in Chart 25, we can conclude that the increased holdings were a fairly typical cyclical response. Although, while the pattern is similar to past cycles, it does appear from Chart 25 that the increase in security holdings is somewhat more pronounced this time around, perhaps reflecting normal cyclical developments as well as some of the problems in the banking industry discussed earlier.

In the "Senior Loan Officer Survey on Bank Lending Practices" Board of Governors of Federal Reserve System, August 1992, bank loan officers were asked why their banks had increased securities holdings over the last two and one-half years. Among the fifty-nine respondents, thirty-five emphasized that securities offered greater profits, thirteen mentioned the uncertain economic outlook, eleven claimed that the securities would be used to fund anticipated increases in loan demand, nine cited a desire to improve their liquidity ratios, and nine gave other reasons. (Banks were allowed more than one answer.) The motive of greater profits, cited most frequently, probably stemmed in part from the potential for yield-curve profits (funding longer term securities with short-term deposits) and the absence of any risk-based capital requirements on government securities.

Governor LaWare, in a statement to Congress, discounted the theory that the Basle Accord capital standards were the cause of the buildup in security holdings at banks.[14] He noted that most banks met the standards and that the increase in holdings of government securities occurred at the stronger banks. He attributed the buildup in government securities to a move by strong banks, "in an environment of depressed loan demand," to accommodate deposit inflows by investing in government securities—the same pattern that occurred at credit unions, financial intermediaries not covered by the Basle Accord. He also noted that almost half of the acquisitions of securities by banks had been in the

[14] John LaWare before the House Subcommittee on Economic Growth and Credit Formation, April 2, 1993.

Chart 25: Banks' Investments



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form of government-backed collateralized mortgage obligations (CMOs), which have a maturity that better matches bank liabilities than does the maturity of conventional mortgages. Finally, it appeared to Governor LaWare that the government securities acquired might be a substitute for state and local government bonds, which had become a less desirable asset for banks since the tax advantages were eliminated in 1986.[15]

Finally, the statistics on conditions and terms of bank lending can shed some light on the existence of a credit crunch from the supply side.[16] Tables 5 and 6 contain our findings. In general, if banks were more reluctant to lend during the 1989-91 period, we would expect to see (1) the average size of loans decline as banks became less willing to finance any given mix of projects, (2) the maturity of loans shorten as banks became less willing to take longer-term exposures, (3) the spread between the effective loan rate and the federal funds rate widen as banks required larger spreads to make loans, (4) a

[15] A more detailed analysis of the increase in the banking system's holdings of government securities can be found in Jonathan Neuberger, "On the Changing Composition of Bank Portfolios," Federal Reserve Bank of San Francisco *Weekly Letter*, March 19, 1993.

[16] These statistics are published quarterly as special tables in the Federal Reserve *Bulletin*.

Table 5: Terms for Short-Term C&I Lending

Year	Average Size (Thous.)	Average Maturity (Days)	Loan Rate less Fed Funds	Percent Commit-ment	Percent Demand	Percent Floating	Percent Short-Term	Percent Collater-alized
1977	44.0	119	2.5	n.a.	28.7	37.3	82.8	40.0
1978	49.5	115	2.4	n.a.	28.8	40.0	84.7	44.3
1979	52.6	113	2.3	n.a.	24.6	37.5	83.8	39.8
1980	78.3	95	2.3	n.a.	22.6	35.5	84.5	33.3
1981	121.9	74	3.8	n.a.	18.4	32.5	86.6	23.3
1982	194.5	49	2.5	62.0	12.6	25.7	89.6	19.3
1983	193.3	40	1.3	63.2	11.1	29.1	90.1	21.3
1984	190.5	44	1.5	66.8	10.2	31.0	89.4	23.0
1985	199.9	47	1.5	67.0	12.8	22.7	86.1	25.5
1986	267.8	46	1.2	76.7	14.6	25.7	88.1	30.0
1987	292.0	49	1.4	78.6	24.3	30.7	89.1	38.0
1988	303.4	48	1.5	78.2	35.9	36.3	91.7	38.5
1989	288.2	52	1.7	76.2	36.4	40.0	91.1	41.0
1990	303.9	49	1.7	76.8	28.0	33.3	90.1	36.5
1991	286.8	59	2.0	75.0	36.1	37.9	89.3	42.0
1992	282.8	60	1.9	70.1	36.6	38.7	89.0	46.9
1993 (first half)	330.0	54	1.8	68.7	40.3	41.3	89.8	43.1

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larger share of loans requiring collateral as banks became more cautious in their lending, (5) a higher percentage of loans made under commitment as banks reduced discretionary lending and made only those loans they had prior commitments to make, (6) a larger share of short-term credit extended as demand notes so that banks could call the loans at the first signs of difficulty, and (7) a larger share of variable rate loans as banks passed more of the interest rate risk back to their customers. Clearly, some of these indicators are subject to alternative interpretations and could reflect changes in borrowers' preferences as well. Our effort, however, in this exercise is only to see whether these statistics, taken as a whole, are broadly consistent with the notion that lending terms tightened over the 1989-91 period.

On balance, the evidence from this source is mixed. From 1989 on, the average maturity of short-term loans (loans with maturity of one year or less, about 90 percent of all loans) tends to lengthen somewhat, not shorten, as might be expected if banks were becoming more restrictive in lending (Table 5). The spread between the loan rate and the funds rate does widen, and remains above the 1983-88 period, but does not become as wide as in the late 1970s and early 1980s. The percentage of loans made under commitment peaks in 1988 and then gradually declines, the same pattern apparent in the per-

Table 6: Terms for Long-Term C&I Lending

Year	Average Size (Thous.)	Long-Term Average Maturity (Months)	Loan Rate less Fed Funds	Percent Commit-ment	Percent Floating	Percent Long-Term	Percent Collateral-ized
1977	46.2	43	3.1	n.a.	45.7	17.2	60.8
1978	62.0	43	2.3	n.a.	55.2	15.3	66.3
1979	60.9	46	2.1	n.a.	56.6	16.2	61.8
1980	100.6	45	2.8	n.a.	68.0	15.5	56.3
1981	135.2	47	4.4	n.a.	71.5	13.4	50.0
1982	147.5	46	3.5	65.1	66.2	10.4	47.0
1983	141.7	52	2.8	66.3	72.1	9.9	55.0
1984	123.2	46	2.8	76.8	72.6	10.6	49.8
1985	157.1	49	2.8	77.0	67.3	13.9	47.0
1986	211.4	52	2.3	76.7	75.2	11.9	51.8
1987	231.9	49	2.2	74.0	67.6	10.9	52.0
1988	215.5	47	2.4	62.9	67.5	8.3	63.8
1989	223.8	48	2.7	69.2	76.5	8.9	65.5
1990	227.5	45	2.8	74.8	75.6	9.9	67.0
1991	200.9	42	3.3	72.2	75.4	10.7	68.5
1992	172.5	45	3.2	73.7	72.2	11.0	68.0
1993 (first half)	176.0	43	3.3	74.2	68.7	10.2	64.6

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centage of loans made as demand credits.[17] The percentage of floating rate notes, however, increases sharply in 1989, as does the percentage of loans requiring collateral; these results are consistent with tighter lending standards. Finally, the percentage of total loans consisting of short-term loans does not show any break in trend that would suggest a tightening of standards.

For long-term loans, the three series that suggest some tightening in lending terms are the rate spreads, the percentage of loans made as floating rate loans, and the percentage requiring collateral (Table 6). The other indicators once again are mixed, at best.

Hence, for both short-and long-term lending, there is some evidence of a tightening of credit standards, but the evidence is not consistent across all the indicators examined. The most convincing evidence comes from the sharp increase in the percentage of loans requiring collateral. In 1985, about 25 percent of short-term loans required collateral, in 1989 41 percent. For long-term loans, the percentage increases from 47 percent to 65.5 percent.

The supply-side indicators reviewed thus far in this section suggest that a credit crunch did occur in the banking sector over the 1989-91 period. Some analysts have argued that the regulators could have played an important role in creating the credit crunch. With several factors from both the demand side and supply side apparently contributing to the slowdown in bank lending, however, the role of the regulators in this credit slowdown is difficult to determine empirically with any degree of precision, although the regulators certainly seem to have received relatively more attention in the press. To the extent that the regulators forced banks to face up to the reality of the real estate market and the state of the economy, they were merely messengers with bad news. That is, the effects of some of the other factors contributing to the bank credit slowdown were transmitted through the regulatory process, making the exogenous role of the regulators seem larger than it actually was. Nevertheless, to the extent that regulators became overly aggressive in pressing banks to raise credit standards, they could have been some part of the reason for the credit crunch. Governor LaWare, in a recent statement before Congress, provided a summary of the regulatory process during this period.[18] Hindsight tells us, he noted, that the regulators should probably have acted sooner and more vigorously to avert the problems in the banking industry during the boom phase, but it would have been difficult to impose such standards in good times. Governor LaWare also addressed the question of excessive tightening of credit standards and the regulatory agencies' responses. He observed that concerns about excessive tightening of credit standards resulting from the growing volume of real estate lending criticized by examiners had prompted the regulatory agencies to review their examination practices. At the same time, however, some tightening of credit standards was necessary given the state of the economy, and the main concern of the regulators was about excessive tightening resulting from a misunderstanding by banks of supervisory actions. As a result, the regulators undertook the following actions:

[17] Earlier studies using commitment statistics also did not find evidence of rationing. For more detail, see Allen Berger and Gregory Udell, "Some Evidence on the Empirical Significance of Credit Rationing," *Journal of Political Economy*, 1992, vol. 100, no. 51, pp. 1048-77. In Table 5, the percent of loans made under commitment had a steady uptrend, peaking in 1987, and slowly declining since then. While higher on average over the 1989-91 period than the 1982-88 period (76 percent versus 70.3 percent), it is still difficult to point to clear evidence of a credit crunch because of upward trend until 1987.

[18] John LaWare, testimony before the Committee on Banking, Finance and Urban Affairs, U.S. House of Representatives, July 30, 1992.

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- Accordingly, building on earlier initiatives, in March 1991 the agencies issued a joint statement to address this matter. That statement sought to encourage banks to lend to sound borrowers and to work constructively with borrowers experiencing temporary financial difficulties, provided they did so in a manner consistent with safe and sound banking practices. The statement also indicated that failing to lend to sound borrowers can frustrate bank efforts to improve the quality and diversity of their loan portfolios. Under-capitalized institutions and those with real estate or other asset concentrations were expected to submit plans to improve their positions, but they could continue sound lending activities provided the lending was consistent with programs that addressed their underlying problems.
- At other times during the year, and particularly in early November, the agencies expanded on that March statement and issued further guidance regarding the review and classification of commercial real estate loans. The intent was to ensure that examiners reviewed loans in a consistent, prudent, and balanced fashion. This second statement emphasized that evaluation of real estate loans should be based not only on the liquidation value of collateral, but also on a review of the borrower's willingness and ability to repay and on the income-producing capacity of the properties.
- Finally, in December, in order to assure that these policies were properly understood by examiners and to promote uniformity, the agencies held a joint meeting in Baltimore of senior examiners from throughout the country in one more effort to achieve the objectives just described. Once again, the principal message was to convey the importance of balance. Examiners were not to overlook problems, but neither were they to assume that weak or illiquid markets would remain that way indefinitely when they evaluated commercial real estate credits.

Because the regulators were simultaneously an independent force as well as a part of the process through which the banks became aware of the changing economic situation, their role in the bank credit slowdown cannot be defined precisely. Indeed, other regulators have suggested more strongly than Governor LaWare that the shortcomings of the regulatory process were not in managing the retrenchment over the 1989-91 period, but rather in not containing the excesses that were created in the preceding three or four years.[19] That is, they argue that the regulators should have been more aggressive in increasing capital earlier in the 1980s, when the risky lending was actually taking place, and that this larger capital cushion could have been used to absorb loan losses during the downturn without cutting off credit to other borrowers. By imposing higher capital standards after the losses became apparent, the regulators, according to Syron and Randall, may have forced banks to downsize, thereby reducing credit supply to borrowers dependent on intermediated credit. In addition, some banks that were able to meet the risk-based asset requirements by allocating their investments carefully across the various risk categories were constrained by the higher leverage ratio of tier one capital to unweighted assets imposed by regulators as their condition deteriorated.[20] Clearly, invest-

[19] Richard Syron, "Are We Experiencing a Credit Crunch?" Federal Reserve Bank of Boston *New England Economic Review*, July/August 1991, pp. 3-10; and Richard Syron and Richard Randall, "The Procyclical Application of Bank Capital Requirements," Federal Reserve Bank of Boston, *1991 Annual Report*.

[20] For more detail and some econometric evidence, see Herbert Baer and John McElravey, "Capital Adequacy and the Growth of U.S. Banks," Federal Reserve Bank of Chicago, Working Paper, May 1992. For evidence from the Boston Federal Reserve District, see Joe Peek and Eric Rosengren, "Crunching the Recovery: Bank Capital and the Role of Bank Credit, *Real Estate and the Credit Crunch*, Federal Reserve Bank of Boston Conference, September 16-18, 1992

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ments cannot be reallocated to meet this constraint, and the only option available to banks in this position is to downsize (that is, if they are unable to raise more tier one capital, an expensive option for banks experiencing large loan losses). Chairman Greenspan and Richard Syron have argued that the leverage ratio should be eliminated as soon as the risk-based measures have been revised to capture the full spectrum of risks faced by bankers.[21] In any case, by the late 1980s, steps were being taken to promote an alternative regulatory approach for banks after the costly savings and loan bailout. Higher capital requirements and insurance premiums were imposed, restrictions on access to the discount window were established for troubled institutions, and prompt regulatory intervention for weak institutions was encouraged.[22]

The slowdown in bank credit that followed these events has been a long, drawn-out process in part because the economy went through a period of slow growth and recession that lasted three years. Consumers and businesses with heavy debt burdens acquired in the 1980s were in no position to produce a rapid recovery by increasing spending, even if credit had been readily available. Moreover, fiscal policy, encumbered by large deficits, could only play a very limited role in turning the economy around. Monetary policy, in contrast, eased throughout this period, reducing short-term rates substantially. Borrowers with direct access to the financial markets clearly benefited from this policy change, but those borrowers that relied on intermediated credit, largely at banks, may not have benefited as much as they might otherwise have if the banking system had been in strong financial condition. Hence, the difficulties experienced by the banking system in recent years may have reduced the effectiveness of monetary policy by blocking the "credit channel."[23]

In summary, although analysts have had considerable time to debate the nature and causes of the "credit crunch," no clear consensus view has emerged even at this late date as to how much weight to assign to the various forces involved. Because a slowdown in economic activity lowered credit demand at the same time that (1) consumers and business worked to reduce heavy debt burdens, (2) banks and regulators lowered their assessment of real estate values, (3) banks reevaluated their lending standards in light of the recession, and (4) higher regulatory capital requirements coincided with the banks' need to increase loss reserves, it has been difficult to sort out the demand and supply causes of the recent credit slowdown. Therefore, while we can find considerable evidence that supply-side factors contributed to the slowdown in bank lending, the presence of demand-side factors makes it difficult to estimate precisely how much of the slowdown should be attributed to supply-side considerations. The situation is made

[21] For example, see the transcript of Chairman Greenspan's statement to the House Subcommittee on Domestic Monetary Policy, Federal Reserve Report to Congress on Monetary Policy, July 22, 1991, pp. 35-36. Also see statements by John LaFalce, William Taylor, Jerome Powell, and Timothy Ryan, The Impact of Bank Capital Standards on Credit Availability, U.S. House of Representatives Committee on Small Business, July 9, 1992.

[22] Many of these changes were required by the Federal Deposit Insurance Corporation Act of 1991, December 19, 1991. For additional views of the regulators on the credit crunch, see statements by Alan Greenspan, Paul Fretts, Robert Clark, and Timothy Ryan in *Credit Availability*, Committee on Banking, Housing and Urban Affairs, U.S. Senate, June 21, 1990.

[23] For more detail, see Donald Morgan, "Are Bank Loans a Force in Monetary Policy?" Federal Reserve Bank of Kansas City *Economic Review*, Q2-1992, pp. 31-41. An earlier, more theoretical, exposition can be found in Ben Bernanke and Alan Blinder, "Credit, Money and Aggregate Demand," *American Economic Review*, May 1988, pp. 435-39. A review of the credit channel for a more general audience can be found in Ben Bernanke, "Monetary Policy Transmission Mechanism: Through Money or Credit?" Federal Reserve Bank of Philadelphia *Business Review*, November/December 1988, pp. 3-11.

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more complex because other factors, not associated with the excesses of the 1980s, may also have played a role. As noted earlier, inventories, especially in the manufacturing sector, may have been managed more closely, and this improvement may have reduced the demand for short-term business credit by a significant amount.

IV. Econometric Analysis

This section presents an econometric evaluation of the slowdown in bank lending. We begin with a time series analysis and then offer some cross-sectional results.

Time Series Regressions

To examine the weakness in loan growth in a more formal manner, we present reduced-form equations for the four main loan categories. We then compare the actual and predicted values from each equation to assess whether the current weakness in loan growth is unusual relative to other recessionary periods. We base these comparisons on reduced-form loan equations, as opposed to structural equations, because our interest is not in determining the true structural model of the loan market. Rather, we seek to establish statistical regularities between loan growth and economic variables that play a role in determining that growth, and to examine whether those regularities have changed over the past few years.

The equations are estimated using VAR methodology to approximate the reduced-form relationships. Quarterly data from 1961-II through 1991-IV are used in the estimation. The results are presented in Table 7. Each category of loan growth is explained by four lags of its own growth, four lags of an economic activity variable, and four lags of an interest rate variable.[24] In addition, four lags of investment in producer durables and in inventory investment are included in the C&I loan equation, four lags of investment in structures are included in the real estate loan equation, and four lags of housing starts are included in the home mortgage equation. With the exception of the interest rate and housing start variables, all of the variables are specified as growth rates.

As the table indicates, with perhaps the exception of the C&I loan equation, the regressions appear to explain the loan variables reasonably well. The adjusted R^2, one measure of an equation's fit, is generally between .5 and .6 on a scale of 0 to 1. For C&I loans, the fit is not as good, perhaps an indication that the nature of business loans has changed over time. Alternatively, the relatively poor fit of the business loan equation could suggest that nonprice terms play a role in business lending, or that the many alternatives to bank business loans make it difficult to capture the dynamics of C&I loan growth.

To determine the stability of our regressions over time, we needed to know whether any of the regressions would be altered if they were estimated over subperiods of our sample. First, we split the time period in half, breaking the sample at 1976-III, and tested whether any of the regressions changed from the first half of the sample period to the second. Only the C&I loan equation showed a significant change. We then split the sample period at 1979-IV to determine whether the regressions would differ over the 1980s. This test demonstrated that the home mortgage equation and the C&I loan equation were statistically different during the 1980s than during the 1960s and 1970s. The tests on the other equations indicated that, for the breaks we considered, our equations were stable over the sample period.

[24] Results are similar when two lags of each variable are used.

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Table 7: Bank Loan Equations
Estimation Period: 1961-II to 1991-IV

Explanatory Variables	Dependent Variable Growth Rate of: (1) C&I Loans		(2) Real Estate Loans		(3) Home Mortgage Loans		(4) Consumer Loans	
Constant	.01	(1.25)	.005	(1.10)	-.007	(1.35)	.002	(.46)
Lag. dep. var. $_{t-1}$	.10	(1.1)	.45	(.74)	.45	(4.70)	.53	(5.52)
Lag. dep. var. $_{t-2}$	.31	(3.4)	.36	(3.46)	.26	(2.47)	.25	(2.25)
Lag. dep. var. $_{t-3}$	.04	(.37)	-.05	(.44)	-.07	(.68)	.13	(1.18)
Lag. dep. var. $_{t-4}$	.05	(.54)	-.007	(.06)	.01	(.05)	-.26	(2.78)
i_{t-1}	-.003	(1.60)	-.002	(1.84)	-.002	(.88)	-.005	(1.29)
i_{t-2}	.002	(1.43)	-.002	(1.62)	-.002	(1.26)	-.003	(.90)
i_{t-3}	.001	(.51)	-.002	(1.57)	-.001	(.49)	-.004	(1.17)
i_{t-4}	.000	(.16)	.002	(1.75)	-.000	(.27)	-.005	(1.59)
$XGDP_{t-1}$	-.07	(.36)	.09	(.70)				
$XGDP_{t-2}$	-.37	(1.80)	-.09	(.68)				
$XGDP_{t-3}$	-.06	(.28)	-.06	(.45)				
$XGDP_{t-4}$	.07	(.34)	.06	(.47)				
YP_{t-1}					-.04	(.27)	-.02	(.11)
YP_{t-2}					.01	(.08)	.23	(1.44)
YP_{t-3}					.07	(.48)	-.12	(.77)
YP_{t-4}					.13	(.86)	-.19	(1.14)
I_{t-1}	.06	(.75)	-.006	(-.16)				
I_{t-2}	.02	(.21)	.04	(1.00)				
I_{t-3}	.05	(.61)	.04	(.99)				
I_{t-4}	.28	(3.89)	.03	(.64)				

Notes: (absolute) t-statistics are in parentheses. All variables are in nominal terms and are specified in growth rates except where noted. The real estate loan variable excludes residential mortgages. XGDP= nominal GDP less expenditures on producer durables, structures, and inventories. I= expenditures on producer durables in equation 1 and expenditures on structures in equation 2. YP= personal income. INV= the stock of business inventories. i= the change in the prime rate in equations 1 and 2, the change in the mortgage rate in equation 3 and the change in the consumer loan rate in equation 4. The consumer loan rate is a weighted average of four consumer loan rates; actual data was available beginning in 1973-I, extrapolated data was used prior to that. HS= the level of housing starts.

(Continued)

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Table 7: Bank Loan Equations *(Continued)*
Estimation Period: 1961-II to 1991-IV

Explanatory Variables	Dependent Variable Growth Rate of: (1) C&I Loans	(2) Real Estate Loans	(3) Home Mortgage Loans	(4) Consumer Loans
INV_{t-1}	-1.0 (.62)			
INV_{t-2}	-.08 (.47)			
INV_{t-3}	.28 (1.64)			
INV_{t-4}	-.14 (.73)			
HS_{t-1}			-.000 (1.23)	
HS_{t-2}			.000 (.98)	
HS_{t-3}			-.000 (.95)	
HS_{t-4}			.000 (2.16)	
Adj.R^2	.39	.53	.61	.60

Notes: (absolute) t-statistics are in parentheses. All variables are in nominal terms and are specified in growth rates except where noted. The real estate loan variable excludes residential mortgages. XGDP= nominal GDP less expenditures on producer durables, structures, and inventories. I= expenditures on producer durables in equation 1 and expenditures on structures in equation 2. YP= personal income. INV= the stock of business inventories. i= the change in the prime rate in equations 1 and 2, the change in the mortgage rate in equation 3 and the change in the consumer loan rate in equation 4. The consumer loan rate is a weighted average of four consumer loan rates; actual data was available beginning in 1973-I, extrapolated data was used prior to that. HS= the level of housing starts.

Finally, we estimated each equation through 1989-IV and examined the 1990-I to 1991-IV out-of-sample prediction errors. This test should reveal whether there has been a recent structural break. The results are reported in Table 8. The table lists the actual and predicted values for each of the four loan variables over the eight forecasted quarters. The average error and the root mean squared error are also reported. In addition, we report the marginal significance level of the F statistic for the test that the prediction errors are small enough to be consistent with the estimated model.

As the table indicates, the C&I loan equation has a relatively small average prediction error; the errors increase as we move to the real estate, home mortgage, and consumer loan equations. The root-mean squared errors indicate that the consumer loan equation forecasts somewhat better than the two real estate equations. This latter finding is consistent with the marginal significance levels of the F-tests, which indicate that only the C&I and consumer loan forecasts cannot reject the hypothesis that the data fit the estimated equation. We also estimated the C&I loan equation beginning first in 1976-III and then in 1979-IV. The out-of-sample forecasts from these two estimations were similar to those reported in the table. Thus, while our previous break tests indicated that the C&I loan equation is not stable over the entire sample period, no break occurs

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over the last two years.[25] The two real estate equations have a significant break after 1989-IV.

With the caveats in mind that the behavior of the home mortgage and C&I loan equations changes by the early 1980s and that the two real estate loan equations change after 1989-IV, we next examine the prediction errors from each equation estimated over the entire sample period. This exercise allows us to assess the current weakness in loan growth relative to its behavior in other recessionary periods.

The differences between the actual and predicted loan growth values are shown in Charts 26-29. Chart 26 presents the C&I loan growth prediction errors. As the chart indicates, the errors in the C&I loan equation do not show any clear cyclical patterns, and the most recent recession does not show unusually large errors (a result consistent with the findings reported in Table 8). However, this result should not be interpreted to mean that a "credit crunch" did not occur for the business sector. To the extent that certain businesses are dependent on bank credit, banks' reduced willingness to lend would constrain these firms' level of business activity without any errors necessarily showing up in an aggregate equation.

[25] However, there was evidence of a break in the C&I loan equation, significant at the 10 percent level, after 1987-IV.

Table 8: Loan Equations' Forecast Accuracy
Estimation Period: 1961-II to 1989-IV; Forecast Period: 1990-I to 1991-IV

	C&I Loans (In Percent)			Real Estate Loans (In Percent)			Home Mortgages (In Percent)			Consumer Loans (In Percent)		
	Actual	Pre-dicted	Error	Actual	Pre-dicted	Error	Actual	Pre-dicted	Error	Actual	Pre-dicted	Error
1990-I	2.07	1.08	0.99	2.26	2.78	-0.52	3.84	2.78	1.06	0.40	2.35	-1.96
1990-II	2.02	0.82	1.20	3.12	2.43	0.70	3.03	2.06	0.97	-0.20	1.97	-2.17
1990-III	0.64	0.24	0.40	1.93	2.30	-0.37	5.00	2.01	3.00	0.46	2.28	-1.82
1990-IV	0.88	0.59	0.29	1.70	2.25	-0.55	4.03	1.92	2.11	-0.24	2.51	-2.76
1991-I	-1.24	1.04	-2.28	-4.82	2.76	-7.58	10.51	2.09	8.42	-0.65	2.41	-3.06
1991-II	0.09	1.04	-0.95	0.03	2.57	-2.54	4.62	1.82	2.81	-0.96	2.54	-3.50
1991-III	-0.30	1.68	-1.98	-0.96	2.99	-3.95	3.92	1.38	2.54	-2.06	2.28	-4.35
1991-IV	-0.67	-0.29	-0.38	0.05	2.76	-2.71	2.45	1.03	1.41	-1.09	2.57	-3.66
Average error			-.34			-2.19			2.79			-2.91
Root mean square error			1.27			3.39			3.58			3.03
F-test significance			.85			.00			.00			.20

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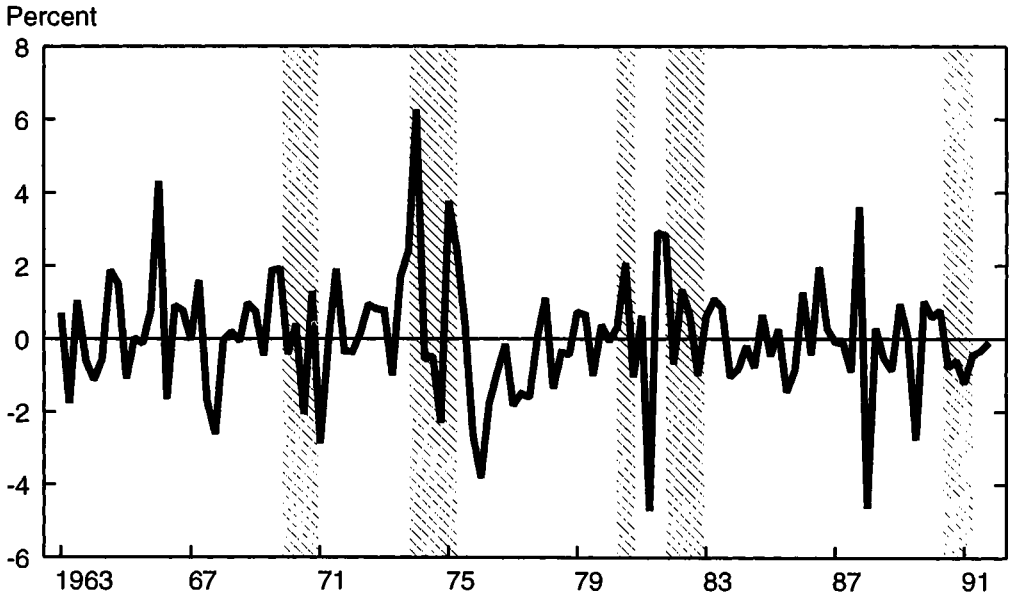
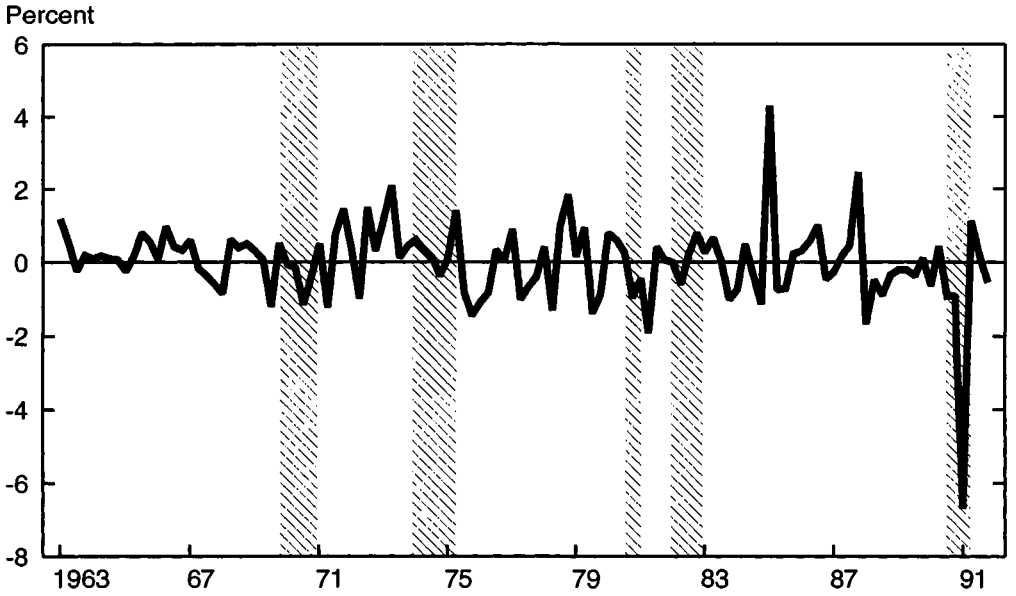
Chart 26: Commercial and Industrial Loan Growth Prediction Errors



Note: Shaded areas represent recessions.

Chart 27: Real Estate Loan Growth Prediction Errors



Note: Shaded areas represent recessions.

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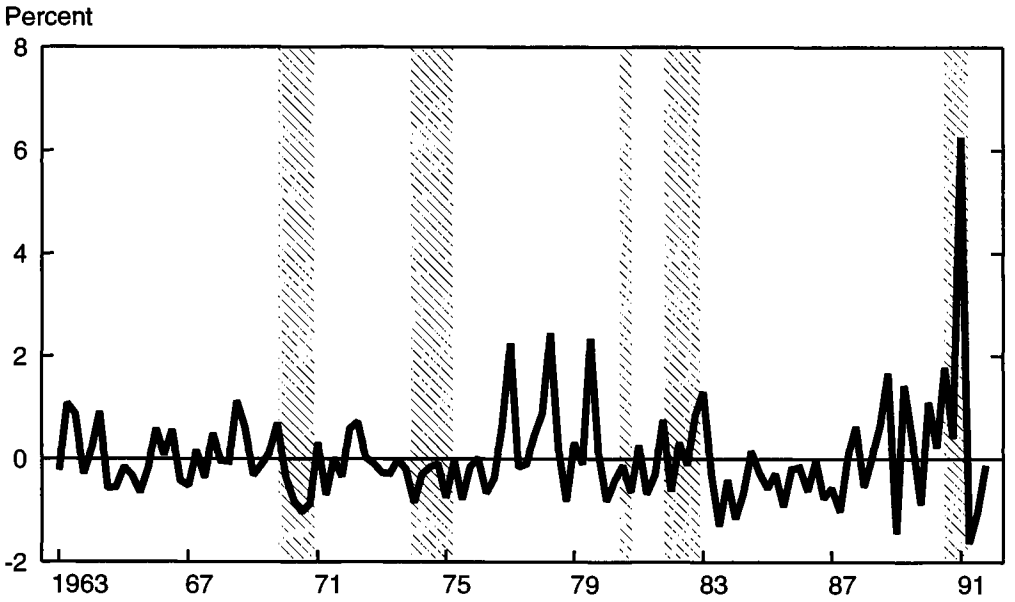
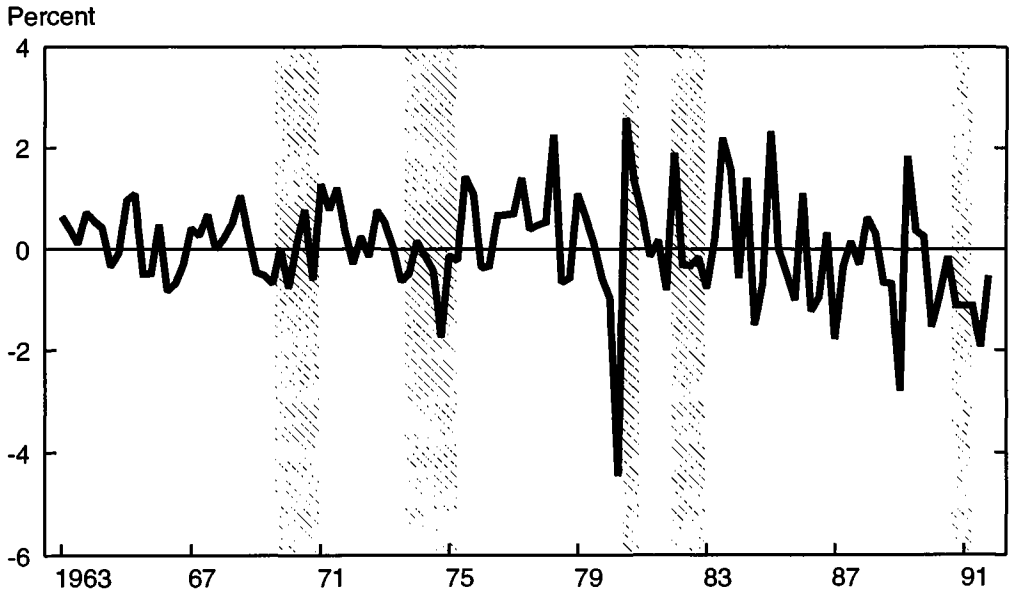
Chart 28: Residential Mortgage Loan Growth Prediction Errors



Note: Shaded areas represent recessions.

Chart 29: Consumer Loan Growth Prediction Errors



Note: Shaded areas represent recessions.

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The prediction errors for the remaining equations are more striking. As Chart 27 shows, the errors for real estate loan growth, excluding home mortgages become huge in the 1990 recession. The opposite pattern is apparent in the home mortgages equation. The actual level of home mortgages was much larger than its equation predicts, resulting in unusually large positive errors during the 1990 recession (Chart 28). This finding also adds support to the earlier observation that growth in residential mortgages during the recent recession was stronger than growth in this series during any other postwar recession. This result is also consistent with the earlier findings that this regression is different during the 1980s. The errors from the equations, which are based on past relationships among economic variables, indicate that during the 1990 recession a change in the behavior of both real estate lending and home mortgages relative to their past cyclical behavior seems to have taken place. Problems with commercial real estate have reduced banks' willingness to lend to this sector, and commercial real estate lenders have consequently needed to reduce their reliance on bank loans, leading to the large negative errors from the equation. At the same time, we see large positive errors in the home mortgage equation because of deregulation, the downsizing of the thrift industry, favorable capital treatment of these assets, and the greater liquidity afforded by the ability to securitize these assets as necessary.

The final loan component to consider is consumer loans. Chart 29 indicates that in previous downturns this loan category showed some weakness that was not predicted by our equation. But during the 1990 recession our equation consistently overpredicts this category of loans, no doubt reflecting the wide interest rate spreads between consumer loan rates and deposit rates that have been prompting consumers to use bank deposits to pay down bank debt.

We conducted one further exercise to determine more precisely whether the behavior of lending during the recent recession differed from that in previous recessions. We included in the regressions a dummy variable for each of the recessions in our sample period, as well as one for the 1966 credit crunch. Each dummy variable is equal to one during the quarters of the recession or credit crunch it is representing, and zero otherwise.[26] The coefficients and their significance for the five variables in each regression are reported in Table 9.

[26] We treated the 1980-81 and 1981-82 recessions as one long recession.

Table 9: Bank Lending During Credit Crunches[a]

Recession Period	C&I Loans		Real Estate Loans		Home Mortgage Loans		Consumer Loans	
1966-III to 1966-IV	0.01	(0.48)	-0.003	(-0.42)	0.000	(0.05)	-0.008	(-1.05)
1969-IV to 1970-IV	0.004	(0.52)	-0.004	(-.85)	-0.01	(-1.61)	-0.005	(-0.89)
1973-IV to 1975-I	0.02	(1.86)	0.003	(0.61)	-0.01	(-1.55)	-0.01	(-2.24)
1980-I to 1982-IV	0.005	(0.86)	.001	(0.24)	-0.01	(-1.54)	-0.01	(-1.60)
1990-III to 1991-I	-0.01	(-.85)	-0.03	(-4.46)	0.04	(6.19)	-0.01	(-1.53)

a. Coefficients and t-statistics (in parentheses) for dummy variables by loan category for each recession period.

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The table confirms that the weakness of lending in this recession relative to previous recessions is unusual. The dummy variable representing the 1990-91 recession is highly significant in the two real estate equations and significant at the 13 percent level in the consumer loan equation. The positive coefficient in the home mortgage equation and the negative coefficients in the real estate and consumer loan equations are consistent with the respective under- and overprediction that we noted in the residual charts.

Interestingly, in the C&I loan equation the dummy variable for the 1973-75 recession is positive and significant. This finding suggests that in this earlier episode, the banking system may have been a greater source of strength to firms having problems funding themselves in the money market than it was in this most recent period. Home mortgages were somewhat weaker than predicted over the first three recessionary periods, as evidenced by the 10 to 15 percent significance level of the three dummy variables. This finding probably reflects the effects of Regulation Q and state usury ceilings. Finally, the 1966 credit crunch period does not appear to have had an unusual effect on any of the loan categories.

Overall then, with the possible exception of the C&I loan equation, all of the equations indicate that the behavior of loans has been unusual during the recent recession. Residential mortgages have been much stronger than their previous behavior would have suggested, while consumer loans and real estate loans have been considerably weaker. Conclusions about C&I loans are difficult to draw because of the instability we found at various break points.

Cross-sectional Regressions

Having established that the behavior of depository lending during the 1990 recession differed from its behavior in previous recessions, we next consider the role that bank capital could have played in this change. In an earlier article examining the 1990 credit crunch, Bernanke and Lown found that banks' capital-to-asset ratios had a positive and significant link with bank lending during the quarters of the 1990-91 recession.[27] They found that this link held in cross-sectional regressions across states and across banks in the state of New Jersey. However, they also observed that the coefficients in these regressions were not large enough to justify attributing all of the slowdown in bank lending to weakness in bank capital. This evidence, along with other findings, led the authors to conclude that weakness in the demand for bank loans clearly played a role in the lending downturn.

Peek and Rosengren also examined the link between lending and bank capital but only for New England banks.[28] They, too, found that over the period 1990-I to 1991-I a capital crunch occurred in New England. They were unwilling to conclude definitively, however, that the capital crunch affected credit availability since they did not take loan sales into account in their analysis (perhaps loans were still made and then sold).

In this section, we extend the results of these earlier articles by examining the link between bank capital and loan growth, not only during the year or quarters of the recession, but also prior to it as well. This approach allows us to consider whether bank capital has always been a determinant of lending or only became a determinant during the

[27] Ben Bernanke and Cara Lown, "The Credit Crunch," Brookings Papers on Economic Activity, 1992-II, pp. 205-39.

[28] Joe Peek and Eric Rosengren, "The Capital Crunch in New England," Federal Reserve Bank of Boston New England Economic Review, May/June 1992, pp. 21-31; and "The Capital Crunch: Neither a Borrower Nor a Lender Be," Federal Reserve Bank of Boston, Working Paper no. 91-4.

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credit crunch period. This latter finding would be consistent with the idea put forth by Bernanke and Gertler, and later explored in Samolyk, that there is an asymmetric relationship between credit health and bank lending, with the link being stronger in bad times or in weak regions.[29] This finding would also be consistent with the notion that during the 1990-91 period, banks were cutting back on loans in order to meet capital standards.

Table 10 contains the regression results. For each year from 1988 to 1991, we estimated cross-sectional (by state) regressions linking loan growth to capital (as a percent of assets), employment growth, and loan loss reserves (as a percent of loans). The capital and loan loss variables are intended to proxy for differences in the condition of the banking system across states, while employment growth serves as a proxy for general economic conditions.[30] For each year, we show a regression with capital by itself, another regression with capital and employment, and finally a regression with capital, employment, and loan losses.

For 1988, only employment and loan losses appear significant in determining loan growth. The capital position of banks does not appear to be a significant factor. The same is true for 1989. In 1990 and 1991, in contrast, capital is significant when it is included in the regressions by itself and when employment is also included. The significance of capital weakens, however, when loan losses are included, a result that suggests some interaction or multicollinearity between the two variables. This outcome probably stems from the fact that the capital ratio is a book-value measure, while the loan-loss ratio likely reflects more accurately the current market value of the banking system's portfolio in each state. Hence, once the loan loss measure is included in the regression, the capital measure provides little additional information.

In general, the regressions provide some evidence of a "capital crunch" (banks being unable to lend because of weak capital positions) in 1990 and 1991 but not in the earlier two years. In all four years, there is evidence that banks cut back on lending when they experience greater loan losses. Differences in the state economies (as proxied by employment growth) tend to be an important determinant of bank lending, as would be expected.[31]

Finally, to obtain some additional information about the sources of the credit crunch across regions, we constructed Table 11, which shows (1) the regression errors by region, and (2) the contribution made to the predicted values by each of the independent variables for 1990 (capital, employment, and losses). These results suggest that the "credit crunch" was greatest for the New England region; indeed, it was even worse than predicted (the decline in loans exceeded the substantial drop predicted by that regression equation). The New England region, followed by the Mid-Atlantic region and the West South Central region, appears to have the weakest capital position to support lending.

[29] Ben Bernanke and Mark Gertler, "Agency Costs, Net Worth and Business Fluctuations," American Economic Review vol. 79 (March 1989), pp. 14-31; and Katherine Samolyk, "A Regional Perspective on the Credit View," *Federal Reserve Bank of Cleveland Economic Review*, 1991-II, pp. 7-38.

[30] Loan loss reserves were intended to capture differences across states in the perceived riskiness of loan portfolios, whereas the capital variable should capture differences in the ability to lend. Ideally, the capital variable should be the difference from a desired value, but since the desired value is not known, some of the effect will be captured in the constant term.

[31] Using bank level data, Frederick Furlong also found that the sensitivity of bank lending to the capital position of banks increased in 1990 and 1991. See Furlong, "Capital Regulation and Bank Lending," *Federal Reserve Bank of San Francisco Economic Review*, no. 3, 1992.

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These regions contributed substantially to reduced lending from loan losses, while lending in New England and the Mid-Atlantic regions also posted declines stemming from weakness in economic activity as proxied by employment.

How much of the slowdown in bank lending from 1989 to 1990 was due to problems in the banking industry? To answer this question, we applied the 1989-90 cross-sectional regression coefficients from equation 3 in Table 10 to the changes in the explanatory variables by region between 1988-89 and 1989-90. In other words, we assumed that the

Table 10: Cross-Sectional Regressions[a]

IV to IV	Capital	Employment	Loan Losses	R^2
1987-88				
(1)	-0.06 (1.09) [1.55]			-0.02
(2)	-0.47 (1.00) [1.39]	2.86 (0.88)*** [1.28]**		0.15
(3)	-0.20 (0.84) [0.98]	2.37 (0.74)*** [1.39]*	-3.54 (0.76)*** [0.87]***	0.40
1988-89				
(1)	0.30 (1.25) [1.44]			-0.02
(2)	-0.004 (1.22) [1.54]	1.16 (0.59)** [0.80]		0.04
(3)	-0.25 (0.90) [1.82]	2.2 (0.47)*** [0.71]***	-7.05 (1.09)*** [1.38]***	0.48
1989-90				
(1)	2.78 (0.95)*** [1.07]***			0.13
(2)	1.95 (0.95)** [1.10]*	1.23 (0.45)*** [0.55]**		0.23
(3)	1.41 (1.03) [1.09]	1.21 (0.45)*** [0.53]***	-1.31 (1.04) [1.92]	0.24
(3')[b]	0.78 (0.74) [0.88]	1.38 (0.33)*** [0.25]***	-3.40 (0.89)*** [1.34]***	0.53
1990-91				
(1)	2.69 (0.73)*** [1.09]**			0.20
(2)	1.72 (0.89)* [1.32]	1.06 (0.57)* [0.73]		0.24
(3)	0.81 (0.74) [0.79]	0.35 (0.49) [0.69]	-3.63 (0.71)*** [0.99]**	0.50

a. Dependent variable is the fourth quarter to fourth quarter growth rate of total loans aggregated to the state level, including the District of Columbia. Capital is equity capital as a percent of total assets at the beginning of the period. Employment is the fourth quarter to fourth quarter growth rate of employment. Loan losses are loan loss reserves as a percent of loans at the beginning of the period. Standard errors are reported in parentheses. Conventional OLS standard errors are in parentheses. Standard errors based on White's correction for heteroskedasticity are in brackets.

b. This regression excludes data from two states that exert an unusually large influence on the coefficients in (3).

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

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Table 11: Decomposition of Loan Growth by Region[a]
1989-IV to 1990-IV, in Percent

Region	Loan Growth			Contribution to Loan Growth			
	Actual	Predicted	Error	Capital	Employ-ment	Losses	Constant
New England	-14.8	-9.0	-5.8	7.2	-5.4	-4.1	-6.7
Mid-Atlantic	0.4	-4.6	5.0	7.7	-1.8	-3.8	-6.7
East North Central	5.1	2.6	2.5	9.6	0.8	-1.0	-6.7
West North Central	4.1	4.4	-0.3	10.7	2.0	-1.5	-6.7
South Atlantic	3.2	2.5	0.7	9.9	0.5	0.5	-6.7
East South Central	4.4	4.2	0.0	10.8	1.3	-1.2	-6.7
West South Central	-2.1	2.0	-4.1	7.8	4.1	-3.2	-6.7
Mountain	1.1	2.4	-1.3	9.1	3.2	-3.2	-6.7
Pacific	12.3	1.6	10.7	8.7	0.7	-1.1	-6.7

a. In aggregating from the state to the regional levels, each state was weighted by its regional share of lending.

Table 12: Regional Slowdown in Lending
1989-90 Relative to 1988-89[a]

	New England	Mid-Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Moun-tain	Pacific
(1) Slowdown in lending	-16.8	-6.9	-1.7	1.5[b]	-8.9	-3.0	3.1[b]	-3.9	-2.4
(2) Due to capital	-1.3	-0.2	0.0	0.5	-0.3	0.1	1.0	0.1	0.8
(3) Due to losses	-3.5	-2.6	-0.2	0.0	-0.2	-0.2	-0.1	-1.3	0.1
(4) Banking (2)+(3)	-4.8	-2.8	-0.2	0.5	-0.5	-0.1	0.9	-1.2	0.9
(5) Percent banking	28.6	40.1	11.8	0.33	5.6	3.3	29.0	30.8	-37.5
(6) Due to employment	-3.2	-2.1	-1.6	-1.2	-1.9	-2.2	1.4	-1.8	-3.6
(7) Percent employment	19.0	30.4	94.1	-80.0	21.3	73.3	45.2	46.2	150.0

a. Slowdown in lending indicates the change in the growth rate of lending from 1988-89 to 1989-90. Values in rows 2 and 3, "Due to capital" and "Due to losses," are calculated from the change in the level of the capital-to-asset ratio and the loan loss-to-loan ratio, respectively, from the end of 1988 to the end of 1989. Values in Row 6, "Due to employment," are calculated from the change in employment calculated in the same way as the lending growth change. The contribution of each variable is obtained by applying the coefficients from the 1989-90 regression (3).

b. Lending did not slow down in these regions; therefore the statistics do not have the same interpretations as for the other regions.

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coefficients on the independent variables estimated across regions could be used in a rough way to explain the lending slowdown over time in each region.[32]

The results are shown in Table 12. The New England and Mid-Atlantic regions experienced slowdowns in bank lending that appear to be due to problems in the banking industry, as did several of the other regions. This outcome naturally invites us to ask how much of the slowdown in bank lending nationally might have come from problems in the banking industry. To arrive at a very rough estimate, we weighted the regional impacts (row 5 in Table 12) by the share of national lending done in each region (Table 4, bottom row). These calculations suggest that about 15 percent (0.7 percentage points) of the slowdown in lending growth nationally from 1989 to 1990 (4.8 percentage points) can be explained by supply-side problems in the banking industry, with the remainder coming from changes in economic conditions and other factors. (Employment explained just over half, 2.5 percentage points, of the slowdown at the national level.) However, using alternative coefficient estimates, (3' in Table 10) which ignore two states that appear to be extreme outlyers (Arizona and Nevada), we find that supply-side problems in banking explain roughly 38 percent of the lending slowdown (1.8 percentage points). Hence, these results suggest that something on the order of 15 to 40 percent (0.7 to 1.8 percentage points) of the slowdown in bank lending (4.8 percentage points) came from banking problems.

Conclusions

In this paper, we have reviewed the role of the banking system in the credit slowdown. We have attempted to show how heavy debt burdens, deregulation and innovation, the savings and loan crisis, and a series of shocks to the banking system during the 1980s set the stage for a sharp slowdown in bank lending late in the decade. With the exception of home mortgage lending, all categories of bank lending were affected in that lending was weaker than past cyclical experience would have suggested. Moreover, survey results, interest rate spreads, and performance indicators for banks are all consistent with the notion that supply-side considerations contributed to the slowdown in bank lending. Regional data are also consistent with this conclusion: lending tended to slow most dramatically in New England and the mid-Atlantic states, the regions where the banking industry was experiencing the greatest difficulty. Econometric work in the paper's final section confirms this conclusion.

However, measuring the impact of supply-side considerations is difficult because several supply- and demand-side considerations appear to have come into play at the same time, and financial innovations and offshore foreign bank lending have also affected the interpretation of the bank lending statistics. Nonetheless, a very rough estimate (based on our cross-sectional regressions) would suggest that supply-side factors in the banking industry account for about 15 to 40 percent of the slowdown in bank lending from 1989 to 1990.

[32] As Bernanke and Lown point out, ideally one would like a time series model of the effect of the various bank balance sheet variables on bank lending.

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The Link Between the 1980s Credit Boom and the Recent Bank Credit Slowdown

by Ronald Johnson and Chun K. Lee[1]

The purpose of this paper is to examine the relationship between the riskiness of a bank's lending and funding strategies during the credit boom and its lending behavior during the recent credit slowdown. We must make clear at the outset that we are not testing whether the most risky banks set off the bank credit slowdown. In fact, it appears that the least risky (high-capital) banks began to slow their lending growth a few quarters before the most risky (low-capital) banks began to slow their lending growth (Chart 1).[2] Our intention in this paper is only to test whether there is a link between risky bank behavior in the credit boom of the 1980s and loan downsizing in the early 1990s.

Previous research and anecdotal evidence on the recent bank credit slowdown suggest that the banks that cut back most on lending during the recent bank credit slowdown had the following characteristics: 1) low capital ratios and high exposure to troubled real estate loans at the beginning of the period; 2) large loan losses during the period; and 3) high concentration in the Northeast both in terms of the number of banks and the amount of banking assets.[3] The analysis in this paper differs from previous studies in that it looks beyond these results—to perhaps more fundamental factors—by asking

[1] We thank Akbar Akhtar, Robert McCauley, Lawrence Radecki, Richard Cantor, and Anthony Rodrigues for helpful comments.

[2] Also, several authors have found evidence of a slowdown in lending from nonbank financial institutions. See Patrick Corcoran, "The Credit Slowdown of 1989-1991: The Role of Supply and Demand," Credit Markets in Transition, Federal Reserve Bank of Chicago, 1992, pp. 445-62; Mark Carey, Stephen Prowse, John Rea, and Gregory Udell, "The Private Placement Market: Intermediation, Life Insurance Companies and a Credit Crunch," Credit Markets in Transition, pp. 843-77; Leland Crabbe and Mitchell Post, "The Effect of SEC Amendments to Rule 2a-7 on the Commercial Paper Market," Board of Governors of the Federal Reserve System, 1992; and Richard Cantor and Anthony Rodrigues, "Nonbank Lenders and the Credit Slowdown," in this volume.

[3] See Ronald Johnson, "The Bank Credit 'Crumble'," *Federal Reserve Bank of New York Quarterly Review*, Summer 1991, pp. 40-51; Cara Lown and Ben Bernanke, "The Credit Crunch," Brookings Papers on Economic Activity, 1992:2, pp. 205-39; Joe Peek and Eric Rosengren, "The Capital Crunch in New England," Federal Reserve Bank of Boston New England Economic Review, May-June 1992, pp. 21-31; Herbert Baer and John McElravey, "Capital Adequacy and the Growth of U.S. Banks," Federal Reserve Bank of Chicago, Working Paper Series, no. WP-92-11, June 1992; and Thomas Lutton, Regional Analysis of Bank Lending, CBO Staff Memorandum, Congressional Budget Office, February 1993. Also, for a useful discussion of much of the recent literature on this subject see Allen Berger and Gregory Udell, "Did Risk-

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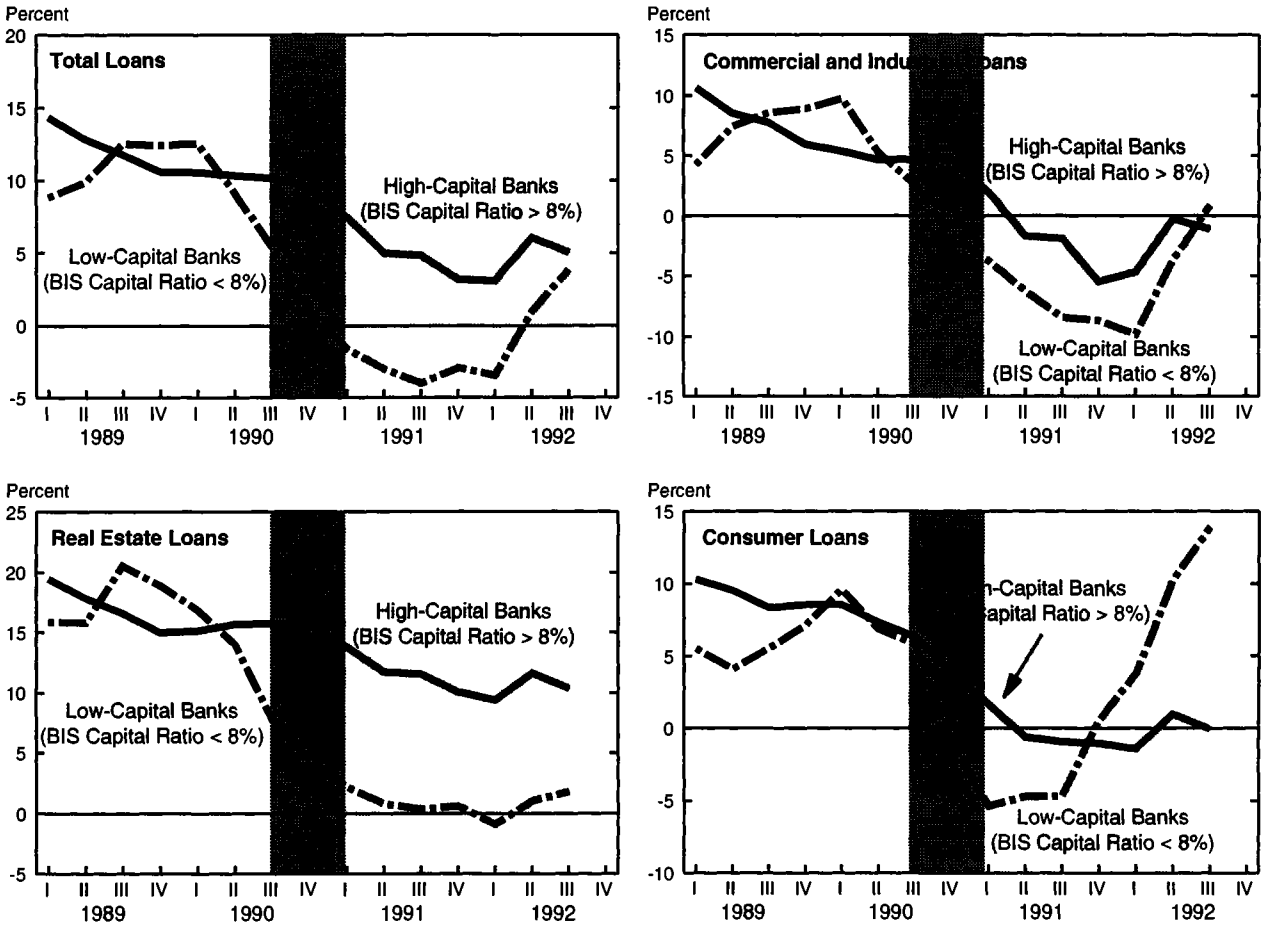
Chart 1: Loans at U.S. Banks



Source: Federal Financial Institutions Examination Council, Reports of Condition.
Note: Total loans are a subset of overall bank credit and include commercial and Industrial (C&I), real estate and consumer loans to U.S. addressees. Bank capital position is measured as of fourth-quarter 1989. Bank capital adequacy is measured relative to the December 31, 1992, total capital requirement of 8 percent. The three stages of bank credit slowdown are highlighted. The unshaded area is in the credit crunch, the dark shaded area is in the recession and the light shaded area is in the recovery.

whether banks that exhibited more risky behavior during the credit boom were the ones that cut back the most during the loan downsizing period.[4] In particular, were they: 1) experiencing weaker asset quality; 2) growing loans more quickly than others, particularly commercial real estate loans; and 3) relying more on volatile liabilities.

Footnote 3 continued
based Capital Allocate Bank Credit and Cause a 'Credit Crunch' In the United States?" Board of Governors of the Federal Reserve System, September 1993.

[4] In past bank credit slowdowns or "credit crunches" the underlying cause was more apparent. This is because past bank credit slowdowns were the direct result of the process of disintermediation — a reduction in savings deposits at banks that forced banks to reduce their lending. Disintermediation occurred when market rates on Treasury bills and commercial paper rose above Regulation Q interest rate ceilings on savings deposits at banks and thrifts. It is generally agreed that the process of disintermediation was not a factor in the recent bank credit slowdown, however. For a detailed analysis of previous credit crunches, see Albert Wojnilower, "The Central Role of Credit Crunches in Recent Financial History," Brookings Papers on Economic Activity, 1980: 2, pp. 277-326.

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This study shows that there is a link between 1980s balance sheet risks and loan downsizing in the early 1990s. We also find that the 1980s balance sheets of highly leveraged banks were more risky than the 1980s balance sheets for low leverage banks. These differences provide a partial explanation for the difference in these groups' lending growth during the early 1990s.

Sample Characteristics and the Data

The Sample

Our analysis is based on a constant sample of U.S. chartered banks that reported data to the Federal Financial Institutions Examination Council (FFIEC) for the period first-quarter 1985 through third-quarter 1992.[5] The sample consists of 9,248 banks with total assets of $2 trillion (46 percent of total banking industry assets) as of the third-quarter 1992.

The sample, although a subsample of the U.S. banking system, provides a clear picture of the lending behavior of banks that were not involved in merger and acquisition (M&A) transactions. Banks involved in M&A transactions were excluded from the sample mainly because there is no straight forward way to separately analyze the leverage strategy and lending growth of the acquiring and target banks over the sample period, first-quarter 1986 through third-quarter 1992.[6]

We excluded 692 banks from the sample because they purchased other banks through M&A transactions over the period first-quarter 1989 to third-quarter 1992.[7] As of the third quarter of 1992, this group of bank purchasers held 27 percent ($ 1.2 trillion) of total banking industry assets. Also, target banks were excluded from the sample because they did not report data for the entire period. In addition, banks that were formed and later closed by the Federal Deposit Insurance Corporation (FDIC), as part of a receivership arrangement to liquidate assets and to pay off deposits, were excluded from the sample.

Sample Period

As mentioned in the introduction, this study examines whether there is a link between bank balance sheet risks in the credit boom and bank lending behavior during the recent bank credit slowdown. To facilitate the analysis we divide the sample period, first-quarter 1986 to third-quarter 1992, into two nonexhaustive segments.

The first segment, which we call the credit boom, runs from the first quarter of 1986 to the fourth quarter of 1988. By most accounts, this period was characterized by a sharp

[5] As of the third quarter of 1992, total banking industry assets were $4.4 trillion. Of this total, U. S. chartered banks held $3.7 trillion and branches and agencies of foreign banks held $701 billion.

[6] An important factor motivating M&A activity is bank management's desire to reduce excess capacity and to achieve efficiencies in banking operations. See Larry Radecki, "The Proximate Causes for the Emergence of Excess Capacity in the U.S. Banking System," Federal Reserve Bank of New York, Draft, July 1992, pp. 5-6 and pp. 41-42.

[7] Large mergers during the sample period include: Bank of America/Security Pacific ($73 billion in assets); Chemical/Manufacturers ($66 billion in assets); Nationsbank (NCNB)/C&S Sovran ($50 billion in assets); Fleet/Bank of New England ($23 billion in assets); First Union/Southeast ($15 billion in assets); Comerica/Manufacturers National ($14 billion in assets); Bank One/Valley National ($11 billion in assets); Society/Ameritrust ($11 billion in assets); Wachovia/South Carolina National ($7 billion in assets); Norwest/United Banks of Colorado ($6 billion in assets); ABN Amro/European American ($5 billion in assets).

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increase in leveraging throughout the economy coupled with a relaxation of lending standards, especially by banks and thrifts.[8] Also, this period is of interest because it starts in 1986 when Regulation Q interest rate ceilings on savings accounts at banks and thrifts were abolished and ends in 1988 just prior to the introduction of risk based capital requirements for banks and the passage of the Financial Institutions, Reform, Recovery, and Enforcement Act (FIRREA).[9]

The second segment, which we call the loan downsizing or adjustment period, runs from the third quarter of 1990 to the third quarter of 1992. This is the period where the recession-induced effects on credit demand and creditworthiness combine with the slowdown in bank credit extensions which began in 1989. A cursory examination of the aggregate data on bank lending growth suggests that the loan downsizing period can be divided into two parts (Chart 2). In the first phase, loan growth rates decline sharply and in some cases become negative. In the second phase, loan growth rates begin to recover as most banks are successful in raising their capital ratios to desired levels and as the demand for consumer credit starts to show signs of recovery.[10]

The Data

To measure bank risk-taking activity we employ seven different data series. These data series were chosen in large measure because they are reasonable indicators of bank lending and funding behavior and because they are available for all the banks in the sample for the entire sample period.[11] These data series cover four facets of bank lending and funding behavior over the entire sample period. They are: 1) lending growth (the growth of total, C&I and commercial real estate loans); 2) problem loans (the ratio of problem loans to total loans); 3) volatile deposits (uninsured time deposits and brokered deposits); and 4) bank asset size.

C&I loans are loans to businesses operating in the United States. Commercial real estate loans consists of loans secured by construction, land development, farmland, multifamily residential properties and nonfarm nonresidential properties. Total loans are the sum of the three major loan categories (C&I, total real estate (commercial and residential) and consumer).[12]

Problem loans are measured as the ratio of troubled loans to total bank credit. Troubled loans consist of loans past due more than 90 days, loans that are nonaccruing, fore-

[8] The origins, magnitude and implications of the massive buildup in corporate and household debt and credit risk over the 1980s are carefully chronicled by Edward Frydl, "Overhangs and Hangovers: Coping with the Imbalances of the 1980s," *Federal Reserve Bank of New York Annual Report*, 1991. Also for a detailed discussion of the building and mortgage credit boom of the 1980s and its aftermath see James Fergus and John Goodman, Jr., "The 1989-92 Credit Crunch for Real Estate," Federal Reserve System, Board of Governors, Staff Study no. 164, July 1993.

[9] FIRREA, among other things, mandated tighter limits on the amount that thrifts could lend to one borrower and imposed new capital requirements on thrifts.

[10] The improvement in the capital ratios of U.S. bank holding companies is chronicled by Cantor and Johnson. That study also analyzes the stock market response to the various methods of improving bank capital ratios. See Richard Cantor and Ronald Johnson, "Bank Capital Ratios, Asset Growth, and the Stock Market," Federal Reserve Bank of New York *Quarterly Review*, Autumn 1992, pp. 10-24.

[11] Our analysis may be biased somewhat in that these variables do not capture the off-balance sheet activities of large banks.

[12] Consumer loans consist of credit cards and related plans, installment loans, single payment loans and all student loans.

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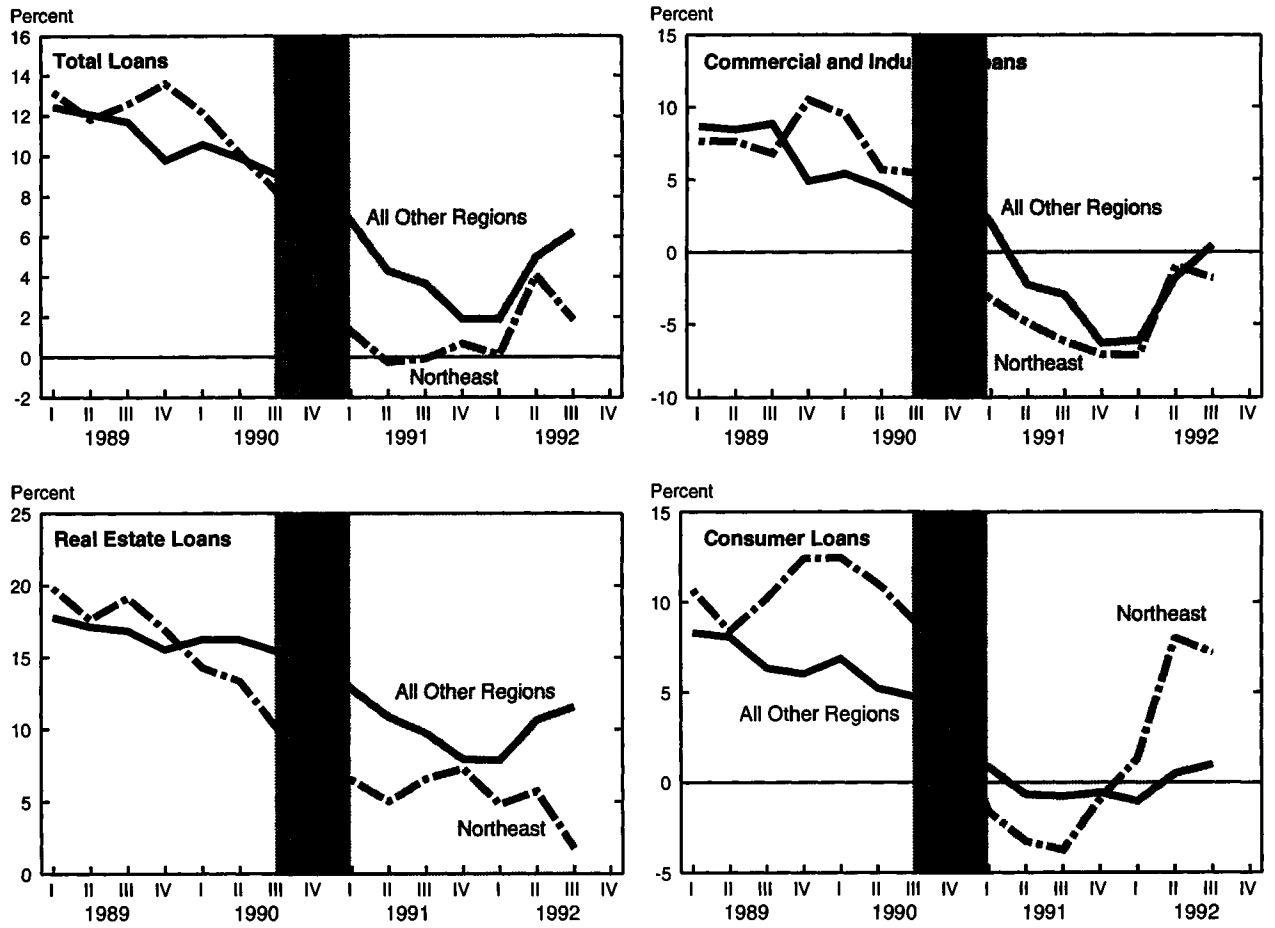
Chart 2: Loans at U.S. Banks



Source: Federal Financial Institutions Examination Council, Reports of Condition.
Note: The three stages of bank credit slowdown are highlighted. The unshaded area is in the credit crunch, the dark shaded area is in the recession and the light shaded area is in the recovery. Total loans are a subset of overall bank credit and include commercial and industrial (C&I), real estate and consumer loans to U.S. addressees.

closed properties and restructured loans. Volatile deposits are defined as time deposits of $100 thousand or more and brokered deposits. Bank size is measured in terms of total balance sheet assets.

Bank balance sheet and income statement data (loans, large deposits, bank capital, and net income) are taken from the "Call Reports" which are filed with the FFIEC and collected by the Federal Reserve System. In addition, this study draws on several other data sources. Bank M&A transactions are taken from the Federal Reserve System's National Information Center (NIC) database on bank structure. State level personal income and employment, which are used to measure regional economic activity, are from the Bureau of Economic Analysis of the U.S. Department of Commerce.

Some Basic Relationships

This section of the paper focuses on the basic relationship between bank leverage and balance sheet riskiness in the mid to late 1980s and loan growth during the loan downsizing period. The first part of this section sorts banks into two groups—highly leveraged and low leverage—based on the size of a bank's capital ratio at the end of 1988 and

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discusses the characteristics of these two bank groups. The second part of this section presents evidence that highly leveraged banks were the ones that cut back the most on their lending during the 1990 loan downsizing period. This finding is consistent with the results found in other studies on the recent bank credit slowdown. The third part of this section presents evidence that suggests bank leverage and balance sheet riskiness were linked during the credit boom—highly leveraged banks had more risky balance sheets than low leverage banks.

Banks Grouped by End-1988 Leverage Ratios

As mentioned above, we divide our bank sample into two groups based on the size of a bank's capital ratio relative to the average capital ratio for all banks at the end of 1988.[13] Banks with above average capital ratios at the end of 1988 are classified as low leverage banks, while banks with below average capital ratios at the end of 1988 are classified as highly leveraged banks.

The distinction between these two groups is quite straightforward. Low leverage banks are those banks that were able to expand their assets during the credit boom while at the same time they were able to maintain or to achieve a higher than average capital ratio. Highly leveraged banks, on the other hand, are those banks that, for whatever reason, did not prevent their capital ratios from lagging behind the all-bank average.

The average capital ratio for low leverage banks (banks that had above average capital ratios) as of the end of 1988 was almost 9 percent (Table 1). The average capital ratio for highly leveraged banks (banks that had below average capital ratios) at the end of 1988 was 5.5 percent. The average capital ratio for all banks at the end of 1988 was 6.7 percent.

To determine whether the leverage characteristics of the two bank groups differed over the sample period we employ the analysis of variance (ANOVA) procedure. The

[13] The average capital ratio for all banks in our sample is determined as the ratio of total bank capital to total bank assets.

Table 1: Average Bank Capital Ratios

	All Banks	Highly Leveraged Banks	Low Leverage Banks
1985	6.7	5.6	8.6
1986	6.7	5.6	8.6
1987	6.5	5.3	8.7
1988	6.7	5.5	8.8
1989	6.5	5.2	8.8
1990	6.7	5.5	8.7
1991	6.9	5.8	8.7
1992	7.4	6.3	9.1

Source: Federal Financial Institutions Examination Council, Reports of Condition.
Note: Data are for the fourth quarter of each year, except for 1992 when the data are for the third quarter. The average capital ratio is defined as the ratio of total bank capital to total bank assets.

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ANOVA procedure is a statistical technique designed to determine whether or not a particular classification of the data is meaningful. This procedure consists of two steps.

In the first step, we test whether the variances of the capital ratios for the two bank samples were equal over the same period. This null hypothesis was rejected at the 99 percent level of confidence. The F-statistic was 2.9 with 229,647 and 57,039 degrees of freedom for low leverage and highly leveraged banks, respectively.

In the second step, we test whether the means of the capital ratios for the two bank groups are equal given that the variances of the two groups are not equal. This null hypothesis was also rejected at the 99 percent level of confidence. The t-statistic was 310.

Highly leveraged banks account for a significant share of banking assets (Table 2). As of the third quarter of 1992, the highly leveraged bank group held 62 percent ($1.3 trillion) of the assets of the banks in our sample. The bulk of these assets ($1 trillion or 51 percent of the assets in our sample as of the third-quarter of 1992) were held by just 7 percent of the more than 1,800 highly leveraged banks.

Bank Leverage and Loan Downsizing in the Early 1990s

The evidence is clear that there is a relationship between bank leverage at the end of the credit boom and loan downsizing in the early 1990s (Chart 3). We find that highly leveraged banks were the most aggressive in loan downsizing during the bank credit slowdown. We also find that the growth in lending from highly leveraged banks exceeded the growth in lending from low leverage banks during the credit boom.

It is difficult, however, to isolate the separate effects on lending growth of bank leverage from the demand-side shocks (the regional economic "luck of the draw") in the market for bank credit and changes in capital adequacy requirements. This is because the probability that a bank will engage in loan downsizing depends to some extent on all three factors. During the loan downsizing period all three of these factors were interrelated as highly leveraged banks bulked quite large in the regions that suffered the most from the economic slowdown—the Northeast and the West—and among the banks with

Table 2: Basic Characteristics of the Commercial Bank Sample
As of 1992-III

Bank Classification	Number of Banks (Figures in parentheses represent the percent of the total number of banks)	Assets in Billions of Dollars (Figures in parentheses represent the percent of the total number of banks)
Total	9,248 (100)	2,026 (100)
Highly leveraged banks	1,840 (19)	1,260 (62)
Banks with assets above $1 billion	134 (1)	1,041 (51)
Banks with assets below $1 billion	1,706 (18)	218 (11)
Low leverage banks	7,408 (81)	766 (38)
Banks with assets above $1 billion	59 (1)	191 (9)
Banks with assets below $1 billion	7,349 (80)	575 (29)

Source: Federal Financial Institutions Examination Council, Reports of Condition.

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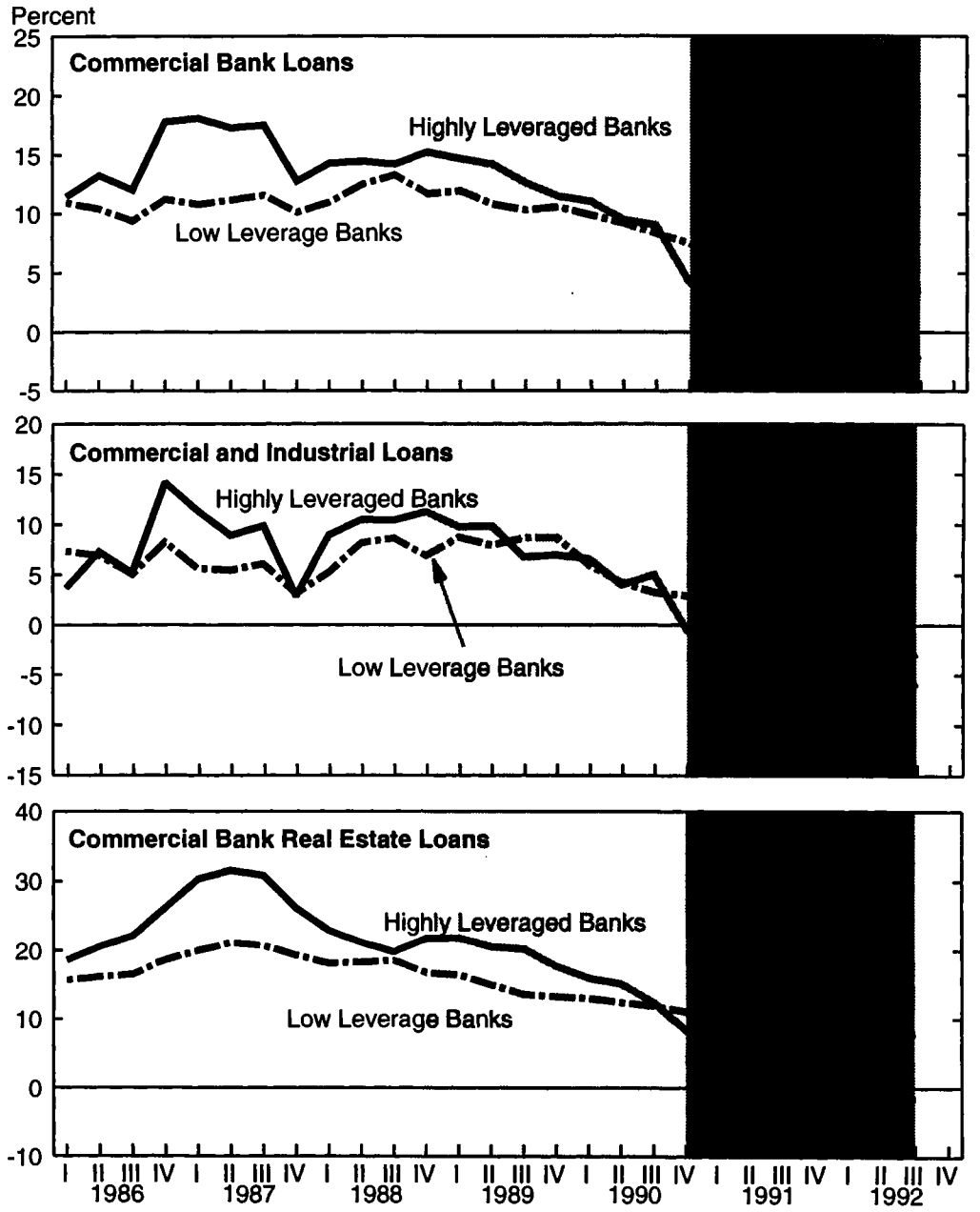
Chart 3: Growth in Loans
Fourth Quarter Growth Rate



Source: Federal Financial Institutions Examination Council, Reports of Condition.
Notes: Commercial bank loans are a subset of total commercial bank credit and include C&I, real estate and consumer loans to U.S. addressees.
The banks are sorted based on the size of their capital ratio relative to the average capital ratio for all banks as of the fourth quarter of 1988. Low leverage banks have capital ratios that exceed the all-bank average and highly leveraged banks have capital ratios that were below the all-bank average.

inadequate regulatory capital ratios.

Although the effects of the regional luck of the draw and capital adequacy can not be easily separated from the effects of bank leverage, we can, at least, get an idea of the

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Table 3: A Comparison of the Growth in Total Loans from Highly Leveraged and Low Leverage Banks by Region and Capital Adequacy
1990-III to 1992-II

Bank Group	Highly Leveraged Banks (Percent)	Low Leverage Banks (Percent)
All banks	-4.7	6.2
Regional groups		
Northeast	-9.4	-1.7
Other	0.3	8.2
Risk-based capital groups		
Undercapitalized	-9.8	-32.4
Adequately capitalized	-0.1	6.8
Regulatory leverage groups		
Undercapitalized	-15.8	-4.6
Adequately capitalized	-3.3	6.3

Source: Federal Financial Institutions Examination Council, Reports of Condition.
Note: Risk-based capital groups are divided in the following ways: 1) undercapitalized if sum of tier 1 and tier 2 risk-based capital ratio is less than 8 percent; 2) adequately capitalized if greater or equal to 8 percent. Regulatory leverage groups are divided in the following ways: 1) undercapitalized if leverage ratio is less than 4 percent; 2) adequately capitalized if greater or equal to 4 percent.

extent to which bank leverage may have intensified the effects of demand- and supply-side shocks in the market for bank credit. To do this we first control for the region (Northeast or other) in which the bank operates and compare the loan growth from our two bank groups. As Table 3 shows, highly leveraged banks posted lower loan growth regardless of region. This finding holds true, with only one exception, when we control for capital adequacy.[14]

In summary, there is evidence of a link between bank leverage at the end of the credit boom and loan downsizing in the early 1990s. Highly leveraged banks were the most aggressive in reducing their lending during the loan downsizing period. This is the case even when we control for region and capital adequacy.

A question arises, however, as to the mechanism that connects a bank's leverage position at the end of the credit boom to loan growth during the loan downsizing period. In the literature on the recent bank credit slowdown a veritable cottage industry has developed that suggests that the connection runs mainly through the luck of the draw and capital adequacy effects.[15] Our results in this part of the paper suggest that these effects do not explain completely the apparent link between a bank's leverage at the end of the credit boom and its loan growth during the loan downsizing period.

[14] The one exception involves low leverage banks that were undercapitalized based on the 1992 risk-based capital standards. This group consisted of a relatively insignificant number of banks (twenty-three) that held about 1 percent of low leverage bank assets.

[15] For a review of the various hypotheses that have been tested in the recent literature on this subject see Allen Berger and Gregory Udell, "Did Risk-based Capital Allocate Bank Credit and Cause a 'Credit Crunch' In the United States?" Board of Governors of the Federal Reserve System, September 1993.

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Bank Leverage and Balance Sheet Risks in the Credit Boom

In this part of the paper we examine whether bank leverage and bank balance sheet risks were correlated during the credit boom. If they were correlated, then bank balance sheet riskiness during the credit boom may provide the missing link or channel between a bank's 1988 leverage position and its early 1990s loan growth. That is, a bank's loan growth in the early 1990s may reflect the credit and financial risks inherent in the mix of assets, liabilities, and off-balance sheet exposures that resulted from its operations during the credit boom.

To a large extent, the willingness and ability of banks to raise the riskiness of their balance sheets can be traced back to the deregulation, financial innovation and leveraging boom that took place during the decade of the 1980s. Regardless of the motivation for the increase, there is a question of whether bank leverage and the riskiness of bank lending and funding were linked during the credit boom. That is, did the highly leveraged banks have the most risk laden balance sheets during the credit boom.

We measure balance sheet risk in three ways: 1) loan quality; 2) credit risk; and 3) volatile deposits. These three measures are not exhaustive; for example, we do not attempt to measure interest rate or foreign exchange risk. When pieced together, however, these measures give, at least, an impressionistic sense of the overall riskiness of a bank's balance sheet.

To proxy loan quality, we use the problem loan ratio (the ratio of problem loans plus foreclosed properties and restructured loans to total commercial bank credit). We employ two credit risk indicators—the ratios of commercial real estate loans and C&I loans to total loans. Volatile deposits are measured as the ratio of large time deposits plus brokered deposits to total deposits.

The evidence based on the above risk indicators suggests that during the credit boom bank leverage and balance sheet riskiness were positively correlated. Chart 4, which presents the problem loan ratio for the two bank groups, shows that the highly leveraged banks had a much higher ratio of problem loans than did the low leverage banks. This was the case for the credit boom and for all of the bank credit slowdown, with the gap widening during the loan downsizing period.

When we examine the connection between bank leverage strategy and the commercial real estate loan ratio we also find that highly leveraged banks held a considerably larger share of their loans in the form of commercial real estate loans than did low leverage banks. The connection between bank leverage strategy and the share of C&I loans on a bank's books appears to be consistent with expectations. Highly leveraged banks held a greater concentration of loans to businesses than did low leverage banks. It is interesting, however, that the share of C&I loans in the portfolios for both bank groups have declined steadily throughout the credit boom and the bank credit slowdown.

It also appears to be the case that there is a connection between the importance of volatile time deposits as a funding source and bank leverage (Chart 5). By a wide margin, highly leveraged banks have relied more heavily on volatile deposits for funding than low leverage banks have. The gap between the volatile deposit ratios for the two bank groups, as would be expected, declined considerably during the loan downsizing period.

In summary, there appears to be a link between bank balance sheet riskiness and bank leverage—the group of banks with the most risky balance sheets were the most highly leveraged during the credit boom. This relationship also holds throughout the bank credit slowdown. This evidence suggests that our bank sample can be segmented into two groups: 1) highly leveraged banks with risky balance sheets; and 2) low leverage banks with lower risk balance sheets.

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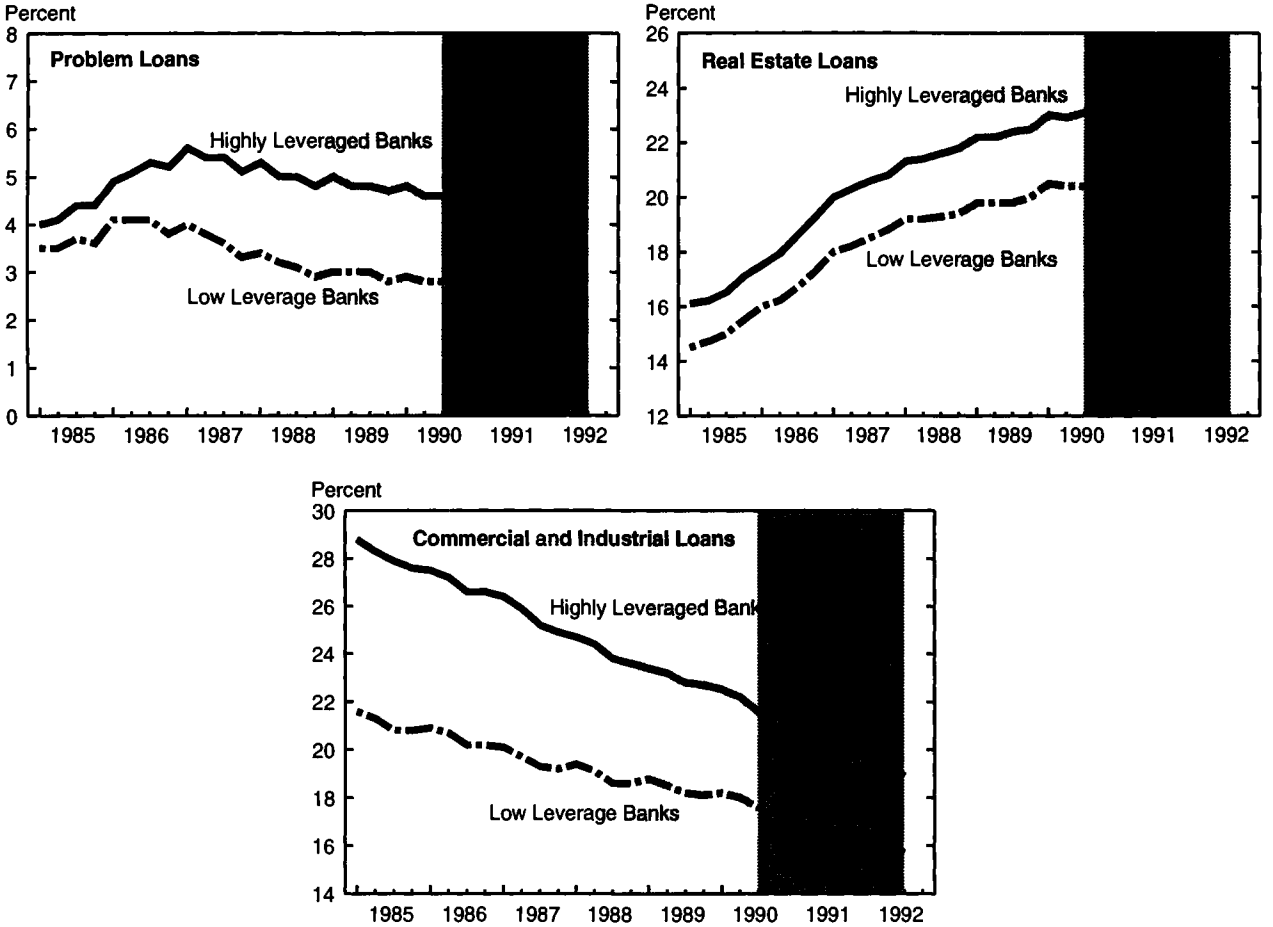
Chart 4: Ratio of Loans
Fourth Quarter Growth Rate



Source: Federal Financial Institutions Examination Council, Reports of Condition.
Note: Commercial and industrial loans is loans to U.S. addressees. The banks are sorted based on the size of their capital ratio relative to the average capital ratio for all banks as of the fourth quarter 1988. Low leverage banks have capital ratios that exceed the all-bank average and highly leveraged banks have capital ratios that were below the all-bank average.

It is quite likely that bank balance sheet riskiness during the credit boom is the missing link that connects 1988 bank leverage to loan growth in the early 1990s. This is because, by most accounts, many banks relaxed their lending standards during the 1980s and increased their holdings, both in number and dollar volume, of loans that were based mainly on anticipated growth in cash flows and asset price appreciation. Therefore, it should not come as a surprise that banks with risk-laden balance sheets found it necessary to downsize in the face of the downturn in economic activity and the collapse in commercial real estate prices and leveraged buyouts in the late 1980s and early 1990s.

Bank Balance Sheet Risks in the Credit Boom and Loan Growth in the Early 1990s

This section reports the results of our preliminary examination of the connection between risky bank balance sheets in the credit boom and loan downsizing in the early 1990s. The first part of this section discusses the basic methodology that is used in our analysis. The second part of this section provides evidence of a link between bank bal-

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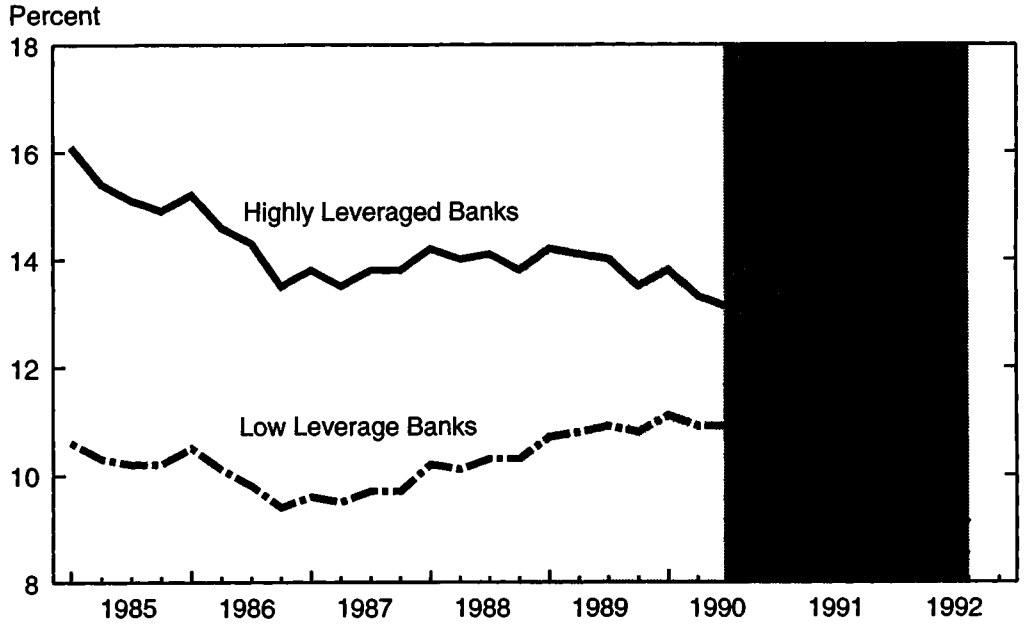
Chart 5: Ratio of Large Time Deposits to Total Deposits at Commercial Banks



Source: Federal Financial Institutions Examination Council, Reports of Condition.
Note: Large time deposits are deposits of $100,000 or more. The banks are sorted based on the size of their capital ratio relative to the average capital ratio for all banks as of the fourth quarter of 1988. Low leverage banks have capital ratios that exceed the all-bank average and highly leveraged banks have capital ratios that were below the all-bank average.

ance sheet riskiness in the mid to late 1980s and loan downsizing in the early 1990s. In addition, this part of the paper examines whether the lending behavior of the two bank groups during the early 1990s differed significantly in response to the credit boom and contemporaneous factors. The last part of this section compares the relative importance of 1980s balance sheet risks in determining loan growth during the loan downsizing period.

Basic Methodology

Our analysis is based on cross-sectional regressions of individual bank level data that are pooled into the two bank groups (highly leveraged and low leverage). The percent change in total bank loans over the loan downsizing period, third-quarter 1990 to third-quarter 1992, is the dependent variable. The change in total bank loans is regressed against four categories of independent or explanatory variables: 1) basic factors; 2) 1980s balance sheet risks; 3) 1980s loan growth; and 4) contemporaneous factors.

The basic factors are the bank's fourth-quarter 1988 capital ratio and bank size. Based on previous studies, we expect to find a positive relationship between the 1988 bank capital ratio and the growth in bank lending.[16] Bank size is measured as the loga-

[16] See, for example, Ben Bernanke and Cara Lown, "The Credit Crunch," Brookings Papers on Economic Activity, 1992:2, pp. 205-39; Joe Peek and Eric Rosengren, "The Capital Crunch: Neither a Borrower nor Lender Be," Federal Reserve Bank of Boston, Working Paper 91-4, February 1991; and Diana Hancock and James Wilcox, "Capital Crunch or Just Another Recession?" Bank Structure and Competition, Federal Reserve Bank of Chicago, 1992.

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rithm of bank assets and is included to capture differences in lending behavior between large and small banks.

The 1980s balance sheet risks are the end-1988 problem loan, real estate loan, C&I loan, and volatile deposits ratios. These variables were described earlier. We expect to find a negative relationship between these variables and the growth in bank lending in the early 1990s.

The 1980s loan growth variables are the growth in total, C&I and commercial real estate loans over the credit boom. We include the 1980s loan growth variables in our regressions to test whether the loan downsizing in the 1990s resulted because the pace at which banking assets grew in the 1980s was simply too fast. As a result, the basic hypothesis is that 1980s loan growth rates should be negatively correlated with loan growth over the loan downsizing period.

The contemporaneous factors include: 1) a regional dummy that segments the sample into Northeast and other; 2) a capital adequacy dummy that sorts the sample into adequately capitalized—at least 4 percent tier 1 capital, 8 percent total risk-based capital and 4 percent leverage ratios—and inadequately capitalized groups as of the third quarter of 1990; and 3) a dummy variable that sorts the sample based on whether the bank was profitable over the loan downsizing period. The tested hypotheses for these variables vary.

The regional dummy is set equal to one in our regression equations if the data on the dependent variable is for a bank that is in the Northeast and is set equal to zero otherwise. Consequently, the regression coefficient for the regional dummy is expected to be negative. The capital adequacy dummy is set equal to one if the bank is adequately capitalized as of the third quarter of 1990 and is set equal to zero otherwise. Consequently, the regression coefficient for this dummy variable is expected to be positive. The bank profitability dummy is set equal to one if the bank was profitable over the loan downsizing period and is set to zero otherwise. The expected sign of the regression coefficient for this dummy variable is positive.

1980s Balance Sheet Risks and Loan Downsizing in the Early 1990s

In this part of the paper, we examine the relationship between bank balance sheet risks from the 1980s and bank lending growth in the early 1990s. The analysis is performed on a step-by-step basis where we first estimate the relationship between 1990s bank loan growth and the basic factors (the first level regression). We next estimate the relationship between 1990s bank loan growth and the basic factors, as well as the 1980s balance sheet risks and loan growth rates (the second level regression). We then estimate the full regression model including the contemporaneous factors.

Table 4 presents the results from the first level regressions for the highly leveraged and the low leverage banks. For the highly leveraged banks the 1988 capital ratio variable is not significant in the first level or basic regression equation. This is a somewhat surprising result given that this variable is significant and positive for low leverage banks. For both groups the bank size variable is found to be negative and significant. This result suggests that larger banks reduced their lending by more than smaller banks during the loan downsizing period.

The results from the second level regressions for the two bank groups are shown in Table 5. We find that for the highly leveraged banks, two of the 1980s balance sheet risks—the problem loan and the real estate loan ratios—were significant and negative. For the low leverage banks the problem loan ratio was the only 1980s balance sheet risk variable that was significant.

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Table 4: First Level Regression

Explanatory Variables	Highly Leveraged Banks (Numbers in parentheses are t-statistics)	Low Leverage Banks (Numbers in parentheses are t-statistics)
Constant term	41.2 (6.8) ***	52.4 (10.9)***
1988 Capital ratio	0.8 (1.3)	0.3 (2.0) **
Bank size	-3.5 (-8.3) ***	4.1 (-9.9) ***

Note: Dependent variable is the third-quarter 1990 to third-quarter 1992 growth rate of total/C&I loans. Results corrected for heteroskedasticity.
* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

For the highly leveraged banks, two of the 1980s loan growth variables were significant while none of these variables were significant for the low leverage banks. It is a bit surprising that in the highly leveraged banks regression the significant 1990s loan growth variables are both positively related to 1990s loan growth. Despite the fact that the size of the coefficients is small and that the coefficients are only marginally significant, this result is not consistent with the relationship that was expected.

The results for the full regression models are presented in Table 6. The introduction of the contemporaneous factors has altered some of the findings from the first and second stage regressions. The most notable change is that the 1988 capital ratio is no longer significant for the low leverage banks.

As it turns out, the regional economic dummy is only significant for the low leverage banks. This is not surprising given the high concentration of highly leveraged banks in the Northeast. The capital adequacy dummy is only significant for the highly leveraged banks. This is also not surprising given the concentration of banks with inadequate regulatory capital among the highly leveraged banks. The bank profitability dummy is significant and positive in both bank regression equations.

Given that our findings in earlier sections of this paper indicated that the lending behavior of the two bank groups differed in both the credit boom and the loan downsizing period, we estimated separate bank level regressions for each of the bank groups. As Table 6 shows, the explanatory power of the full regression model, as measured by the goodness of fit (adjusted R^2), is considerably higher for the highly leveraged banks than for the low leverage banks. The table also reports the results of a more formal test (the F-test or Chow test) that also finds that the separate regressions for the two bank groups are different.

In summary, our findings indicate that there is a direct link between 1980s balance sheet risks and loan cutbacks in the early 1990s. At the level of the full regression model for both bank groups, the 1988 bank capital ratio is not significant. Also, the results from the regression models highlight some of the reasons why the 1990s loan growth differed across the two bank groups.

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The Relative Importance of the Link Between 1980s Balance Sheet Risks and 1990s Loan Growth

In this part of the paper we examine the marginal contribution of bank characteristics in the full regressions reported in Table 6. The calculation of marginal contributions involve decomposing each independent variable in the full regression model and quanti-

Table 5: Second Level Regression

Explanatory Variables	Highly Leveraged Banks (Numbers in parentheses are t-statistics)	Low Leverage Banks (Numbers in parentheses are t-statistics)
Constant term	58.0 (7.7) ***	55.8 (10.5) ***
Basic factors		
1988 capital ratio	-0.4 (-0.7)	0.3 (1.7) *
Bank size	-3.6 (-6.9)***	-4.2 (-8.7) ***
1980s balance sheet risks		
Problem loan ratio	-0.4 (-3.9)***	-0.2 (-2.7)***
Real estate loan ratio	-0.2 (-3.4)***	-0.0 (-0.1)
C&I loan ratio	0.0 (0.2)	0.0 (0.1)
Ratio of large time deposits to total deposits	-0.1 (-1.5)	-0.1 (-1.3)
1980s loan growth		
Percent change in total loans during the credit boom period	0.001 (2.0) **	0.0 (1.2)
Percent change in C&I loans during the credit boom period	0.001 (1.8) *	0.0 (0.3)
Percent change in real estate loans during the credit boom period	-0.0 (-1.6)	0.0 (0.4)
R-square	0.05	0.02
Adjusted R-square	0.05	0.02
Number of observations	1,840	7,408

Note: Dependent variable is the third-quarter 1990 to third-quarter 1992 growth rate of total/C&I loans. Results corrected for heteroskedasticity.

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

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Table 6: Full Regression Model

Explanatory Variables	Highly Leveraged Banks (Numbers in parentheses are t-statistics)	Low Leverage Banks (Numbers in parentheses are t-statistics)
Constant term	56.9 (6.7) ***	82.2 (3.4) ***
Basic factors		
1988 Capital ratio	-0.9 (-1.4)	0.2 (1.5)
Bank size	-4.5 (-8.0) ***	-4.9 (-9.5) ***
1980s balance sheet risks		
Problem loan ratio	-0.3 (-3.7) ***	-0.2 (-2.7) ***
Real estate loan ratio	-0.2 (-3.5) ***	0.0 (-0.2)
C&I loan ratio	0.0 (0.2)	0.0 (0.1)
Ratio of large time deposits to total deposits	0.0 (-1.3)	-0.1 (-1.3)
1980s loan growth		
Percent change in total loans during the credit boom period	0.0 (1.1)	0.001 (1.7) *
Percent change in C&I loans during the credit boom period	0.001 (1.7) *	0.0 (0.3)
Percent change in real estate loans during the credit boom period	-0.0 (-0.3)	0.0 (0.4)
Contemporaneous factors		
Dummy variable for Northeast region	-2.9 (-1.2)	-3.0 (-2.9) ***
Dummy variable for capital adequacy	8.6 (1.9) *	-20.5 (-0.9)
Dummy variable for banks' profitability	10.2 (7.2) ***	4.4 (5.7) ***
R-square	0.09	0.03
Adjusted R-square	0.08	0.03
Number of observations	1,840	7,408
F-test:	**F=22.5**	**F=12.2**
Test for difference between highly and less leveraged banks	**F=2.8** Critical F=1.8 @ 5%	Reject the null that the two regressions are the same

Note: Dependent variable is the third-quarter 1990 to third-quarter 1992 growth rate of total/C&I loans. Results corrected for heteroskedasticity.

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

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fying the added impact of each of these variables on the explained variation or R^2 of the regression model. It must be emphasized that we are discussing marginal and not total contributions. Unless the explanatory variables are completely independent of each other, the marginal contribution will fall short of the total contribution.

Since our focus is on the marginal contribution of the independent variables and not on a comparison of the two bank groups, we focus our discussion only on the results from the highly leveraged banks regressions. The evidence suggests that bank size provided the largest contribution to the explained variation of the model (Table 7). Bank

Table 7: Partial Contribution
Percent

Explanatory Variables	Highly Leveraged Banks (Numbers in parentheses are t-statistics)	Low Leverage Banks (Numbers in parentheses are t-statistics)
Basic factors		
1988 Capital ratio	0.9	1.9
Bank size	42.4	55.6
1980s balance sheet risks	15.8	8.3
Problem loan ratio	8.4	4.9
Real estate loan ratio	6.6	0.0
C&I loan ratio	0.0	0.0
Ratio of large time deposits to total deposits	0.8	3.4
1980s loan growth	0.8	3.4
Percent change in total loans during the credit boom period	0.1	1.1
Percent change in C&I loans during the credit boom period	0.1	0.0
Percent change in real estate loans during the credit boom period	0.6	2.3
Contemporaneous factors	34.9	17.7
Dummy variable for Northeast region	0.9	1.5
Dummy variable for capital adequacy	1.9	1.1
Dummy variable for banks' profitability	32.1	15.0
Total	94.9	86.8

Note: Dependent variable is the third-quarter 1990 to third-quarter 1992 growth rate of total/C&I loans. Results corrected for heteroskedasticity.

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size accounts for 42 percent of the model's explained variation.[17] The second most important explanatory variable is the bank profitability dummy, which accounts for 32 percent of the explained variation of the model.

The 1980s balance sheet risks provided the third largest overall contribution to the explained variation of the model. Of this group, the problem loan ratio (8.4 percent) was the most important. It should be noted, however, that by themselves the problem loan and real estate loan ratios provide the third and fourth largest contributions to the explained variation of the model.

Conclusion

The task set for this study was to examine whether there is a link between bank balance sheet riskiness in the 1980s and loan downsizing in the early 1990s. The available evidence suggests that there is a significant relationship between these two measures of bank behavior. This result should not come as a surprise given the size of the bad loan hangover from the 1980s.

The most important 1980s balance sheet risk variable was the loan loss reserve ratio. For the highly leveraged banks, the real estate loan ratio also played an important role. Overall the 1980s balance sheet risks were more important for the highly leveraged banks than the low leverage banks in explaining 1990s loan growth.

[17] This result is consistent with the finding by Boyd and Gertler that bank size is a good indicator of a bank's susceptibility to distress. See John Boyd and Mark Gertler, "U.S. Commercial Banking: Trends, Cycles, and Policy," New York University, February 1993.

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Loan Sales and the Slowdown in Bank Lending

by Rebecca Demsetz[1]

A complete understanding of the recent slowdown in bank lending requires an examination of loans that were originated by banks but are absent from their balance sheets as a result of loan sales activity. Sales from domestic banks to foreign banks, nonbank financials, and nonfinancial institutions cause outstanding credit to leave the books of the domestic banking system. If loan sales of this nature have increased (decreased) over the "credit crunch" years, then trends in loans reported on the books of domestic banks will overstate (understate) the severity of the recent credit slowdown.

This paper begins with an analysis of aggregate business loan sales by domestic banks. We find that outstanding balances on loans sold to buyers outside the domestic banking system increased in the late 1980s but decreased quite sharply between 1991 and 1992. We conclude that statistics describing outstanding business loans on the books of domestic banks *understate* the severity of the recent slowdown in bank-originated business lending. Next, we take a closer look at the characteristics of loan sellers and the conditions that foster loan sales activity. Since the liquidity provided by the secondary loan market may encourage loan origination, it is important to understand the factors affecting secondary market activity. We use individual bank data to estimate a model of loan sales activity. With these cross-sectional regressions, we identify several bank characteristics that are statistically significant determinants of loan sales activity: asset size, capital ratios, on-balance-sheet loans (as a fraction of assets), funding costs, loan performance, loan portfolio concentration, and holding company affiliation. We also explore the role of regional economic conditions in explaining cross-sectional variation in loan sales activity.[2]

[1] The author thanks Akbar Akhtar, Richard Cantor, Beverly Hirtle, Rama Seth, John Simpson, and John Wenninger for comments on earlier drafts of this paper. August Moret, Katherine Styponias, and Kevin Leyh provided excellent research assistance.

[2] Both sections of this paper focus on the sale of business loans. Business lending is arguably the lending area for which banks are most likely to have superior origination and monitoring abilities. Analyses of trends in business loan sales and the nature of the business loan sales market are thus of particular importance to our understanding of the slowdown in bank lending. Cantor and Demsetz (1993) report measures

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I. Accounting for Business Loan Sales When Evaluating the Slowdown in Bank Lending

The recent slowdown in bank lending to businesses is sometimes described by documenting a decline in the stock of commercial and industrial (C&I) loans on the books of domestic banks (U.S. banks and U.S. branches and agencies of foreign banks).[3] A more correct evaluation of the decline in bank-originated business credit should account for loans sold by domestic banks to foreign offices of foreign banks, nonbank financials, and nonfinancial institutions since these loans do not appear on the books of selling banks but do contribute to the stock of domestically originated bank credit. In addition, it is useful to account separately for the sale of bank loans to nonfinancial institutions since these sales represent a decrease in the outstanding bank credit of the nonfinancial sector. This type of analysis is possible for the set of banks included in the Federal Reserve Board's Senior Loan Officer Survey of Lending Practices (SLP) because the SLP asks banks to describe the types of institutions purchasing their loans as well as the quantity of outstanding loans that have been sold. The SLP data do have two drawbacks, however: the sample of approximately sixty included banks is relatively small, and not every bank reports loan sales data in each survey.

Reports of Income and Condition (Call Reports) facilitate a second analysis based on data describing the full population of U.S. commercial banks;[4] however, two factors complicate the use of Call Report loan sales statistics. First, Call Reports do not ask banks to identify the types of institutions buying their loans. Calculation of loan sales from U.S. banks to institutions outside the U.S. banking system is thus less straightforward than in the case of the SLP data. Fortunately, Call Reports include statistics on loan purchases as well as loan sales. By defining a sample that consists of all U.S. banks, and then subtracting aggregate loan purchases from aggregate loans sales, it is possible to use Call Report data to measure net business loan sales to institutions outside the U.S. banking system. However, Call Reports do not facilitate the measurement of loan sales to particular purchaser groups such as nonfinancial institutions.

A second problem associated with the Call Report sales data is that Call Reports convey information on business loan sales and purchases in the form of flows rather than stocks; that is, banks are asked to report the dollar volume of loans sold and loans purchased in a given quarter. A flow-to-stock conversion of Call Report data is not possible because of limited information regarding the duration of sold and purchased loans. In particular, there is no way to determine the dollar volume of quarterly sales or purchases still outstanding at the close of a given calendar quarter. Thus, while Call Report data are a valuable source of information for analyzing trends in aggregate sales activity, only the SLP provides data specifically suited for calculation of outstanding balances on loans sold to institutions outside the domestic banking system, or to particular buyer groups such as nonfinancial institutions. The following section analyzes the SLP (stock) data. Next we examine the Call Report (flow) data and summarize our findings.

Footnote 2 continued
of credit growth that include mortgage, consumer, and business loans originated by intermediaries but absent from their balance sheets because of direct loan sales or the issuance of asset-backed securities.

[3] Throughout the remainder of this paper, we distinguish "U.S. banks" from "domestic banks." We use "domestic banks" to denote U.S. banks *and* U.S. branches and agencies of foreign banks.

[4] U.S. branches and agencies of foreign banks do not provide loan sales data in the Call Reports.

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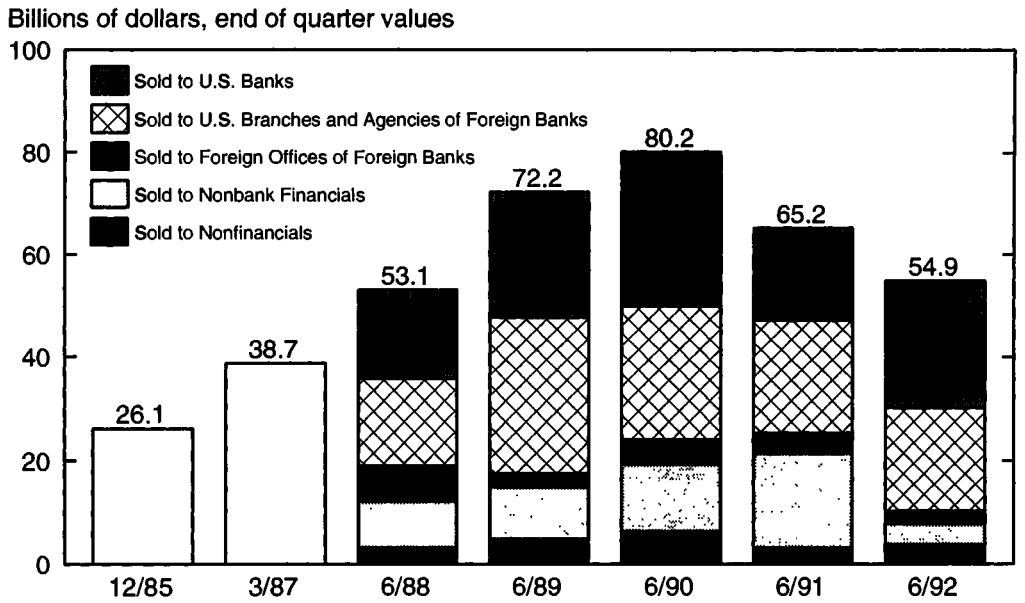
Analysis of the Survey of Lending Practices (SLP) Data

Since 1986, the SLP has asked responding banks to report approximately annually on the outstanding amounts of C&I loans originated and then sold in their entirety or participated to others (without recourse). Bernanke and Lown (1991) compile these sales statistics through June 1991. They observe a sharp peak and subsequent decline in this loan sales series around the June 1990 survey. We extend the Bernanke/Lown analysis using data from June 1992 and information on the types of institutions buying loans. Loan sales involving a transfer from one U.S. bank to another do not remove loans from the books of the U.S. banking system. Following Berger and Udell (1992), we use SLP data to estimate trends in loan sales from U.S. banks to buyers *other than* U.S. banks.

The stacked bar chart in Chart 1 reports outstanding balances on commercial and industrial loans sold by SLP banks to buyers of several types: U.S. banks, U.S. branches and agencies of foreign banks, foreign offices of foreign banks, nonfinancial institutions, and all other buyers (including finance companies, insurance companies, pension funds, mutual funds, and bank trust departments). We refer to this final group of buyers as "nonbank financials." Total outstanding balances on sold loans rise from $26 billion in December 1985 to $80 billion by June 1990, but fall back down to $55 billion by June 1992. At each date, there is strong representation from each of three buyer groups: U.S. banks, U.S. branches and agencies of foreign banks, and nonbank financials. The June 1992 SLP reveals an increase in the share of loan sales to U.S. banks and a sharp decrease in the share of loan sales to nonbank financials, which had been increasing from June 1989 through June 1991.

Charts 2a, 2b, and 2c track outstanding balances on loans sold by SLP banks to three particular buyer groups. Chart 2a reports loans sold to "non-U.S.-bank" buyers. These buyers include nonfinancial institutions, nonbank financials, foreign offices of foreign

Chart 1: Outstanding Balances on Commercial and Industrial Loans Sold by LPS Banks



Source: Senior Loan Officer Survey of Bank Lending Practices.
Note: A consistent buyer categorization is available beginning in 1988.

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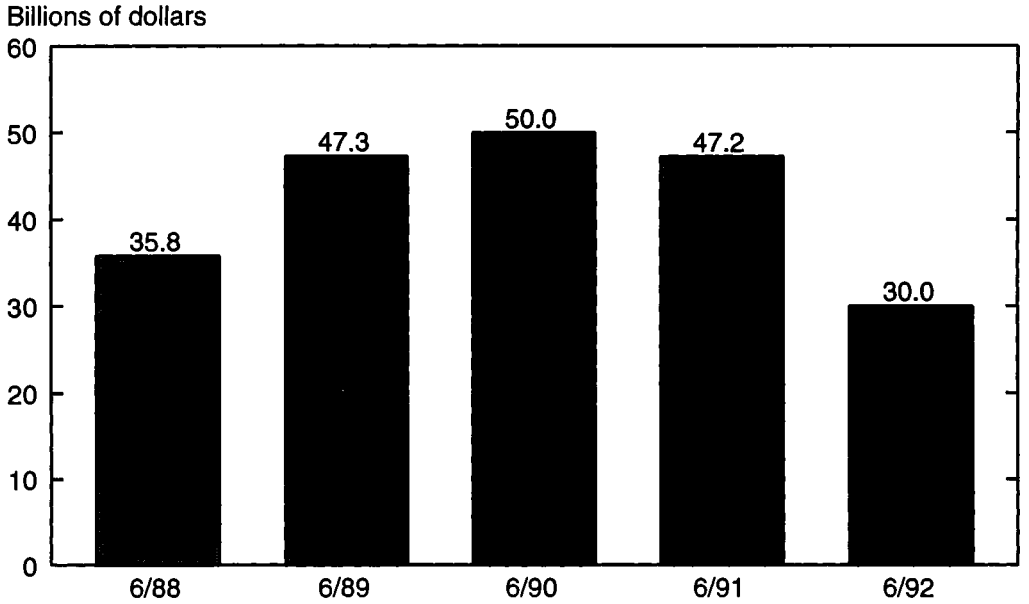
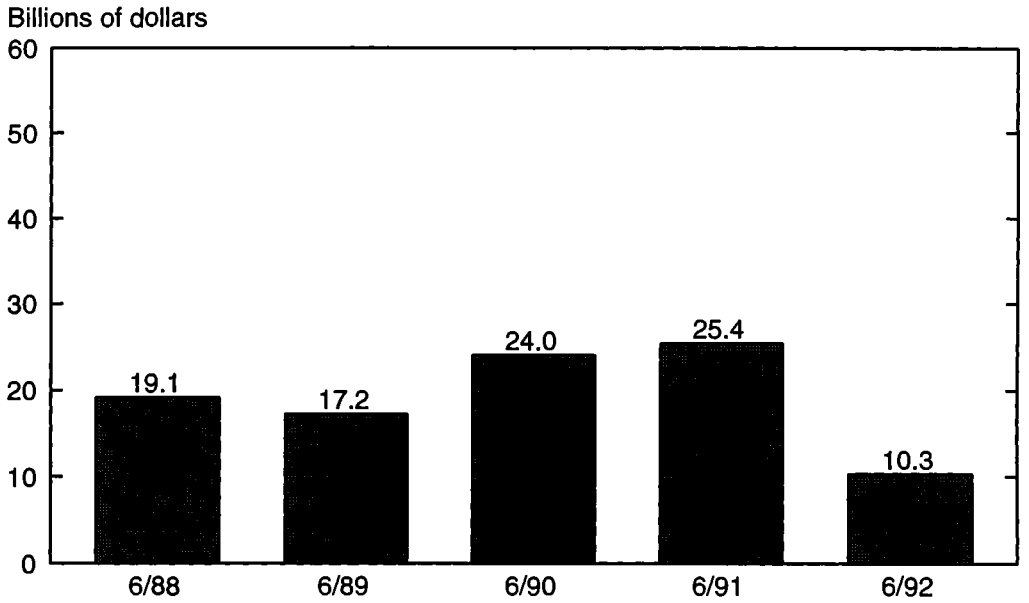
Chart 2A: Outstanding Balances on Loans Sold by LPS Banks to Non-U.S Bank Buyers



Source: Senior Loan Officer Survey of Bank Lending Practices.
Note: "Non-U.S. Bank Buyers" includes nonfinancials, nonbank financials, foreign offices of foreign banks, and U.S. branches and agencies of foreign banks.

Chart 2B: Outstanding Balances on Loans Sold by LPS Banks to Non-Domestic Bank Buyers



Source: Senior Loan Officer Survey of Bank Lending Practices.
Note: "Non-Domestic Bank Buyers" includes nonfinancials, nonbank financials, and foreign offices of foreign banks.

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banks, and U.S. branches and agencies of foreign banks. Chart 2b reports loans sold to "non-domestic-bank" buyers. These buyers include nonfinancial institutions, nonbank financials, and foreign offices of foreign banks (but not U.S. branches and agencies of foreign banks). Both series decline sharply between June 1991 and June 1992. Hence, accounting for loan sales to non-U.S.-bank buyers or to non-domestic-bank buyers will increase the measured decline in C&I lending by SLP banks, especially over the latter "credit crunch" years. An important caveat regarding this conclusion is that there is some inconsistency in the SLP response group. The report accompanying the 1991 SLP explains that the decline in total loan sales from 1990 to 1991 "in part reflects the inability of some banks that had reported outstanding loans in the August 1990 survey to do so [that] year." The same complication may bias the 1991-92 decline.[5]

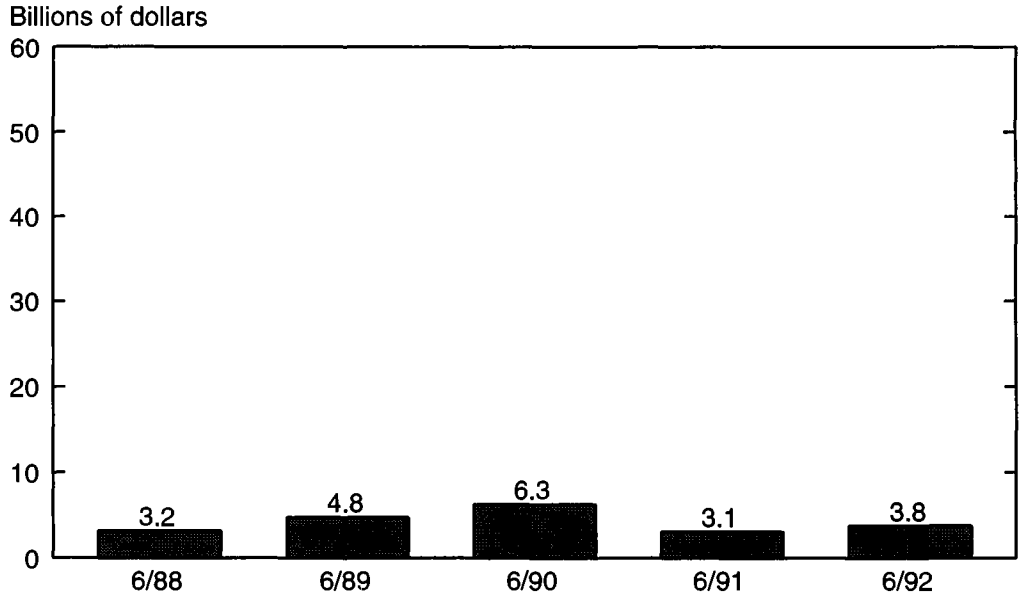
Chart 2c tracks outstanding balances on loans sold by SLP banks to nonfinancial institutions only. These balances, measuring outstanding bank credit returned to the nonfinancial sector, are small compared with those depicted in Charts 2a and 2b, and thus appear relatively constant over the time period examined.[6]

We estimate outstanding balances on loans originated and sold by all U.S. banks by scaling the SLP loan sales data. Using Call Report data, we calculate the fraction of quarterly commercial bank loan sales flows attributable to SLP banks, and use this scal-

[5] Recorded annually, the total number of SLP banks reporting sales volume reaches a minimum of 53 and a maximum of 57 over the 1987-92 time period. This range may overstate the severity of reporting fluctuations, however, since the largest SLP banks tend to be the most active loan sellers as well as the most consistent reporters of SLP data. In 1991, 55 banks reported sales volume. In 1992, that number *rose* to 57.

[6] A closer look at loans sold to nonfinancial institutions reveals a steady rise from March 1987 through June 1990, followed by a 50 percent decline between June 1990 and June 1991. However, by June 1992, loans sold from SLP banks to nonfinancials had risen 22 percent above the value reported one year earlier.

Chart 2C: Outstanding Balances on Loans Sold by LPS Banks to Nonfinancial Institutions



Source: Senior Loan Officer Survey of Bank Lending Practices.

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ing ratio to inflate the SLP statistics reported in Charts 2a, 2b, and 2c. Though we believe that our approach is appropriate given the available data, there are three caveats worth noting: first, our scaling factor is based on flow data rather than stock data; second, the same scaling factor is applied to all loan sales, regardless of purchaser identity; and third, since the SLP responses of individual banks are confidential, our scaling factor cannot reflect changes in the set of SLP banks reporting sales volume.

The magnitude of our scaling factor is very high, averaging about 90 percent over the relevant period; the SLP contains an overrepresentation of large banks, and these banks are the most active participants in the loan sales market. The scaling factor is also quite stable over time, ranging from 82 to 92 percent over the relevant period. Trends reported in Charts 2a, 2b, and 2c are thus fairly representative of trends estimated for the U.S. banking system as a whole.

Table 1 uses our estimates of outstanding balances on loans sold by all U.S. banks to adjust trends in the on-balance-sheet lending of U.S. banks and the on-balance-sheet lending of domestic banks. The first section of Table 1 adjusts the on-balance-sheet lending of U.S. banks by adding outstanding balances on loans sold to all buyers other than U.S. banks. The 1990-92 decline in lending by U.S. banks increases in magnitude from 12.2 percent to 14.1 percent after accounting for relevant loan sales.

A similar pattern emerges from the second section of Table 1, where we adjust the on-balance-sheet lending of U.S. banks and U.S. branches and agencies of foreign banks and find that the 1990-92 decline in lending by these institutions increases in magnitude from 6.0 percent to 7.6 percent after accounting for relevant loan sales. Since the on-balance-sheet statistics reported in the second section of Table 1 already reflect loan sales from U.S. banks to U.S. branches and agencies of foreign banks, our loan sales adjustment includes only those sales made by U.S. banks to foreign offices of foreign banks, nonbank financials, and nonfinancial institutions. A precise adjustment should also reflect sales from U.S. branches and agencies to these buyers. We lack sufficient data to calculate these sales for each year examined; however, data from the 1991 and 1992 SLPs suggest that sales by U.S. branches and agencies of foreign banks to foreign offices, nonbank financials, and nonfinancial institutions are very small relative to U.S. bank sales to these same institutions.

The third section of Table 1 adjusts C&I loans on the books of U.S. banks to reflect only sales to nonfinancial institutions. In this case, the magnitude of the 1990-92 decline in C&I lending is practically unchanged, rising in magnitude from 12.2 percent to 12.4 percent. The stock of C&I credit returned to the nonfinancial sector through loan sales is small compared with that transferred to other non-domestic-bank buyers.

Analysis of Call Report Data

Beginning in the second quarter of 1983, Call Reports provide individual bank flow data describing loans originated by U.S. banks that have been sold or participated to others (without recourse) during the calendar quarter ending with the report date.[7] A second series, describing loan purchases, begins in the second quarter of 1987. Since both series are constructed as flow variables rather than stock variables, they are not directly comparable to the SLP sales series or to series describing the stock of outstanding business loans. Still, Call Reports provide a valuable source of information on aggregate

[7] The term "loans originated" covers any loan made directly by the reporting bank. It does not include loans purchased from others. In the case of syndicated loans, "loans originated" covers only the reporting bank's share, even if the reporting bank is the lead bank in the syndication.

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loan sales activity and can be used to confirm the pattern of declining business loan sales outside the U.S. banking system over the recent credit slowdown.[8]

Since banks do not describe the types of institutions purchasing the loans they have sold, measurement of sales outside the U.S. banking system is less direct than in the case

[8] The Call Report sales and purchase series exclude loans secured by one-to-four-family residential properties and loans to individuals for household, family, and other personal expenditures. The reported series thus describe business loans and some other loan types. However, the April 1986 description of the February 1986 SLP reports that "most bankers contacted by Board staff indicated that domestic commercial and industrial was by far the most important category of loans sold." Consequently, we follow Bernanke and Lown (1991) and Gorton and Haubrich (1990) in interpreting the Call Report series as indicators of business loan sales and purchase activities.

Table 1: Lending Growth, before and after Adjusting On-Balance-Sheet Lending for Loan Sales

	Outstanding Amounts, Billions of Dollars			Percentage Change	
	1988-II	1990-II	1992-II	1988-II to 1990-II	1990-II to 1992-II
Part I					
Loans on the balance sheets of U.S. banks[a]	597.4	618.4	543.2	+3.5	-12 2
Loans sold to buyers other than U.S. banks[b]	39.2	56.4	36.5	+43.9	-35.3
Total	636.6	674.8	579.7	+6.0	-14.1
Part II					
Loans on the balance sheets of U.S. banks and U.S. branches and agencies of foreign banks[a]	715.5	756.7	711.6	+5.8	-6.0
Loans sold to buyers other than U.S. banks and U.S. branches and agencies of foreign banks[b]	20.9	27.0	12.5	+29.2	-53.7
Total	736.4	783.7	724.1	+6.4	-7.6
Part III					
Loans on the balance sheets of U.S. banks[a]	597.4	618.4	543.2	+3.5	-12.2
Loans sold to nonfinancial institutions[b]	3.5	7.1	4.6	+103	-35.2
Total	600.9	625.5	547.8	+4.1	-12.4

a. Source: Federal Reserve Bulletin.

b. Estimates, based on Senior Loan Officer Survey of Lending Practices and Call Reports.

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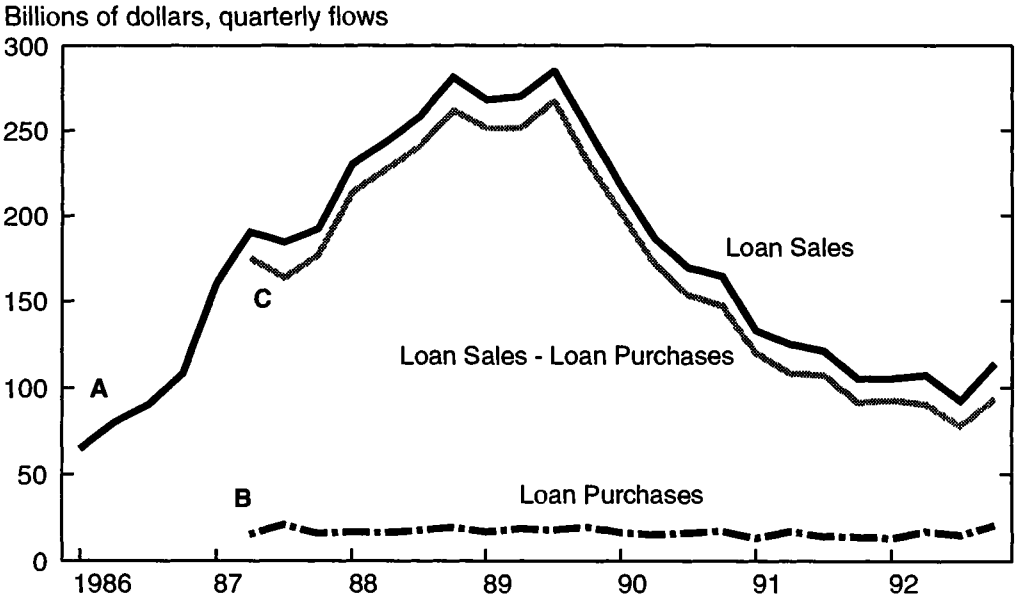
of the SLP banks. In addition, Call Report data do not facilitate measurement of loan sales to particular buyer groups such as nonfinancial institutions. However, by analyzing a sample consisting of all U.S. banks and subtracting aggregate business loan purchases from aggregate business loan sales, one can use the Call Report loan sales and purchase series to measure trends in net business loan sales from U.S. banks to institutions outside the U.S. banking system.

Some examples help to illustrate how the Call Report loan sales and purchase series can be used to measure the relevant trends. First consider a loan sold by a U.S. bank to an institution outside the U.S. banking system. Since we analyze only those institutions that are part of the U.S. banking system, this transaction contributes to aggregate sales but not to aggregate purchases; the net sales figure will reflect this transaction. In contrast, consider a loan sold by one U.S. bank to another U.S. bank. This second transaction will contribute to both aggregate sales and aggregate purchases, and thus make no contribution to the final net sales figure. Finally, a loan sold by an institution outside the U.S. banking system and purchased by a U.S. bank will appear as a loan purchase only and thus contribute negatively to aggregate net sales.

Series A in Chart 3 shows the quarterly sales flow by insured U.S. commercial banks from 1986 through 1992. Loan sales grew rapidly during the late 1980s, reaching almost $300 billion per quarter in 1989. After the third quarter of 1989, loan sales slowed sharply, falling to about $90 billion per quarter by 1993. Series B in Chart 3 shows the quarterly purchase flow reported by insured U.S. commercial banks. This series is small and stable. The net sales flow — the flow to buyers other than insured U.S. commercial banks — is similar to the gross sales flow.

It is difficult to compare the Call Report sales trends to the SLP sales trends because of differences in reporting frequencies. However, the basic trends conveyed through the SLP (stock) and Call Report (flow) data appear consistent, with the Call Report series

Chart 3: Commercial and Industrial Loan Sales and Purchases by U.S. Banks



Source: Call Reports.
Note: This sample includes all insured U.S. commercial banks.

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declining slightly earlier than the SLP series. Note, however, that the relative magnitudes of the total sales series (Series A) and the net sales series (Series C) in Chart 3 suggest an interesting contrast between the SLP (stock) and Call Report (flow) data. Responses of SLP banks indicate that over the relevant period, the stock of loans purchased by non-U.S.-bank buyers generally accounts for about two-thirds of the total stock of sold loans. In contrast, the Call Report data indicate that nearly all of the flow of business loan sales is purchased by institutions other than U.S. banks.

There are at least two possible explanations for this disparity. First, it is possible that banks in the SLP sample are simply more likely than others to sell loans to U.S. banks. However, further analysis reveals that the disparity between SLP (stock) data and Call Report (flow) data persists even within the SLP sample. A second potential explanation for the stock data/flow data disparity involves a difference in loan maturities by purchaser. In particular, if loans sold to U.S. banks are of much longer maturities than loans sold to other purchasers, then the SLP (stock) data will show significant outstanding balances on loans sold to U.S. banks while Call Report (flow) data show little sales activity to U.S. bank buyers.

II. The Determinants of Loan Sales Activity

In this section, we explore the characteristics of loan sellers and the conditions that foster secondary market activity. Our analysis is based on Call Report data, which include information on the quarterly flow of loan sales associated with individual institutions as well as relevant bank characteristics potentially related to sales activity. Since Call Reports do not identify the types of institutions purchasing loans from a given buyer, we focus on total loan sales, regardless of buyer identity. Following Pavel and Phillis (1987), we scale each bank's loan sales by asset size and use the resulting sales ratio as the dependent variable in a cross-sectional regression analysis. We examine the stability of the regression coefficients over time and reach some preliminary conclusions regarding factors underlying the loan sales decline during the "credit crunch" period. The independent variables in our reduced form model are described below. They are motivated by several mutually consistent theories of loan sales activity.

Asset Size. Large banks are the biggest sellers of bank loans. Since a small number of large banks account for a large fraction of all bank loan sales, our regressions include a set of asset size dummy variables. We differentiate between twelve size groups, defined in Table 2, and thus allow for nonlinearities at both ends of the asset size distribution.

Outstanding Loan Volume. We explore the ratio of outstanding loans-to-assets in order to determine whether banks that hold a high fraction of assets as loans are more or less likely to sell the loans that they originate.[9] Haubrich and Thomson (1993) find a significant positive relationship between the loans-to-assets ratio and the concurrent sales-to-assets ratio. We include two measures of outstanding loan volume, the loans-to-assets ratio and the C&I loans-to-assets ratio. The C&I loans-to-assets ratio is included because the Call Report loan sales data primarily reflect sales of C&I loans. We lag both loan-to-assets ratios by one quarter, since their current values will reflect concurrent sales activity.

Funding Costs. To the extent that some banks have a comparative advantage in funding credit and others in originating credit, we should see a positive relationship between

[9] See Mester (1992) for a discussion of diseconomies of scope between traditional activities of originating and monitoring loans and nontraditional activities of loan selling and buying.

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funding costs and sales activity. In other words, banks with costly funding sources should be more likely than others to sell the loans they originate, all else equal (see Pennacchi 1988). Following Haubrich and Thomson (1993) and Berger and Udell (1992), we measure funding costs as the sum of brokered deposits and large deposits (deposits that exceed the $100,000 FDIC insurance limit), scaled by assets. Again, a one-quarter lagged value is used.

Bank Capital. Banks may sell loans in order to capture the benefits of loan origination without the costs of increased capital. In particular, capital-constrained banks may use the loan sales market to facilitate loan origination, receiving origination and servicing fees without increasing the size of the loan portfolio they hold.[10] We test the hypothesis of an inverse relationship between bank capital and loan sales activity by including in our regression the ratio of equity capital to assets. Again, we use the one-quarter lagged value because the current capital-to-assets ratio will reflect concurrent capital-enhancing sales activity. We also explore the effects of some additional capital measures designed to test more directly the hypothesis that capital-constrained institutions are more likely than others to be active loan sellers. These additional capital measures are defined later in this section.

Loan Portfolio Diversification. Another theory of loan sales suggests that banks sell and buy loans to enhance the diversification of their loan portfolios (Pavel and Phillis 1987). The diversification motive implies that sales activity should be most prevalent among banks with loan origination focused in a narrow geographical area or business line, all else equal. Unfortunately, it is difficult to distinguish these banks from other banks. We lack information on the types of loans originated by specific institutions, and information on the types of loans within existing portfolios is not detailed enough to build fully satisfactory measures of loan concentration. In particular, it is not possible to identify industrial and geographical concentrations, the two types of loan concentrations that are probably most relevant to the sale of business loans. Instead, we measure overall portfolio concentration using a concentration index equal to the sum of the squared shares of the loan portfolio in each of five Call Report loan categories: real estate, agriculture, consumer, C&I, and other loans. Again, we use a one-quarter lag.

Loan Portfolio Performance. Buyers' perceptions of poor loan quality may lead to reduced demand for a particular bank's loans. Hence, the selling institution's past loan portfolio performance may be positively related to the loan sales ratio. An alternative supply-side hypothesis is that a bank with poor loan performance will try to sell loans in order to maintain an existing level of capital. This hypothesis suggests a negative correlation between loan portfolio performance and sales activity. Our reduced form model includes two measures of loan portfolio performance. The first measure, the nonperforming loan ratio, is defined as the sum of nonaccruing loans and loans past due ninety or more days, divided by total loans. Again, a one-quarter lagged value is used. Both Pavel and Phillis (1987) and Haubrich and Thomson (1993) examine a second measure of portfolio performance, the ratio of net charge-offs to assets. Both studies find a positive relationship between net charge-offs and loan sales, though that relationship is statistically significant only in the former analysis. Along with the lagged nonperforming loan ratio, we include the net charge-off ratio, equal to net charge-offs occurring in the current quarter, scaled by assets.

Holding Company Affiliation. Haubrich and Thomson (1993) find that holding company affiliation is a positive, significant determinant of sales activity and explain that

[10] See Pavel and Phillis (1987) for an early discussion.

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loan sales are frequently transactions between sellers and buyers in the same holding company. We include a dummy variable indicating whether a given bank belongs to a holding company.

Economic Conditions. The role of economic conditions has been given little attention in previous studies of loan sales activity. However, there are at least two reasons to believe that economic conditions, and especially expectations of future economic conditions, will affect loan sales activity. First, optimism regarding the economy should stimulate loan origination, and strong loan origination creates the potential for strong loan sales activity. Second, since economic strength should positively affect the performance of newly originated loans, optimism regarding the economy may dampen buyers' fears of weak loan performance. Both stories suggest that a promising economic environment will stimulate loan sales activity.

To explore the importance of economic conditions in the context of our cross-sectional analysis, we construct measures of regional economic strength and test the hypothesis that at a given point in time, banks operating in promising economic environments are more active loan sellers than those operating in weak economic environments, all else equal. We measure the strength of each regional economy using a state-specific consumer confidence index, which we aggregate to the regional level.[11]

In summary, our regression equation expresses the loan sales-to-assets ratio as a function of total assets, the loans-to-assets ratio, the C&I loan ratio, a measure of funding costs, the equity capital-to-assets ratio, a measure of loan portfolio diversification, two measures of portfolio performance, holding company affiliation, and a measure of regional economic conditions. Most of these variables are potential determinants of the supply of sold loans; others are related to the demand for loans in the secondary market.

Model Estimation

The model is estimated separately for the first quarter of each year between 1986 and 1992. The sample analyzed includes all insured domestic commercial banks. It would be possible to pool the seven yearly data sets and estimate a single set of coefficients using a panel model. An advantage of separate yearly regressions is that they allow us to examine changes in estimated coefficients over time. Those changes prove to be important, indicating that the implicit assumption of coefficient stability underlying a panel model is not valid in this case.

We estimate the model using a tobit procedure. A tobit model is used when the regression's dependent variable combines both qualitative and quantitative information. In this case, the qualitative information conveyed by the dependent variable is each bank's participation or lack of participation in the loan sales market. The quantitative information conveyed is the magnitude of sales activity (relative to total assets) for those institutions that do participate.

[11] In particular, we create regional measures of economic strength by averaging state-specific values of the Sindlinger "Household Money Supply Index," which reflects the fraction of surveyed households reporting that (1) total combined annual income is up from, or the same as, six months prior, (2) total combined annual household income in the next six months will remain the same or be up, (3) the number of jobs where the respondent works will increase or remain the same in the next six months, and (4) business conditions where the respondent lives will be the same or better in the next six months. Each region represents one Federal Reserve District. A state belonging to two Federal Reserve districts contributes to the value calculated for each district. Since data were unavailable for Alaska and Hawaii, the District 12 values do not reflect these two states.

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Results and Discussion

Table 2 reports our results. In one sense the results are encouraging, since most independent variables are highly significant in each year examined and most of the estimated coefficients have the hypothesized signs. However, some of the estimated coefficients vary over time, making it difficult to draw firm conclusions regarding certain determinants of loan sales activity.

As expected, asset size is an important determinant of sales activity. Since the size category deleted from the regression corresponds to banks of intermediate size (those with assets greater than $100 million but less than $500 million), the significant positive coefficients on both the highest and lowest size dummies suggest an interesting nonlinear relationship: sales activity increases at the high end of the size distribution and at the low end of the size distribution, all else equal, though the increase is of much greater magnitude at the high end. This pattern is consistent with the need for small banks to participate in the secondary market in order to meet lending limits or to enhance portfolio diversification. Although the often negative coefficient associated with the concentration index would suggest that more diversified banks are *less* likely to be active sellers, that index is a rather crude measure of the type of portfolio concentration that is likely to stimulate sales activity, as noted earlier. Indeed, its coefficient is quite unstable across the yearly regressions reported in Table 2.

A closer look at the asset size coefficients reveals that their relative magnitudes change substantially across the seven-year period examined. In particular, coefficients associated with the largest size groups increase in the middle of the seven-year period, peaking in 1989, concurrently with aggregate loan sales. This pattern suggests that the regression model excludes some important factor(s) that differentially affect(s) the sales activity of small and large banks. A likely candidate is the origination of large merger-related loans, loans that are frequently divided into smaller credits and sold in the secondary market.[12] Unfortunately, we lack historical bank-level data on merger-related originations, so the regression model cannot control for this factor.[13]

Outstanding loan volume is significantly related to sales activity, with positive coefficients associated with each of the loans-to-assets variables in each year examined. Also consistent across the seven regression equations are the positive, significant coefficients associated with the variables measuring funding costs and holding company affiliation. The relationship between the nonperforming loan ratio and sales activity is generally negative and significant; the coefficient associated with the net charge-off ratio is less robust. The capital ratio coefficient is negative and highly significant (as hypothesized) in each year. Finally, our measure of regional economic conditions enters the equation with a positive and highly significant coefficient in 1988-92 but a negative significant coefficient in the first two years examined, suggesting that the link between economic conditions and sales activity may be more complex than initially hypothesized.[14]

Berger and Udell (1992) note that two large banks alone account for a sizable share of the loan sales market in the 1986-92 period. When these banks are deleted from the model, the results are qualitatively unchanged, although the asset size coefficients asso-

[12] Indeed, a strong correlation between corporate merger activity and aggregate sales activity has been noted (see Berger and Udell 1992).

[13] See Demsetz (1994) for a more detailed discussion.

[14] Relationships between regional economic conditions, lending opportunities, and loan sales activity are explored further in Demsetz (1994).

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Table 2: Yearly Tobit Models: Dependent Variable=(Sales/Assets)

Independent Variables	(1) 1992-I Coeff. (t-stat)	(2) 1991-I Coeff. (t-stat)	(3) 1990-I Coeff. (t-stat)	(4) 1989-I Coeff. (t-stat)	(5) 1988-I Coeff. (t-stat)	(6) 1987-I Coeff. (t-stat)	(7) 1986-I Coeff. (t-stat)
Regional economic conditions	.0021** (11.8)	.0021** (12.9)	.0012** (11.2)	.0009** (3.04)	.0007** (4.36)	-.0011** (3.74)	-.0003** (4.90)
Assets < $10 m.	.0437** (5.94)	.0343** (9.03)	.0189** (8.19)	.0377** (8.28)	.0194** (5.68)	.0142* (2.08)	.0230** (8.79)
$10 m. < assets < $25 m.	.0072 (1.67)	.0143** (6.08)	.0079** (5.26)	.0099** (3.22)	.0090** (3.83)	-.0011 (.234)	.0103** (5.51)
$25 m. < assets < $50 m.	-.0030 (.759)	.0075** (3.45)	.0042** (2.98)	.0041 (1.41)	.0035 (1.54)	-.0135** (2.92)	.0020 (1.12)
$50 m. < assets < $100 m.	-.0038 (.970)	.0016 (.703)	-.0005 (.341)	-.0029 (.994)	-.0018 (.766)	-.0134** (2.81)	-.0017 (.933)
$500 m. < assets < $1 b.	.0163* (1.96)	.0217** (4.60)	.0058 (1.81)	.0116 (1.71)	-7.5e-07 (0.00)	.0043 (.372)	.0037 (.824)
$1 b. < assets $5 b.	.0249** (2.98)	.0124** (2.66)	.0057* (1.90)	.0017 (.277)	.0080 (1.71)	.0232* (2.30)	.0155** (4.04)
$5 b. < assets < $10 b.	.0385* (2.51)	.0268** (3.17)	.0191** (3.42)	.0223 (1.95)	.0241* (2.46)	.0526** (2.61)	.0206** (2.57)
$10 b. < assets < $20 b.	.0652** (3.23)	.0474** (3.94)	.0243** (2.83)	.0268 (1.49)	.0305* (2.07)	.0788* (2.20)	.0200 (1.32)
$20 b. < assets < $50 b.	.0841* (2.34)	.1098** (5.24)	.1487** (12.4)	.1564** (5.58)	.2817** (12.8)	.1754** (3.85)	.0138 (.712)
Assets > $50 b.	.1770** (4.76)	.1859** (8.38)	.3114** (19.8)	.4910** (16.5)	.2271** (9.09)	.1818** (3.52)	.0707** (3.64)
Loans/assets	.1079** (10.1)	.0464** (7.86)	.0438** (11.5)	.0616** (8.10)	.0520** (9.09)	.1210** (9.92)	.0653** (13.5)
C&I loans/assets	.1225** (6.13)	.0794** (7.63)	.0697** (11.3)	.1318** (10.6)	.1077** (11.7)	.1943** (10.5)	.0806** (11.6)
Capital/assets	-.2583** (5.87)	-.1901** (7.77)	-.0985** (7.11)	-.2123** (6.98)	-.1162** (5.30)	.4191** (10.5)	-.1058** (5.20)
Nonperforming loans/ assets	-.3291** (3.07)	-.2892** (4.86)	-.2047** (5.55)	-.3229** (4.79)	-.1175** (2.74)	.0186 (.235)	-.1578** (5.16)
Net charge-offs/assets	-1.546* (2.37)	.6153 (1.86)	-.4855** (2.78)	-.5121 (1.51)	.1311 (.731)	-.3348 (.900)	.1234 (.921)
Concentration index	-.0306** (2.58)	-.0202** (2.97)	-.0024 (.541)	-.0294** (3.19)	.0111 (1.57)	-.0476** (3.10)	.0242** (4.12)

Notes: Deleted size category is $100 m. < assets < $500 m.
* Significant at the 5 percent level.
** Significant at the 1 percent level.

(Continued)

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Table 2: Yearly Tobit Models: Dependent Variable=(Sales/Assets) *(Continued)*

Independent Variables	(1) 1992-I Coeff. (t-stat)	(2) 1991-I Coeff. (t-stat)	(3) 1990-I Coeff. (t-stat)	(4) 1989-I Coeff. (t-stat)	(5) 1988-I Coeff. (t-stat)	(6) 1987-I Coeff. (t-stat)	(7) 1986-I Coeff. (t-stat)
(Large + brokered dep)/ assets	.0341** (2.69)	.0366** (5.38)	.0296** (8.71)	.0416** (5.01)	.0264** (4.15)	.0598** (5.91)	.0564** (11.7)
Belongs to holding company	.0255** (8.02)	.0161** (9.23)	.0101** (9.19)	.0248** (11.1)	.0210** (12.4)	.0449** (13.2)	.0172** (13.4)
Constant	-.2068** (18.1)	-.1401** (19.1)	-.1142** (17.9)	-.1464** (8.08)	-.1435** (11.6)	-.1744** (10.1)	-.0820** (16.1)
Number of observations	11,685	12,089	12,428	12,783	13,305	13,794	12,969
Chi-squared	757	999	1,515	1,106	1,155	934	1,654

Notes: Deleted size category is $100 m. < assets < $500 m.
* Siignificant at the 5 percent level.
** Significant at the 1 percent level.

ciated with the "assets > $ 50 billion" size group are, not surprisingly, much smaller than in Table 2, especially in 1989, at the height of aggregate loan sales activity.

We also experimented with some alternative capital ratios. For 1991 and 1992, we constructed the following variables: tier 1 capital divided by assets (*leverage ratio*); tier 1 capital divided by risk-weighted assets (*tier 1 ratio*); tier 1 plus tier 2 capital divided by risk-weighted assets (*total capital ratio*); and a dummy variable (*capital-constrained*) which equals one for banks with a total capital ratio less than 8 percent, *or* tier 1 *or* leverage ratios less than 4 percent, and equals zero for all other banks.[15] According to the capital constraint hypothesis discussed above, coefficients associated with these capital ratios should all be negative, while the coefficient associated with the "capital-constrained" dummy should be positive. When data from 1992 are used, hypotheses regarding the capital ratios are confirmed, although the coefficient associated with the "capital-constrained" dummy is not significantly different from zero. A similar pattern arises with 1991 data, although in this case, the "capital-constrained" dummy variable is significant at the 10 percent level.

Cross-sectional results reported in Table 2 provide some insight into the decline in loan sales over the "credit crunch" years. Our regression results indicate that even after we control for bank-specific characteristics, many of which reflect the economic environment in which the bank operates, strong regional economies are associated with strong loan sales activity in all but the first two years examined. To the extent that these cross-sectional findings are generalizable to changes across time, we should expect loan sales activity to decline in a recessionary period. Indeed, estimates from the 1990 regression in Table 2 suggest that changes in economic conditions on the order of those that occurred over the recent economic downturn can have a substantial effect on the

[15] Banks that fail to meet any of these three conditions are considered "undercapitalized" under the "Prompt Corrective Action" provisions of the Federal Deposit Insurance Corporation Improvement Act of 1991.

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dollar volume of loan sales. Replacing 1990 values of the consumer confidence index with 1991 values causes aggregate fitted sales to fall by over 10 percent, based on the 1990 regression coefficients.[16] This change is much larger in magnitude than those that result when 1990 values of the other regression variables are replaced by their 1991 values. These results are summarized in Table 3.

III. Summary

Aggregate data reveal a strong decreasing trend in loan sales from U.S. banks to non-U.S.-bank buyers and from domestic banks (U.S. banks and U.S. branches and agencies) to non-domestic-bank buyers over the "credit crunch" years. One important implication of this decreasing trend is that statistics describing outstanding business loans on the books of U.S. banks and on the books of all domestic banks actually *understate*

[16]Fitted values of the sales-to-assets ratios are calculated as described in Maddala (1983), pp. 159-60, equation 6.37. Fitted aggregate sales are then calculated by multiplying each bank's fitted sales-to-assets ratio by bank size and summing across all observations.

Table 3: Sensitivity of Aggregate Fitted Sales to Changes in the Values of Regression Variables

Each row reports the *percentage change in fitted aggregate sales* when 1990-I values for one (or some) of the regressors are replaced by 1991-I values and all other variables are held constant at their 1990-I levels. Results are derived using coefficients from the 1990-I regression in Table 2. Fitted values of the sales-to-assets ratios are calculated as described in Maddala (1983), pp. 159-60, equation 6.37. Fitted aggregate sales are then calculated by multiplying each bank's fitted sales-to-assets ratio by bank size and summing across all observations.

Independent Variable(s)	Percentage Change in Fitted Aggregate Sales, Replacing 1990-I Regressor Values by 1991-I Values
Regional economic conditions (regional consumer confidence)	-10.2
Asset size (dummy variable indicating asset size group)	+0.9
Outstanding loan volume (loans/assets, C&I loans/assets)	+0.1
Funding costs [(large + brokered deposits)/assets]	+0.2
Bank capital (capital/assets)	-0.2
Loan portfolio concentration (concentration index)	0
Loan portfolio performance (nonperforming loans/assets, net charge-offs/assets)	-0.8
Holding company affiliation (dummy variable: "belongs to holding company")	0

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the severity of the recent slowdown in bank lending. We estimate that the magnitude of the 1990-II to 1992-II decline in C&I lending by U.S. banks increases from 12.2 percent to 14.1 percent after accounting for loans sold to non-U.S.-bank buyers and that the magnitude of the decline in C&I lending by domestic banks (U.S. banks and U.S. branches and agencies of foreign banks) increases from 6.0 percent to 7.6 percent after accounting for loans sold to non-domestic-bank buyers. The adjustment for loans sold to nonfinancial institutions is much smaller. Estimates based on the sales activities of the SLP banks suggest that the stock of C&I credit returned to the nonfinancial sector through loan sales is small compared with that transferred to other loan buyers.

Microdata describing loan sales by individual banks facilitate analysis of several determinants of loan sales activity. Cross-sectional regressions based on data from 1986-92 indicate that asset size, loans-to-assets ratios, capital ratios, funding costs, and holding company affiliation are consistently significant determinants of sales activity. The effects of portfolio diversification and portfolio performance are less robust. A measure of regional economic conditions is positively and significantly related to loan sales in most of the years examined, and regression results based on 1990 data suggest that changes in economic conditions on the order of those that occurred over the recent economic downturn may have a substantial effect on the dollar volume of loan sales.

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Foreign Credit Expansion in the United States

by Rama Seth[1]

Several recent studies have examined U.S. bank credit growth during the recent recession.[2] These studies have focused on the balance sheet contraction of U.S. banks and the reasons for this contraction. The role of foreign banks during this period, however, has largely been ignored. This article seeks to assess the prevalence of foreign bank lending in the United States in 1990-92 and to analyze the determinants of that lending. We consider the behavior of foreign banks as a group, then identify differences in foreign bank behavior across countries and institutional forms. We give particular attention to the factors that led certain groups of banks to increase credit.

On the surface, it appears that foreign bank lending in the United States increased while domestic banks were reducing loan extensions.[3] Although foreign banks taken together did increase their U.S. lending, differences emerge when the group is disaggregated according to both institutional form and nationality. While the U.S. branches and agencies of foreign banks expanded their outstanding commercial loans, foreign bank subsidiaries followed the pattern of U.S.-owned banks and contracted their loans. Early in the recession, Japanese banks diverged from domestic banks and many other foreign banks by increasing their U.S. lending; later, French and Canadian banks would do the same.

In Section I, we first briefly discuss our sample selection. The second section describes the growth in balance sheets of foreign banks in the aggregate and then of two broad groupings of these banks—namely, growing and retrenching foreign banks. Section III discusses various attributes of these bank categories—capital strength, asset quality, output growth in the home country, and relative lending rates in the home coun-

[1] I am grateful to Akbar Akhtar, Ron Johnson, Robert McCauley, and Anthony Rodrigues for comments and suggestions, to Ted Fischer for research assistance, and to Valerie LaPorte for editorial assistance.

[2] For a summary of these studies, see Allen N. Berger and Gregory F. Udell, "Did Risk-Based Capital Allocate Bank Credit and Cause a 'Credit Crunch' in the U.S.?" *Journal of Money, Credit, and Banking*, vol. 26, 1994.

[3] The growth in credit by foreign banks during this period can only partially be attributed to loan purchases from domestic banks. At least some of the growth must be attributed to new lending.

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try—and examines the differences in these attributes across bank categories. We tentatively assess some determinants of foreign lending by examining means differences in this section. In section IV, we present regression models that not only test the capital adequacy hypothesis directly but also measure the extent of lending differences by nationality. Section V examines the factors that may explain nationality differences and specifies a reduced-form model. Section VI discusses the results of this model, distinguishing between the factors explaining growth in branches and agencies, on the one hand, and subsidiaries of foreign banks, on the other. The paper's final section lays out the conclusions of the study.

We find that the dissimilarity in lending behavior between foreign and domestic banks also extends to a dissimilarity in the determinants of this lending. Two supply-side factors that have been found to be significant in explaining recent U.S. bank credit behavior are capital strength and asset quality. While capital strength was found to be significant in explaining lending by the positive growth group of branches and agencies, it did not appear to be important in explaining subsidiaries' lending. Reported asset quality did not emerge as a significant determinant of lending by any group of foreign banks. Instead, a desire to increase market share, better U.S. lending rates, and credit diversion from offshore to onshore branches appear to explain the growth in foreign bank branches and agencies. In the case of the few subsidiaries that increased credit, market share is one plausible explanation underlying their behavior.

I. Sample Selection

The sample was dictated by data availability. In each instance, we tried to use all the information available for that particular analysis; consequently, the samples varied somewhat across analyses. For data analyses without capital ratio variables, all foreign banks were used.[4] For analyses using the capital ratio, data limitations required the sample to be more limited.[5] In the tables for these analyses, subsidiaries were included only if they reported capital ratios at the end of December 1990. Since the reporting of capital ratios by parents of foreign banks was somewhat more sparse, we included the branches and agencies provided that their parent had reported capital ratios at least once during 1990-91. Because certain variables used in the regressions were only available for selected industrial countries, the final table with detailed regression results only included foreign banks from Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom.

Since the aim of this paper was to examine credit behavior of foreign banks over the course of the recession, in most of our analysis the time period used spanned the recession. On the assumption that some foreign banks may have needed time to adjust to recessionary conditions, we generally conducted the analyses through the date of the most recent data availability (at the time the data work was done—that is, September 1992).

II. Credit Growth

Foreign banks as a group continued to increase corporate loan extensions in 1990-92 when domestically owned banks were contracting theirs (Chart 1). Differences in lending behavior across foreign banks appear, however, when these banks are subdivided by institutional form.

[4] See Table 1; the first, third, and fourth columns of Table 2; Tables 3 and 3a; and appendix Tables 1 and 2.

[5] Including the second (capital ratio) column of Table 2, Tables 4, R-1, and R-2.

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Foreign banks provide services to U.S. customers through seven different institutional forms.[6] The two most important forms—branches and agencies of foreign banks and foreign bank subsidiaries—behaved rather differently during the recent bank credit slowdown.[7] As a group, U.S. branches and agencies of foreign banks expanded their outstanding loans. By contrast, the U.S.-chartered foreign banks, or subsidiaries, followed the same course as U.S.-owned banks in reducing their lending. Indeed the reduction in lending by these foreign banks (which account for less than a third of credit extended to U.S. corporations by all foreign banks in the United States) from the start of the recession to September 1992 was almost identical to the reduction in lending by U.S.-owned banks (Table 1). Because these two groups of banks are alike in their portfolio composition, clientele, and other characteristics, the similarity in their lending behavior during this period is not surprising.[8]

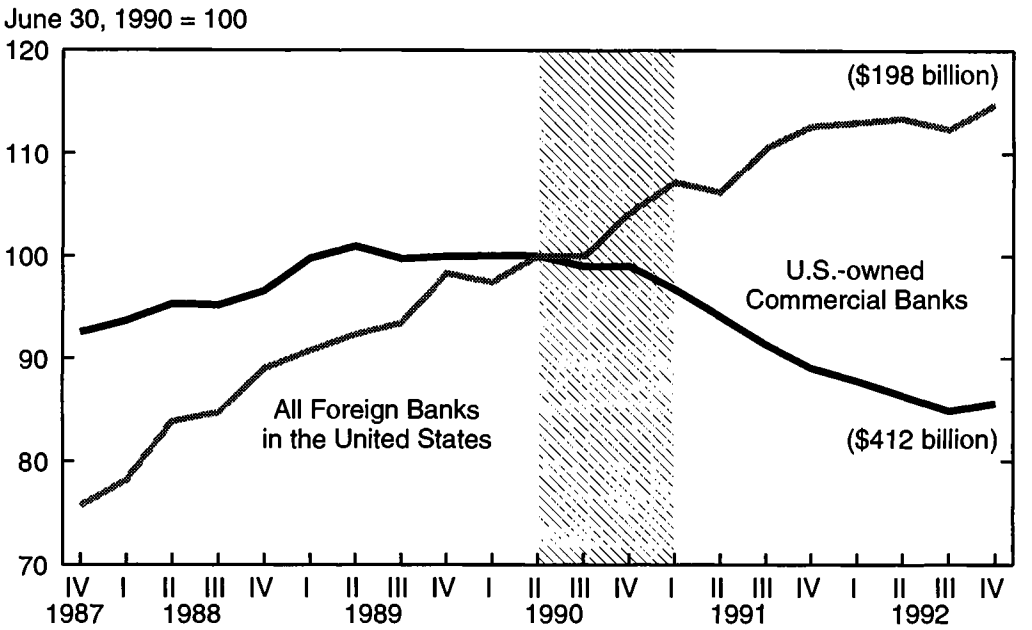
Even after institutional differences are taken into account, all foreign banks did not behave homogeneously. The difference in behavior is most easily observed by dividing banks into two categories, those whose home country banks as a group expanded their total U.S. corporate loan portfolio after the start of our recession and those whose home country banks as a group decreased their portfolio. We shall term these categories "positive growth" banks and "negative growth" banks, respectively.

[6] For a summary of the different institutional types, their functions and their relative importance, see Rama Seth, "Foreign Banks' Contribution to Excess Capacity," FRBNY memo, November 1992.

[7] Ronald Johnson notes this difference in "The Bank Credit 'Crumble,'" Federal Reserve Bank of New York *Quarterly Review*, Summer 1991.

[8] See Seth and Quijano, "Japanese Banks' Customers in the United States," Federal Reserve Bank of New York *Quarterly Review*, Spring 1991; and Seth, "Excess Capacity."

Chart 1: Commercial and Industrial Loan Growth by U.S. and Foreign-Owned Banks



Source: Federal Financial Institutions Examination Council, Reports of Condition.
Notes: Tick marks refer to the end of the quarter. The numbers in parentheses are the values of commercial and industrial loans as of the end of 1992. All foreign banks include U.S. branches and agencies and subsidiaries of foreign banks.

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Table 1: Lending of Banks by Institutional Type and Pattern of Growth

Growth of Commercial and Industrial Loans from June 30, 1990, to September 30, 1992 (Percent)

	Domestically Owned Domestic Banks	Subsidiaries of Foreign Banks	Branches and Agencies of Foreign Banks
Total	-3.03	-11.58	15.78
Positive growth	31.88	23.73	126.04
Negative growth	-25.66	-14.10	-7.21

Breakdown by Commercial and Industrial Loans as of September 30, 1992

	Domestically Owned Domestic Banks	Subsidiaries of Foreign Banks	Branches and Agencies of Foreign Banks
Total (billions of dollars)	400.7	41.6	132.4
Positive growth (percent of above total)	52.86	9.33	33.68
Negative growth (percent of above total)	47.14	90.67	66.32

Breakdown by Number of Banks as of September 30, 1992

	Domestically Owned Domestic Banks	Subsidiaries of Foreign Banks	Branches and Agencies of Foreign Banks
Total (number of banks)	11,201	139	522
Positive growth (percent of above total)	50.17	13.67	53.83
Negative growth (percent of above total)	49.83	86.33	46.17

Source: Federal Financial Institutions Examination Council, Reports of Condition.

Notes: The definition of positive and negative growth bank depends on the type of bank. For subsidiaries and branches and agencies, all the banks were grouped by the country of their owners. Then each bank was classified by whether the banks from the home country as a whole increased or decreased commercial and industrial loans to the United States from June 30, 1990, to September 30, 1992. For domestically owned banks, the classification was done by the growth in each individual bank's loans over the same period. This means that the statistics of domestically owned banks are those in existence over 1990-92 (a constant sample), while this is not necessarily true for foreign-owned banks. The total figures for domestically owned banks exclude those not in the constant sample. The total figures for foreign banks exclude banks from countries that did not maintain a continual presence in the U.S. from 1990-92. The positive growth subsidiaries exclude the expansion in holdings by a Spanish bank in First Fidelity Inc. in the first quarter of 1991. This expansion caused the banks controlled by First Fidelity to be counted as subsidiaries. The positive growth branches and agencies exclude the New York branch of the Union Bank of Switzerland in the New York and Atlanta agencies of the Bank of Nova Scotia. These entities had disproportionately large increases in loans.

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The resemblance of subsidiaries to domestic banks remains when banks are grouped according to this scheme. The increase in lending by branches and agencies of foreign banks that grew far exceeds that of growing domestic banks or the small group of growing subsidiaries. By the same token, the branches and agencies that contracted reduced their lending less than a similar group of subsidiaries and domestic banks (Table 1).[9]

Indeed, one could argue that subsidiaries conform more closely to the stereotype of domestic banks than do domestic banks themselves. A far smaller percentage of subsidiaries, both by number of banks and share of loans, showed positive growth than either the branches and agencies or the domestic banks. Growing subsidiaries account for less than 10 percent of all foreign bank subsidiaries, by value of commercial and industrial loans or by number of banks.

Another revelation of this grouping[10] is that a higher percentage of U.S.-owned banks than of branches and agencies increased their lending if the value of such lending is used as the measure. Roughly half of the U.S.-owned banks, by value of loans, fell into the positive growth group, while only a third of foreign bank branches and agencies fell into this group (Table 1 and Chart 2). Even if we calculate the percentage according to the number of banks, branches and agencies that grew did not much exceed domestic banks that grew. By contrast, as pointed out earlier, the percentage of subsidiaries that grew was very small.

In each of the two growth categories that we have defined, individual countries have had wide-ranging growth rates in the corporate credit extended by their banks. Germany, Australia, Canada, and France are among the countries that fall into the positive growth group, while Japan, the United Kingdom, and Italy fall into the negative growth group. An appendix table details the growth in corporate loans by banks from each country during several periods.

Foreign bank commitment to the U.S. market appears much larger if we add the asset-backed commercial paper sponsored by foreign banks to their direct lending to U.S. corporations. This type of "lending" is capital economizing and is engaged in most by the least capitalized U.S. banks. If we factor in the commercial paper sponsored by Japanese banks, one group of banks for which we have the data, the results are indeed striking. Although six of ten of these banks decreased their commercial and industrial loans, their total commitment to the U.S. market can be said to have increased if we include the asset-backed commercial paper that they sponsored (Chart 3). Data limitations, however, force us to exclude this aspect of foreign bank "lending" in the analysis that follows.

Foreign banks also lend to U.S. corporations by booking loans outside the United States. A previous study concluded that these loans formed a substantial part of the total growth in lending by foreign banks (see Chart 4).[11] More recently, however, such lending has not grown as quickly because the need to circumvent reserve requirements no longer motivates banks to book loans through offshore centers. Again because of data limitations, we will not include these loans in the analysis below.

[9] The figures in Table 1 exclude the subsidiaries that were formed as a result of takeovers by a Spanish acquirer. These banks were all part of the same holding company— First Fidelity— and their inclusion tends to skew our results a great deal. When these subsidiaries are included, lending growth by positive growth subsidiaries increases to a phenomenal 136 percent over the period. As a consequence, subsidiaries appear to resemble branches and agencies rather than the domestic banks. But because so few subsidiaries show positive growth, we chose to highlight their similarity to domestic banks in this instance also.

[10] It is commonly believed that foreign banks continued to lend as domestic banks cut back during the credit slowdown in the United States.

[11] See Robert N. McCauley and Rama Seth, "Foreign Bank Credit to U.S. Corporations: The Implications of Offshore Loans," Federal Reserve Bank of New York *Quarterly Review*, vol. 17, no. 1 (Spring 1992).

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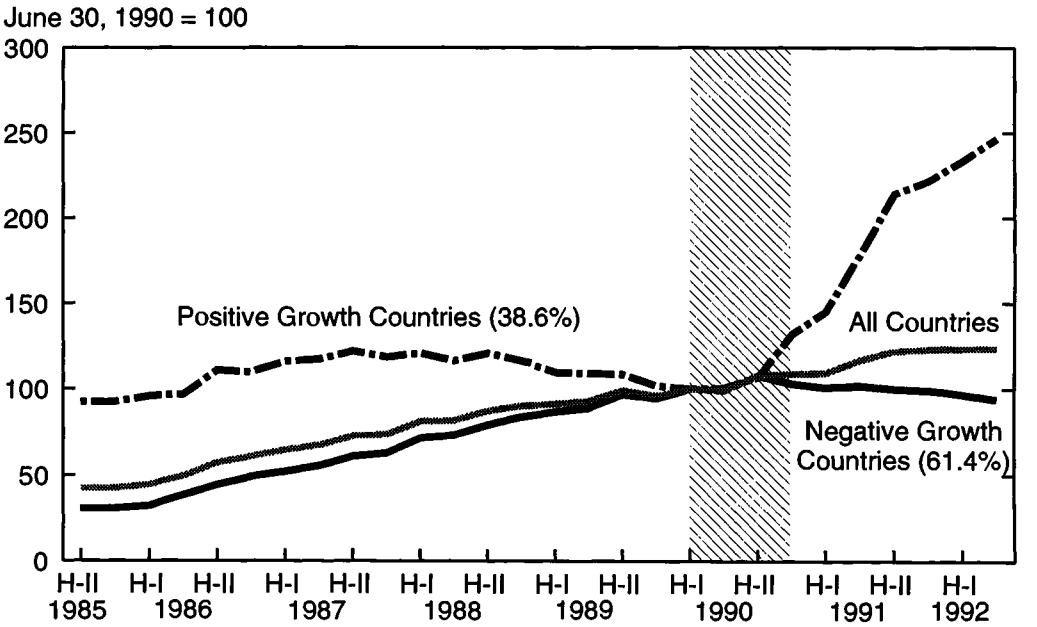
III. Mean Attributes

Studies of domestic banks have shown a connection between particular attributes of banks and banks' lending behavior. If applied to foreign bank lending in the United States, the findings of these studies would suggest that, ceteris paribus, banks from countries that increased credit would likely have better asset quality and a stronger capital base than banks from countries that retrenched credit in the United States. In addition, demand considerations would suggest that positive (U.S. credit) growth groups would exhibit generally weaker output growth relative to the United States than would negative growth groups. We would also expect these relatively buoyant growth conditions to be reflected in interest rates, so that positive growth countries would generally offer relatively lower lending rates.

We find that some of the attributes of positive and negative growth groups conform to expectations (Table 2). The asset quality of the positive growth group of banks was superior to that of the negative growth group. For branches and agencies and (to a lesser extent) the subsidiaries of foreign banks, the ratio of problem loans to total corporate loans was higher for banks from negative growth countries than for banks from positive growth countries.

Contrary to expectations, however, the average capital ratio of the parents of branches and agencies of banks from positive growth countries was lower than that of the parents of branches and agencies from negative growth countries. A similar pattern was observed for the subsidiaries: the average capital ratio of the subsidiaries of banks from positive growth countries was lower than that of the subsidiaries of banks from negative growth countries. In a later section, we note that even after controlling for other factors, this pattern still holds for the subsidiaries. The similarity between branches and agen-

Chart 2: Commercial and Industrial Loans by Branches and Agencies of Foreign Banks



Source: Federal Financial Institutions Examination Council, Reports of Condition.
Notes: Banks are grouped by whether commercial and industrial loans from all the banks in each country grew after the start of the recession. Tick marks signify the end of the period. Percents indicate share of loans by all countries as of the end of September 1992.

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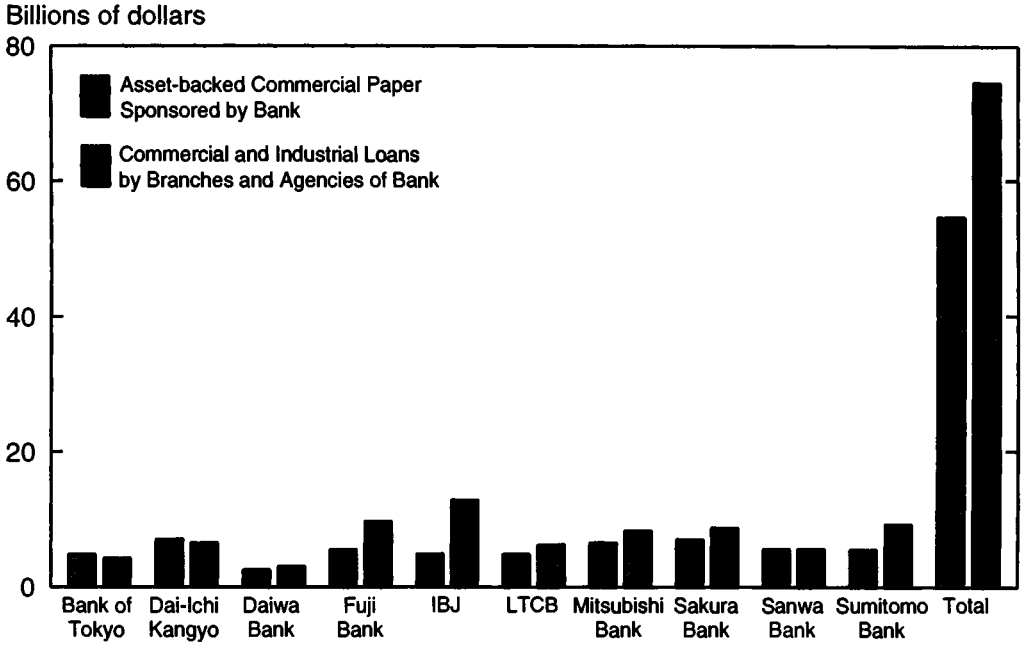
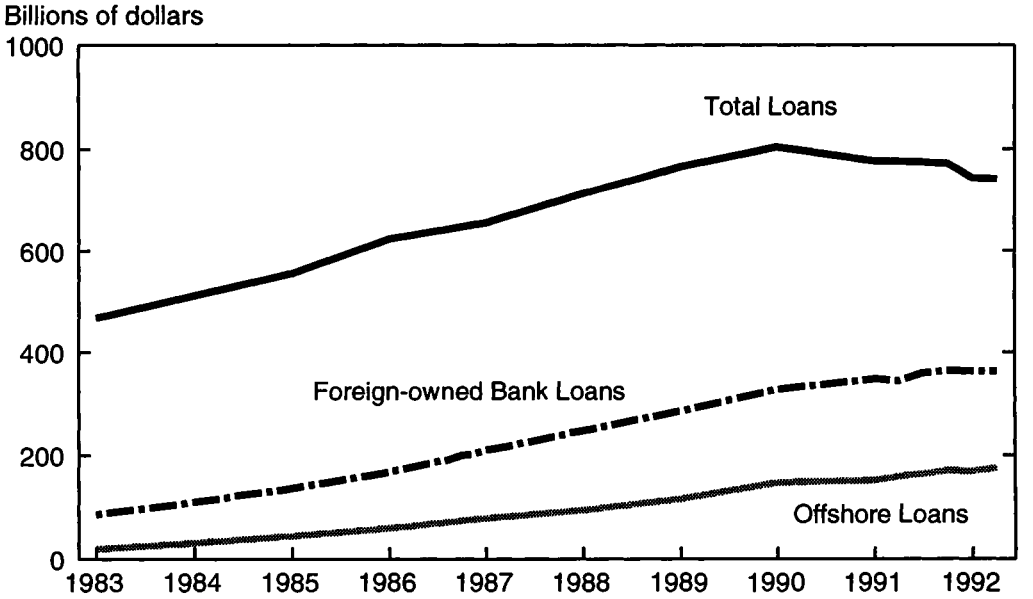
Chart 3: Lending to United States by Japanese Banks



Sources: Federal Financial Institutions Examination Council, Reports of Condition; *Asset Sales Report.*
Note: Bar on the left shows C&I loans as of June 30, 1990. The bar on the right shows the amount of loans as of September 30, 1992, and asset-backed CP as of mid-1993.

Chart 4: Bank Lending to U.S. Corporations



Sources: Bank for International Settlements; Federal Financial Institutions Examination Council, Reports of Condition; Federal Reserve Form 2502; Federal Reserve Form 2951; Federal Reserve Bulletin, Statistical Table 4.3; FRBNY staff estimates.
Note: Tick marks refer to the end of the year.

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Table 2: Attributes of Positive and Negative Growth Countries
Weighted Averages

	Bad Loan Proportion Average (Percent)	Average Capital Ratio (Percent)	Logarithmic Growth in GDP	Difference in Interest Rate (Percent)
Branches and agencies				
Positive growth	6.34	8.53	0.011	-1.46
(Regression)	7.17	8.53	0.003	-1.91
Australia	7.46	10.40	0.006	-8.25
Canada	7.71	8.81	-0.020	-2.75
France	6.89	7.46	0.015	-0.25
Germany	8.03	8.65	0.056	-1.87
Hong Kong	5.43		0.316	
Israel	5.08			
Korea	7.67			
Netherlands	6.06		0.041	-1.75
Switzerland	2.65	11.40	0.018	2.08
Negative growth	6.47	8.71	0.042	1.26
(Regression)	6.48	8.71	0.043	1.29
Italy	5.23	7.06	0.016	-3.68
Japan	6.11	8.79	0.047	1.98
Spain	3.02	11.91	0.035	-5.94
United Kingdom	22.16	9.05	-0.01	-4.00
Subsidiaries				
Positive growth	4.59	9.41	0.035	-5.94
(Regression)	6.36	10.50	0.004	-5.94
Spain	6.36	10.50	0.035	-5.94
Negative growth	7.91	9.89	0.026	-0.34
(Regression)	6.83	9.76	0.025	-0.34
Canada	3.07	11.57	-0.020	-2.75
France	3.51	7.94	0.015	-0.25
Hong Kong	13.1	8.36	0.032	
Israel	15.08	11.27		
Italy	6.16	12.12	0.016	-3.68
Japan	5.80	10.68	0.047	1.98
Korea	3.81	13.94		
Netherlands	2.45	10.97	0.041	-1.75
Switzerland	3.69	10.60	0.018	2.08
United Kingdom	10.90	7.23	-0.01	-4.00

Sources: Federal Financial Institutions Examination Council, Reports of Condition and Income; International Banking and Credit Analysis; Bank for International Settlements; International Monetary Fund.

Notes: All averages are weighted by the amount of commercial and industrial loans outstanding for each bank as of June 30, 1990. The aggregate figures for difference in interest rates and growth in GDP are weighted by the amount of C&I loans for each country. The bad loan proportion for all banks includes loans not accruing or more than ninety days past due. The proportion for subsidiaries also includes net charge-offs. The capital ratio for branches and agencies is that of the parent bank, while the capital ratio for subsidiaries is that of the actual subsidiary. The bad loan proportions shown are as of the end of 1991, while the capital ratios and difference in interest rates (U.S. capital ratios and differences in interest rates [U.S. prime rate - foreign country lending rate]) are shown for the end of 1990. The logarithmic growth in GDP is over 1990. A country is identified as positive growth or negative growth on the basis of its banks' growth in lending from June 30, 1990, to September 30, 1992. All banks from a particular country are assigned to the same category, irrespective of the growth in loans from a particular bank.

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cies on the one hand and subsidiaries on the other is surprising since subsidiaries are thought to resemble domestic banks and capital strength has been shown to be an important determinant of loan growth in the case of U.S.-owned banks.

Demand factors in the home country appear to be important in determining U.S. lending by branches and agencies but not that by subsidiaries. The group of branches and agencies exhibiting negative credit growth had a relatively higher home country output growth than did the positive growth group. This finding suggests that higher output growth in the home country led to some reallocation of the portfolio away from the United States and probably toward the home country. Conversely, the negative growth group of subsidiaries had relatively lower home country growth, suggesting that home country demand was not a strong influence on lending by the subsidiaries.

The relative differences between interest rates in negative and positive growth countries also seem puzzling. Banks from countries that had lending rates higher than those in the United States lent more in the United States regardless of the institutional form of the banks. This result does not hold, however, when other determinants of U.S. lending are controlled for in a later section.

Comparing Foreign and Domestic Banks

Comparing the mean attributes of the different types of banks, we find little evidence that supply-side factors are significant determinants of foreign bank lending in the United States. In particular, if we compare U.S. banks with the group of foreign banks from countries that continued to extend credit, we observe that the difference in growth is not supported by the differences in asset quality (Table 3). In most cases even the signs are wrong. That is, the group of banks that grew rapidly had the poorer portfolio. Indeed, the most striking negative result is that branches and agencies of foreign banks increased their lending significantly more than the smaller domestic banks although the asset quality of their parents was significantly worse than that of these domestic banks. Moreover, while the asset quality of parent banks did not differ significantly from that of the larger domestic banks, the growth in their branches and agencies was significantly higher. Only in one comparison—large U.S. banks and subsidiaries of foreign banks—was the sign in the expected direction: that is, subsidiaries that grew faster than the large domestic banks also had the better asset quality. Nevertheless, neither the loan growth difference nor the asset quality difference was significant.

Slicing the same groups of banks according to their capital strength leads to similar conclusions. Where the differences in loan growth were significant, differences in asset quality were not and vice versa. Indeed, very often the signs were contrary to expectations. That is, even after capital strength was held constant, the more rapidly growing foreign banks often had the worst asset quality. In particular, branches and agencies of those positive growth banks that were more weakly capitalized grew significantly faster than the more weakly capitalized U.S. banks—both small and large (Table 4). These parent banks, however, had a weaker balance sheet than either group of domestic banks. Similarly, the branches and agencies of the better capitalized parents grew more than either the small or large domestic banks although their asset quality was worse. Note, however, that in three of the four comparisons just made, the loan growth differed significantly for the two groups but the asset quality did not, and in the remaining comparison neither difference was statistically significant. These comparisons suggest that the perverse result that we observed earlier is less strong once we control for capital strength.

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Comparing Foreign Banks

Conclusions similar to those above emerge when we compare foreign banks grouped according to both institutional type and capital strength. In general a close relationship between loan growth, asset quality, and capital strength is not borne out (Table 5). In particular, we find a significant difference in growth between the more weakly capitalized branches and agencies that showed positive growth and those that showed negative growth, but no significant difference in asset quality between these two groups. A perverse result that emerges is that the negative growth branches and agencies with a weaker capital base contracted less than those with the stronger capital base. By contrast, the behavior of well-capitalized branches and agencies is consistent with expectations—banks with the better asset quality also had significantly stronger loan growth.

The descriptive analysis of the influence of capital strength and of asset quality can control for other factors only in a very limited way. To overcome this limitation, we will

Table 3: Comparison of Mean Attributes of Banks
Difference in Weighted Means of the Two Groups: Domestic Banks minus Foreign Banks
(Foreign Banks from Countries with an Expanding C&I Portfolio)

Logarithmic Growth of Commercial and Industrial Loans from 1990 to 1992

Foreign Banks from Countries with an Expanding C&I Portfolio	Domestic Banks	
	Small Banks	Large Banks
Subsidiaries	-28.50 (-1.16)	-23.06 (-0.93)
Branches and agencies	-63.05 (-4.54) ***	-57.51 (-4.03) ***

Bad Loan Proportion as of the End of 1991 (Percent of Loans Past Due 90+ Days or Not Accruing)

Foreign Banks from Countries with an Expanding C&I Portfolio	Domestic Banks	
	Small Banks	Large Banks
Subsidiaries	-0.88 (-0.47)	1.12 (0.56)
Branches and agencies	-3.87 (-2.57) ***	-1.77 (-1.14)

Source: Federal Financial Institutions Examination Council, Reports of Condition.

Notes: Comparison is based on bank-specific (as opposed to country-specific) data. A bank is categorized according to aggregate commercial and industrial loan growth by all banks from its home countries. Numbers in parentheses are t-statistics. The cutoff for big banks is $1 billion in assets as of the end of 1991. Variances are assumed to be not equal. The means are weighted by the amount of commercial and industrial loans outstanding at the start of the recession. A constant sample of banks is used in computing the data for this table.

* Means are significantly different at the 10 percent level.
** Means are significantly different at the 5 percent level.
*** Means are significantly different at the 1 percent level.

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Table 4: Comparison of Mean Attributes of Banks
Difference in Weighted Means of the Two Groups: Domestic Banks minus Foreign Banks
(Foreign Banks from Countries with an Expanding C&I Portfolio)

Logarithmic Growth of Commercial and Industrial Loans from 1990 to 1992

Foreign Banks from Countries with an Expanding C&I Portfolio	Domestic Banks			
	Small Banks		Large Banks	
	Low Capital Ratio	High Capital Ratio	Low Capital Ratio	High Capital Ratio
Subsidiaries				
Low capital ratio	-73.68 (-1.51)		-53.53 (-1.10)	
High capital ratio		4.67 (0.43)		13.41 (1.19)
Branches and agencies				
Low capital ratio	-90.40 (3.29) ***		-70.16 (-2.57) **	
High capital ratio		-65.37 (-1.90) *		-56.62 (-1.64)

Bad Loan Proportion as of the End of 1991 (Percent of Loans Past Due 90+ Days or Not Accruing)

Foreign Banks from Countries with an Expanding C&I Portfolio	Domestic Banks			
	Small Banks		Large Banks	
	Low Capital Ratio	High Capital Ratio	Low Capital Ratio	High Capital Ratio
Subsidiaries				
Low capital ratio	2.79 (4.55) ***		2.77 (3.10) ***	
High capital ratio		-2.44 (-0.63)		-1.52 (-0.39)
Branches and agencies				
Low capital ratio	-3.47 (-1.05)		-3.48 (-1.04)	
High capital ratio		-2.35 (-0.98)		-1.43 (-0.59)

Sources: Federal Financial Institutions Examination Council, Reports of Condition; International Banking and Credit Analysis.

Notes: Comparison is based on bank-specific (as opposed to country-specific) data. A bank is categorized according to aggregate commercial and industrial loan growth by all banks from its home countries. Numbers in parentheses are t-statistics. The cutoff for big banks is $1 billion in assets, and the cutoff for the high capital ratio is 9 percent. The cutoffs are for the end of 1990 for capital ratios, and for the end of 1991 for assets. Variances are assumed to be not equal. All subsidiaries and domestic banks are included in the table, but only branches and agencies from countries whose parent banks disclose capital ratios are included. The means are weighted by the amount of commercial and industrial loans outstanding at the start of the recession. A constant sample of banks is used in computing the data for this table.

* Means are significantly different at the 10 percent level.
** Means are significantly different at the 5 percent level.
*** Means are significantly different at the 1 percent level.

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Table 5: Comparison of Mean Attributes of Country Groupings of Banks
Difference in Weighted Means of the Two Groups (Column minus Row)

Logarithmic Growth of Commercial and Industrial Loans from 1990 to 1992

	Branches and Agencies			
	Positive Growth		Negative Growth	
	Low Capital Ratio	High Capital Ratio	Low Capital Ratio	High Capital Ratio
Branches and agencies				
Low capital ratio				
Negative growth	80.31 (2.05) **			-54.38 (-2.24) *
Positive growth		41.59 (0.61)	-80.31 (-2.05) **	
High capital ratio				
Positive growth	-41.59 (-0.61)			-176.26 (-2.92) **
Negative growth		176.26 (2.92) **	54.38 (2.24) *	
Subsidiaries, negative growth				
Low capital ratio			11.04 (0.86)	
High capital ratio				-37.06 (-1.47)

Bad Loan Proportion as of the End of 1991 (Percent of Loans Past Due 90+ Days or Not Accruing)

	Branches and Agencies			
	Positive Growth		Negative Growth	
	Low Capital Ratio	High Capital Ratio	Low Capital Ratio	High Capital Ratio
Branches and agencies				
Low capital ratio				
Negative growth	-0.63 (0.10)			3.49 (0.36)
Positive growth		-2.91 (-0.94)	0.63 (-0.10)	
High capital ratio				
Positive growth	2.91 (0.94)			7.03 (0.91) *
Negative growth		-7.03 (-0.91) *	-3.49 (-0.36)	
Subsidiaries, negative growth				
Low capital ratio			-1.32 (-0.14)	
High capital ratio				4.45 (0.55)

Sources: Federal Financial Institutions Examination Council, Reports of Condition; International Banking and Credit Analysis.

Notes: Comparison is based on bank-specific (as opposed to country-specific) data. A bank is categorized according to aggregate commercial and industrial loan growth by all banks from its home country. The means are weighted by the amount of commercial and industrial loans outstanding at the start of the recession. Numbers in parentheses are t-statistics. The cutoff for the high capital ratio category is 9 percent as of the end of 1990. Variances are assumed to be not equal. All subsidiaries are included in this table, but only branches and agencies from countries that disclose parent bank capital ratios are included.

* Means are significantly different at the 10 percent level.
** Means are significantly different at the 5 percent level.
*** Means are significantly different at the 1 percent level.

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introduce an equation that controls for many factors simultaneously, but first we offer a simple capital adequacy model.

IV. Capital Adequacy

This section offers a direct test of the hypothesis that capital strength determined the rate of expansion of foreign banks. Recent literature on the credit crunch has argued that capital adequacy contributed importantly to the downsizing of balance sheets by domestic banks in recent years.[12] The onset of the BIS era has drawn attention to the risk-adjusted capital ratios at banks. In an effort to establish uniform capital standards across banks from different countries, the Basle capital regulations have stipulated that banks attain a risk-adjusted capital ratio of at least 8 percent. To achieve these standards, banks with low ratios can either raise capital or, in the face of difficult stock market conditions, reduce growth.

The simple reduced-form model that we test takes the following form:

$$C_{it} = a + bk_{it},$$

where

C = log change in C&I loans,
k = risk - adjusted capital ratio,

and the subscripts

$_i$ = bank i
$_t$ = time t.

A few points should be noted. First, both the capital ratio and loan growth are bank-specific variables. Second, we run two sets of regressions, the first using the actual capital ratio, labeled CAPRATIO, and the second using a dummy variable, CAPDUM, that is equal to one if the risk-adjusted capital-asset ratio is greater than or equal to nine.[13] Third, the growth in commercial and industrial loans is computed over the recession—1990-II through 1991-I—and the end-1990 capital ratio is used. The regressions thus represent a pure cross-section analysis. Finally, we run a set of regressions for both branches and agencies and subsidiaries using country dummies to control for country-specific factors.

Results of these regressions, reported in Table R-1, confirm the view that capital adequacy was not a significant determinant of foreign bank loan growth. The capital ratio is significant and of the right sign in only one regression for the branches and agencies that uses the actual capital ratio and does not control for country-specific factors. This regression, however, has very low explanatory power. Once country dummies are in-

[12] See, for example, Richard F. Syron, "Are We Experiencing a Credit Crunch?" Federal Reserve Bank of Boston, *New England Economic Review*, July/August, pp. 3-10; Joe Peek and Eric Rosengren, "The Capital Crunch in New England," Federal Reserve Bank of Boston, *New England Economic Review*, May/June 1992, pp. 21-31; Ronald Johnson, "The Bank Credit 'Crumble'"; and Ben S. Bernanke and Cara S. Lown, "The Credit Crunch," Brookings Papers on Economic Activity, 2:1991, pp. 205-47.

[13] We chose nine as the cut-off rather than the BIS-stipulated ratio of eight since almost all banks would otherwise have been in the "high capital ratio" group. We felt that this categorization would not have represented the vulnerability of the capital ratio of many banks to market conditions.

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troduced in the regression, the explanatory power of the regression improves considerably, but the importance of capital strength disappears. These findings suggest that capital strength served as a relatively weak proxy for country-specific factors. In the next section, we explore which country-specific factors mattered most.

V. Country-Specific Factors

This section examines a reduced-form model of foreign bank lending. In addition to the effect of capital strength on credit extended by foreign banks, we examine the effect of asset quality by controlling for several factors. These factors include foreign direct nonbank investment in the United States, the price-earnings ratio, market capitalization of the home-country[14] stock market, growth in real GDP in the United States as well as in the home country, the difference in lending rates between the United States and the home country, bank loans to all U.S. nonbanks booked in the home country, and last period's growth in commercial and industrial loans of the bank in question. As in the previous section, we run the regressions separately for the two institutional types—branches and agencies, and subsidiaries. In addition, we extract the positive growth group to identify the determinants of lending of the group of foreign banks that differed in their credit behavior from U.S.-owned banks.

In addition to capital strength as defined in the last section, we examine the role played by credit quality. Poor asset quality has largely resulted from a combination of bank exposure to real estate loans and rapidly declining real estate values. In our regres-

[14] Home country refers to the country of domicile of the parent of the foreign bank.

Table R-1: Regression over Commercial and Industrial Loan Growth

	Branches and Agencies				Subsidiaries			
	Without Country Dummies		With Country Dummies		Without Country Dummies		With Country Dummies	
INTERCEPT	-0.03 (-1.0)	-0.75 *** (3.3)			-0.04 (-1.6)	0.01 (.5)		
CAPRATIO		0.08 *** (3.2)		0.03 (1.2)		-0.00 * (-1.8)		-0.01 ** (-2.5)
CAPDUM	0.04 (0.6)		0.02 (0.3)		-0.00 (0.1)		-0.04 (-1.0)	
F	0.3	10.4 ***	6.0 ***	6.1 ***	0.0	3.4 *	3.4 ***	3.7 ***
R-Square	0.00	0.04	0.31	0.32	0.0	0.02	0.50	0.53
Adj. R-Square	-0.00	0.04	0.26	0.26	-0.0	0.02	0.36	0.38

INTERCEPT Intercept
CAPRATIO Actual Capital Ratio
CAPDUM Dummy variable=1 if capital ratio is greater than or equal to 9, else variable=0

Notes: Capital ratio is for the end of 1990. Commercial and industrial loan growth is from June 30, 1990, to March 31, 1991.

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sions, we use the percentage of loans not accruing or past due ninety days or more, BADPROP, to proxy for the extent of bad loans in each bank's portfolio. We expect a negative sign for the coefficient of BADPROP because the more numerous the bad loans, the poorer the asset quality and the slower we expect loans to grow.

The literature on foreign bank activity in the United States has frequently tied the growth of foreign banks to the servicing of home country clients.[15] This servicing of home clientele would suggest a positive sign on the coefficient of foreign direct investment capital flows, FDIFLOW, to the United States from the home country of the foreign bank.

It has been argued elsewhere that the willingness of foreign investors to accept lower returns than do U.S. investors has probably been the most important determinant of foreign bank growth in the United States.[16] To examine the effect of differences in cost of equity on the growth of foreign banks, we include the price-earnings ratio of the stock market, PERATIO, in the home country of the foreign bank. The lower the price-earnings ratio, the lower the cost of equity, and the greater we can expect the foreign bank expansion to be. Thus we expect the sign on this coefficient to be negative.

Wealth effects may also affect foreign bank activity. For home country investors, more wealth should create greater demand for all instruments, assuming the investor's portfolio is appropriately diversified, and should lead to greater direct foreign investment, including investment in foreign banking. It has been pointed out that "greater fund availability" by foreign banks could account for their growing presence.[17] It is possible that wealth effects underlie this argument. These wealth effects would suggest a positive coefficient on market capitalization or MARKCAP.

A demand factor that has been included in studies on domestic banks is the growth in real gross domestic product (GDP). Stronger domestic growth, termed USGDP in our regressions, has been found to increase the demand for credit from domestic banks. By the same token, the growth in real GDP of the home country of the foreign bank could be an important demand factor in determining credit in that country. It follows that all things being equal, the slower the growth in real GDP in the foreign bank's home country, FORGDP in our regressions, the more rapid the bank's expansion of credit abroad, in particular credit to the United States.[18]

Differences in lending rates between the home country of the foreign bank and the United States, adjusted for expected movements in the exchange rate, are also likely to affect foreign bank growth in the United States. Differing GDP growth rates for the two

[15] At least as early as 1979, a study by the General Accounting Office suggested that among the reasons for the influx of foreign banks into the United States was the "following by foreign banks of foreign business to the United States." See Comptroller General of the United States, General Accounting Office (1979, p. 3). Also see Clifford A. Ball and Adrian E. Tschoegl, "The Decision to Establish a Foreign Bank Branch or Subsidiary: An Application of Binary Classification Procedures," *Journal of Financial and Quantitative Analysis*, vol. 17, no. 3 (September 1982), pp. 411-24; Lawrence G. Goldberg and Anthony Saunders, "The Determinants of Foreign Banking Activity in the United States," *Journal of Banking and Finance*, vol. 5 (1981), pp. 17-32; Charles W. Hultman and Randolph McGee, "Factors Affecting the Foreign Banking Presence in the United States," *Journal of Banking and Finance*, vol. 13, no. 3 (July 1989), pp. 383-96.

[16] McCauley and Seth, "Foreign Bank Credit to U.S. Corporations." See also Steven A. Zimmer and Robert N. McCauley, "Bank Cost of Capital and International Competition," Federal Reserve Bank of New York *Quarterly Review*, vol. 15 (Winter 1991), pp. 35-59.

[17] Gary C. Zimmerman, "The Growing Presence of Japanese Banks in California," Federal Reserve Bank of San Francisco *Economic Review*, Summer 1989, pp. 3-17.

[18] We are assuming that, at least over the period of analysis, foreign banks face an inelastic supply of capital.

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countries constitute one factor explaining the interest rate differentials but not the only factor. We therefore include in the regressions differences in lending rates, DIFFINT, adjusted for exchange rate changes, EXCHANGE. It should be noted that we do not restrict the coefficient to be identical for the rate differential and exchange rate changes.

Foreign banks lend to U.S. corporations both by booking loans onshore and by booking them offshore.[19] In examining the factors determining growth in loans booked by foreign banks onshore, we would have to control for the loans they booked offshore. The two types of loans could conceivably be substitutes or complements. If the loans are substitutes, foreign banks would book fewer onshore loans if their offshore book was increasing rapidly. This situation would arise if, say, it was more cost effective to borrow abroad and lend offshore. If the loans are complements, these banks would be increasing their onshore book at the same time that their offshore book was increasing. Since bank-specific data are not available for offshore loans, we include in our regressions all bank flows to nonbanks in the United States from the home country of the bank in question—BISFLOW. Finally, to capture a possible adjustment factor, we include the past period's growth in commercial and industrial loans by the foreign bank—OLDCIGRO. This variable incorporates the idea that foreign banks are seeking a "target" market share. The faster the growth in previous periods, the slower the current growth has to be to adjust to this desired share level.

Incorporating the above variables in Equation 1, we test the following reduced-form equation:

$$C_{it} = f(\underset{+}{k_{it}}, \underset{-}{q_{it}}, \underset{+}{W_{jt}}, \underset{-}{COE_{jt}}, \underset{+}{FDI_{jt}}, \underset{+}{GDP_t^{US}}, \underset{-}{GDP_t^j}, \underset{+}{(i_t^{US} - i_t^j)}, \underset{-}{e_t^j}, \underset{?}{OL_t^j}, \underset{-}{C_{it-1}}),$$

where

C = log change in C&I loans
k = risk - adjusted capital ratio (or a dummy)
q = percent of total loans 90 days past due and not accruing (and also charged off, in the case of subsidiaries)
W = total stock market capitalization
p = price - earnings ratio of the stock market
FDI = foreign direct investment capital flows into the United States
GDP = log change in real GDP
i = bank lending rate
e = exchange rate (foreign currency per U.S. dollar)
OL = cross-border bankflows to U.S. banks

and the subscripts

$_i$ = bank i
$_j$ = home country j of bank i
$_t$ = time t

and the superscript

^{j} = home country of bank i.

[19] McCauley and Seth, "Foreign Bank Credit and U.S. Corporations."

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VI. Results

The results of the regressions using this model are reported in Table R-2. Although only about 10 percent of the variance is explained, some interesting results emerge. Factors determining foreign bank lending differ across institutional types. Although supply-side factors are generally not very important, capital strength does appear to have been important in determining lending by the positive growth branches and agencies. By contrast, we get a negative but insignificant sign on the capital coefficient for subsidiaries—a surprising finding given the similarity of subsidiaries to domestic banks. Reported asset quality does not emerge as significant in either case.

U.S. demand was important in determining lending by foreign banks but in an unexpected way. The coefficient on U.S. GDP was negative though significant only in the case of branches and agencies. The negative sign suggests that in recessionary circumstances, foreign banks actually increased their lending to U.S. corporations. Earlier studies have shown that domestic banks tightened lending in response to the weak state of the U.S. economy. The market niche exposed by this credit slowdown appears to have been filled by foreign bank credit, probably in a bid by foreign banks to increase their market share in the United States. This inference is supported by surveys that have polled treasurers of large U.S. corporations.[20] The responses indicate that U.S. corporations did indeed shift some of their credit demand to foreign banks as these banks aggressively priced their loans, probably in order to increase their market share.

The positive growth branches and agencies seem to have diverted some of their loans' booking to the United States from overseas branches, including those in offshore centers. This diversion of loans to the United States was to be expected once reserve requirements, considered a primary determinant of the rapid growth in offshore loans, were reduced to zero. In addition, higher U.S. lending rates relative to home country rates adjusted for exchange rate expectations also provided an impetus to lending by this group.

Market share considerations may also have prompted lending by the small group of subsidiaries that increased credit during the recent recession. The only variable that has a significant coefficient is the "adjustment factor variable." The lower the previous period's growth, the faster this group of subsidiaries grew. One interpretation is that if the subsidiaries had been expanding slowly in one period, their market share could only be made up in the next period by expanding more rapidly.

We offer some cautions about our findings in this paper. The first is obviously the modest nature of these results, and the second is that the group of subsidiaries that increased credit and for which the results are reported here is extremely small. Two additional cautions apply particularly to our results for the branches and agencies of foreign banks, which form roughly two-thirds of all foreign banks in the United States. First, the assets that we are looking at are only part of the global assets of the larger entity to which the branch or agency belongs. Second, the asset quality may be reported according to accounting standards that are not uniform across countries.

VII. Conclusions

Foreign banks as a group expanded lending to U.S. corporations even as domestic banks were cutting back. Across foreign banks, however, differences in lending behavior are evident. Most subsidiaries and two-thirds of the branches and agencies of foreign banks, by value of commercial and industrial loans (just under one-half by number of

[20] These surveys are conducted annually by Greenwich Associates in Connecticut.

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Table R-2: Determinants of Foreign Banks' Commercial and Industrial Loan Growth
Banks from Positive Growth Countries

Variables	Branches and Agencies	Subsidiaries
INTERCEP	0.21 (2.5) ***	-0.27 (-0.2)
USGDP	-1.74 (-1.7) *	-0.13 (-0.1)
FORGDP	-0.39 (-0.4)	-0.53 (-0.1)
CAPDUM	0.08 (2.4) **	-0.01 (-0.2)
DIFFINT	0.02 (2.3) **	0.01 (0.3)
FDIFLOW	-0.00 (-1.5)	0.00 (0.3)
MARKCAP	-0.00 (-1.5)	-0.00 (-0.2)
PERATIO	0.00 (0.0)	0.02 (0.2)
EXCHANGE	-0.52 (-1.8) *	-0.06 (-0.2)
BISFLOW	-0.00 (-2.5) ***	0.00 (0.3)
BADPROP	-0.00 (-1.3)	-0.01 (-1.1)
OLDCIGRO	-0.05 (-1.4)	-0.28 (-3.4) ***
F	(6.8) ***	(1.7) *
R-Square	0.083	0.119
Adj. R-Square	0.070	0.049

Variable Label

INTERCEP	Intercept
USGDP	Log change in U.S. real GDP
FORGDP	Log change in foreign country real GDP
CAPDUM	Variable is 1 if capital ratio is greater than or equal to 9, else variable is 0. For the branches and agencies regression, the capital ratio of the parent bank is used in all cases. For the subsidiaries regression, the capital ratio of the subsidiary as of the end of 1990 is used for all time periods.
DIFFINT	U.S. prime rate - foreign lending rate
FDIFLOW	FDI capital inflows to U.S.
MARKCAP	Market capitalization for stock market of country
PERATIO	P/E ratio for stock market of country
EXCHANGE	Log change in exchange rate
BISFLOW	Capital flows to U.S. nonfinancial firms from the country
BADPROP	Percentage of loans not accruing or past due 90 days or more
OLDCIGRO	Lagged 1-quarter value of C&I loan growth

Notes: The branches and agencies regression begins in 1989 or 1990 (depending on the bank), while the subsidiaries regression begins at the end of 1987. In all cases, the regressions end in the fourth quarter of 1991.

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

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banks), actually decreased lending in tandem with U.S.-owned banks. Nevertheless, the growth in loans from the group of foreign banks that increased credit outweighed the contraction in loans from the group of banks that reduced credit. Moreover, if we include in our consideration the banks' sponsorship of asset-backed commercial paper programs, even those foreign banks that cut back credit may have increased their total commitments to U.S. corporations.

The evidence indicates that the supply-side factors found to be important in determining domestic bank corporate loan contraction have not been equally important determinants of foreign bank lending. In particular, capital strength has affected the group of branches and agencies that increased credit but not subsidiaries that did the same. Reported asset quality did not appear significant in explaining lending by either group.

In the case of branches and agencies, banks that increased credit were motivated by the desire to increase their U.S. market share and by the existence of better lending rates in the United States than in their home country (adjusted for exchange rate expectations). Finally, some of the increased credit probably reflected foreign banks' moves to book loans onshore that they had previously booked offshore as reserve requirements in the United States were reduced to zero.

Market share considerations probably also explain the lending behavior of the small group of subsidiaries that increased credit. The slower the credit growth in one period, the faster the growth in the next. One might infer from this pattern that these foreign banks desired to increase market share. A credit slowdown in one period may thus have been followed in the next by aggressive credit increases designed to give subsidiaries a higher share.

Because we consider only a partial set of assets for branches and agencies of foreign banks and because accounting standards vary across countries, we cannot conclude that supply-side factors were unimportant to foreign banks. Nevertheless, the differing response of the foreign banks was undoubtedly useful: U.S. borrowers may have been able to obtain credit that would not have been available had the banking system been more homogeneous.

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Appendix

Appendix Table: Growth of Commercial and Industrial Loans by Foreign Banks
Categorized by Country (Percent)

	Branches and Agencies		Subsidiaries	
	Growth from 1990-II to 1992-III	Share of B&A Loans 1992-III	Growth from 1990-II to 1992-III	Share of Subsidiary Loans 1992-III
Peru	-93.24	0.00		
U.A.E.	-82.12	0.00	-27.69	0.0
Denmark	-79.85	0.04	-30.95	0.1
Bahrain	-73.34	0.02		
Chile	-66.17	0.00		
Argentina	-60.77	0.0		
Cayman Islands	-51.95	0.01		
New Zealand	-49.12	0.02		
Yugoslavia	-45.93	0.10	-24.62	0.1
India	-44.38	0.12	**35.71**	0.1
Spain	-44.17	0.38	**194.37**	10.1
Panama	-42.14	0.00		
U.K.	-37.61	1.03	-13.93	17.0
Brazil	-37.22	0.11	-22.60	1.9
Ireland	-32.39	0.03	-28.65	2.4
Puerto Rico	-27.31	0.12		
Kuwait	-25.94	0.02		
Greece	-25.31	0.01	-38.63	0.3
Italy	-24.43	3.95	-17.11	0.7
Belgium	-15.61	0.05		
Venezuela	-15.23	0.01	-37.51	0.5
Malaysia	-13.95	0.17		
Jordan	-9.53	0.00		
Japan	-2.31	55.24	-0.52	39.3
Guam	**0.67**	0.00		
Singapore	**2.17**	0.04		
Philippines	**7.03**	0.01	-26.64	0.2
Indonesia	**8.23**	0.15	-20.31	0.7

Source: Federal Financial Institutions Examination Council, Reports of Condition.

Notes: Only countries that were included in the analyses are shown. Excluded countries did not have a branch, agency, or subsidiary with a positive amount of loans on June 30, 1990, or September 30, 1992. Iran and Saudi Arabia were also excluded since they had very small amounts of loans in 1990. An empty cell means that the foreign country did not maintain that kind of foreign bank during the 1990-92 period. Boldface type denotes positive growth.

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Appendix Table: Growth of Commercial and Industrial Loans by Foreign Banks (*Continued*)
Categorized by Country (Percent)

	Branches and Agencies		Subsidiaries	
	Growth from 1990-II to 1992-III	Share of B&A Loans 1992-III	Growth from 1990-II to 1992-III	Share of Subsidiary Loans 1992-III
Austria	**15.45**	0.06		
Germany	**16.13**	1.67		
Thailand	**25.96**	0.07		
Israel	**29.58**	1.11	-30.62	2.6
Korea	**54.59**	1.41	-17.00	0.3
Pakistan	**76.35**	0.01		
China	**80.61**	0.16		
Australia	**90.94**	0.60		
Portugal	**94.08**	0.25	-51.07	0.0
Taiwan	**99.16**	0.62	-40.43	0.1
Egypt	**104.55**	0.00		
Mexico	**110.14**	0.09	-43.43	0.2
Finland	**115.75**	0.69		
Norway	**127.31**	0.44		
Canada	**128.91**	9.46	-16.08	5.7
Hong Kong	**156.61**	1.01	-37.65	6.4
France	**206.22**	7.94	-31.52	0.7
Netherlands	**220.49**	5.47	-57.47	0.6
Switzerland	**279.91**	6.80	-12.32	0.0
Sweden	**435.19**	0.35		
El Salvador			-62.32	0.0
Other Western Europe			-53.12	1.1
Multiple countries			-45.56	3.7
Bermuda			-39.08	0.0
Columbia			-34.91	0.1
Ecuador			-29.30	0.2
Other Caribbean			**57.73**	0.1
Netherlands Antilles			**68.61**	4.6
Dominican Republic			**156.73**	0.0

Source: Federal Financial Institutions Examination Council, Reports of Condition.

Notes: Only countries that were included in the analyses are shown. Excluded countries did not have a branch, agency, or subsidiary with a positive amount of loans on June 30, 1990, or September 30, 1992. Iran and Saudi Arabia were also excluded since they had very small amounts of loans in 1990. An empty cell means that the foreign country did not maintain that kind of foreign bank during the 1990-92 period. Boldface type denotes positive growth.

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Nonbank Lenders and the Credit Slowdown

by Richard Cantor and Anthony P. Rodrigues[1]

Many analyses of the recent slowdown in business credit growth have focused on the decline in commercial and industrial bank loans. In contrast, we examine in this paper the behavior of nonbank business credit, which consists primarily of corporate bonds, commercial paper, and loans from finance companies. Credit availability from nonbank sources began to decline at year-end 1989, particularly for small firms and other borrowers without strong credit ratings. Around that time, the junk bond market collapsed, real estate problems and a recession emerged in New England, and defaults on bonds and commercial paper soared. Over the next three years, the actions of rating agencies, private investors, and regulators encouraged all financial intermediaries—banks, finance companies, and insurance companies—to improve their asset quality, strengthen their capital bases, and limit their balance sheet growth. The relatively smooth functioning of the capital markets during this otherwise turbulent period, however, did reduce the impact of the credit crunch by allowing borrowers with strong credit ratings to obtain funds at reasonable rates. Moreover, the market's ready acceptance of asset-backed securities enabled many hobbled financial intermediaries to reduce their funding and capital needs without dramatically cutting back on loan origination.

During the 1990-91 credit crunch period, nonbank business lending did grow faster than bank loans, but the main causes of the aggregate slowdown do not appear to be limited to problems specific to the banking system. Nonbank credit had already been growing faster than bank credit since the mid-1980s. During the recent crunch period, bank and nonbank business credit growth rates in fact declined by roughly the same amounts and the timings of their decelerations were also very similar. The causes of the credit slowdown must, therefore, include factors that affected nonbank as well as bank sources of credit.

Our paper emphasizes factors that led to a decline in nonbank credit availability, although cutbacks in demand and supply both likely contributed to the credit slowdown

[1] We are particularly grateful to Gary Haberman for his comments and also owe thanks to Akbar Akhtar, Dick Davis, Benjamin Friedman, Cara Lown, Trish Mosser, Mitch Post, Charles Steindel, and John Wenninger. Excellent research assistance was provided by Kin Cheng, Jeanette Donato, Bill LeCates, and Ted Manton.

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and its similarity in appearance across different sources of credit. Credit demand undoubtedly fell due to the weakness in economic activity and to borrower efforts to reduce indebtedness. Contracting credit supply, however, may also explain a substantial portion of the parallel decline in bank and nonbank credit. Our study suggests that capital markets and nonbank financial institutions experienced shocks and stresses that induced a decline in credit supply similar to that observed in the banking industry.[2]

In Section I, we present a summary of our view of the events leading up to the current period of credit stringency, emphasizing developments affecting nonbank sources of business credit and making some comparisons to previous crunches. Section II presents time series evidence on the slowdown in business credit and compares the recent behavior of various nonbank sources of credit to their behavior in previous recessions and crunches. In contrast to past episodes, we find little evidence of a shift from bank to nonbank sources of funds during the current slowdown. We then employ a simple econometric model to test whether the slow growth rates of bank and nonbank credit were quantitatively unusual given their historical relationships with other macroeconomic variables. Here we confirm the similarities, both in terms of magnitude and timing, between the slowdown in bank and nonbank business credit growth. Section III reviews the recent stresses experienced by nonbank financial intermediaries and the fragility visible in parts of the organized credit markets. This evidence suggests that credit availability from nonbank funding sources has constrained some borrowers, particularly firms that are small or rated below-investment grade. We conclude with a review of the role played by the asset-backed securities market in relieving some of the pressures on intermediaries associated with the credit crunch. In the Appendix, we provide a brief review of the major sources of business credit.

I. Overview of Recent Factors Affecting Nonbank Business Credit

The slowing of credit growth that occurred in 1966, 1969, 1974 and 1982 was prompted by a tightening of monetary policy in response to rising inflation. On those occasions, banks and thrifts lost deposits as market rates rose above Regulation Q interest rate ceilings.[3] This disintermediation process led to a contraction in bank loans and thrift mortgages. Business borrowing from nonbank sources generally rose in the beginning of these credit crunches, as firms substituted away from bank loans to commercial paper issuance and other funding sources. Nonbank business lending later fell, though, as credit demand weakened during the ensuing decline in economic activity.

The current recession was also preceded by a sharp contraction in the rate of business borrowing which was greater in real terms than observed in previous credit crunches. This credit slowdown appeared particularly sharp in comparison to the extremely rapid real rates of credit growth experienced during the mid-1980s. Compared to past credit crunches, rising interest rates played a much less significant role in the current episode,

[2] For review of other papers on the bank credit crunch and some independent analysis as well, see see the paper by Cara Lown and John Wenninger in this volume.

[3] The characterization presented above of post-War credit crunches emanates from the writings of Wojnilower and Kaufman in the mid-1960s. A historical review of credit crunches and the related literature is contained in Richard Cantor and John Wenninger, "Perspective on the Credit Slowdown," *Quarterly Review*, Federal Reserve Bank of New York, Spring, 1992-93. Government officials may have also played a direct role in past credit crunches when they pressured banks to maintain a constant prime lending rate while restraining credit growth as part of campaign against inflation. This aspect of credit crunches has been emphasized by Raymond Owens and Stacey Schreft in "Identifying Credit Crunches," Federal Reserve Bank of Richmond, *Review*, 1992.

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as short-term rates fell continuously after reaching a modest peak in early 1989. Moreover, in contrast to previous crunches, most depository institutions did not report unusual liquidity problems. Furthermore, the decline in credit growth was much more evenly distributed across a wide variety of funding sources, including bank loans, below-investment-grade bonds, commercial paper, and finance company loans.

Beginning in 1989, a variety of factors converged to reduce the willingness and ability of both banks and nonbanks to lend to businesses, particularly lower quality credits. The economy's long lasting expansion began to slow and the commercial real estate market soured, weakening the balance sheets of both financial intermediaries and prospective borrowers. In October 1989, the stock experienced a mini-crash and the junk bond market collapsed, putting an end to the M&A/LBO-related activities that had propelled bank and nonbank business credit for much of the decade.

Defaults and bankruptcies began to rise, not only among junk bond issuers, but among the thrifts, life insurers and finance companies that had invested in junk bonds and commercial real estate. The credit rating agencies, reflecting the concerns of investors more generally, increased their scrutiny of financial institutions and issued a rash of rating downgrades in late 1989 and early 1990. At the same time that financial institutions were trying to improve their capital ratios and asset quality, many borrowers themselves decided to strengthen their balance sheets by paying off debt or foregoing planned borrowing.

The financial regulators took aggressive actions to deal with the emerging credit problems and reassure creditors of financial intermediaries. Following the shocking commercial real estate losses announced by New England banks beginning in the Fall of 1989, bank examiners began paying closer attention to the quality of real estate credits across the nation. In mid-1990, following some defaults in the commercial paper market, the Securities and Exchange Commission adopted a rule that limited the amount that money market mutual funds could invest in securities that did not carry the highest possible credit ratings. Around the same time, following several prominent life insurer failures and near-failures, the state insurance regulators adopted rules that discouraged investments in below-investment grade bonds and required greater disclosure and reserves for such bonds.

By early 1990, both banks and finance companies had raised their credit standards, widened their lending spreads, and slowed the rate of growth in business loans.[4] Life insurance companies shifted their investments away from commercial real estate mortgages, junk bonds, and private placement issues of middle market firms to higher quality credits such as investment grade corporate bonds, treasury bonds and mortgage-backed securities. Firms of lower credit quality found borrowing difficult in the long-term credit markets and in the commercial paper market.

Nonfinancial firms with strong credit ratings, however, had uninterrupted access to credit in the money and capital markets—as investment-grade quality yield spreads, both at short and long maturities, remained relatively flat throughout the recession. Junk bond issuance, however, collapsed in late 1989 and the yield spread between above- and below-investment-grade bonds widened dramatically shortly thereafter. Commercial paper issuance, by companies other than those with the highest credit ratings, also shrank in 1990. Yet the market for high quality fixed-income securities remained strong,

[4] Survey evidence that banks tightened credit availability significantly, particularly for small firms, is presented by Kausar Hamdani, Anthony Rodrigues, and Maria Varvatsoulis in this volume. In their annual reports and informal discussions, finance companies executives have stated directly that they raised their credit standards in 1990.

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and many financial intermediaries were able to issue asset-backed securities that relieved, in part, their balance sheet constraints and allowed them to continue lending.

II. Business Credit Growth and Historical Comparisons

In order to understand the effects of the events described in the historical narrative above, we review in this section the quantitative behavior of various sources of business credit before and during the current period of credit stringency. We first document the unusually rapid real growth in business credit during the mid-1980s and highlight the abruptness of the slowdown in credit growth that began in 1989. We then provide a graphical comparison of the recent behavior of various components of total business credit with their behavior in previous credit crunches. When comparing the relative movements of bank and nonbank credit in the early stages of the credit crunches, we find little evidence of a shift from bank to nonbank sources of funds during the current slowdown in contrast to past episodes. In a regression framework, we then confirm the similarities, both in terms of magnitude and timing, between the slowdown in bank and nonbank credit growth.

Overview of Trends in Business Credit Growth

The top panel of Chart 1 displays the annual growth rate of nonfinancial business sector liabilities since 1960. Business credit grew quite rapidly in the mid-1980s and was followed by a substantial credit slowdown at the end of the decade. When measured in nominal terms, however, the growth in the mid-1980s does not appear all that unusual when compared to the late 1960s, mid-1970s, and late 1970s.

This comparison is not particularly meaningful, though, because inflation (as well as the growth in economic activity) was greater in those earlier periods. In order to make the measured growth rates more comparable over time, we have also included in the top panel of Chart 1 the real rate of credit growth. The enormity of the run-up in debt in the 1980s and sharpness of subsequent slowdown becomes much more evident when measured on an inflation-adjusted basis. The sharp rise in leverage and subsequent slowdown is even more apparent in the lower panel of Chart 1 where we have graphed the ratio of total business liabilities to business sector GDP. Here we see that (1) a rising trend in leverage is evident throughout the sample period but it accelerated sharply in the mid-1980s, and (2) the recent slowdown in credit growth has led to a decline in the debt-to-GDP ratio. Despite the recent sharp deceleration in credit growth, the ratio of credit to GDP has fallen only modestly because the growth of GDP also slowed at the same time.

As in previous periods of credit stringency, data that has been aggregated across many funding sources are insufficient to distinguish whether the credit slowdown was primarily the result of supply or demand factors. Researchers have, however, been able to identify supply-side credit crunches in the past by observing occasions in which frustrated borrowers shifted away from bank credit to nonbank funding sources.[5] Chart 2 suggests that frustrated borrowers at banks were not able to shift to nonbank sources of credit during the recent credit slowdown. On this chart, we have plotted the levels of

[5] See, for example, (1) Anil Kashyap, Jeremy Stein and David Wilcox, "Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance," *American Economic Review*, March 1993; (2) Mark Gertler and Simon Gilchrist, "Monetary Policy, Business Cycles and the Behavior of Small Manufacturing Firms," NBER Working Paper #3892, 1992; and (3) Stephen Oliner and Glenn Rudebusch, "The Transmission of Monetary Policy to Small and Large Firms," mimeo, Federal Reserve Board, June, 1992.

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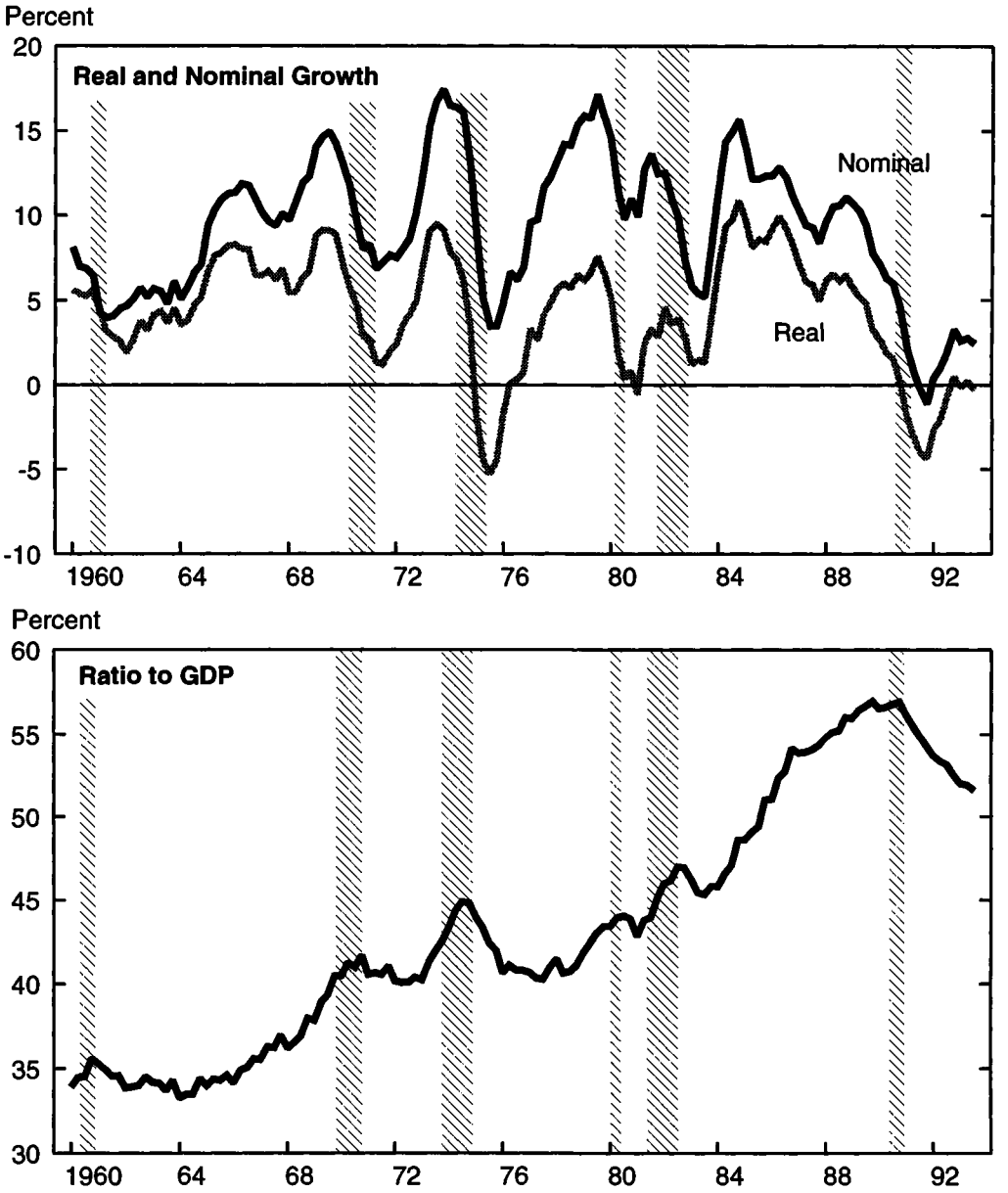
bank loans, commercial paper, finance company loans, and corporate bonds—all benchmarked to 100 at July 1990. Around that date, the rapid growth of finance company loans and commercial paper abruptly halted and the rate of bond growth slowed slightly.

Table 1 presents data for selected liabilities (excluding commercial mortgages and deferred taxes) of the nonfinancial business sector over various periods. A brief description of these sources of business credit is given in the Appendix. The table shows that the growth in total liabilities fell from about 11 percent average annual growth rate between year-end 1983 and year-end 1988 to 4 percent annual growth between year-end 1988 and the year-end-1992. Over this latter period, bank loans grew much more slowly

Chart 1: Total Nonfinancial Business Sector Liabilities



Source: Board of Governors, Flow of Funds and Department of Commerce, National Income and Product Accounts.
Note: The charts display credit to nonfarm, nonfinancial business.

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(virtually no growth) than did commercial paper (6 percent annual growth), bonds (6 percent annual growth), and finance company loans (5 percent annual growth).[6]

This simple comparison creates an impression that the credit crunch was primarily a banking industry phenomenon. The correct interpretation, however, is likely more complicated. While bank credit growth fell from about 8 percent per year to about nil, the growth rates of most of the other components of business credit, excepting trade debt and corporate bonds, fell by at least as many percentage points, albeit from higher initial rates. The analysis presented below, which takes into consideration the secularly declining share of C&I loans in total business credit, suggests that credit restraint was common to many business financing sources over the last few years.

Graphical Comparisons of the Current and Previous Slowdowns

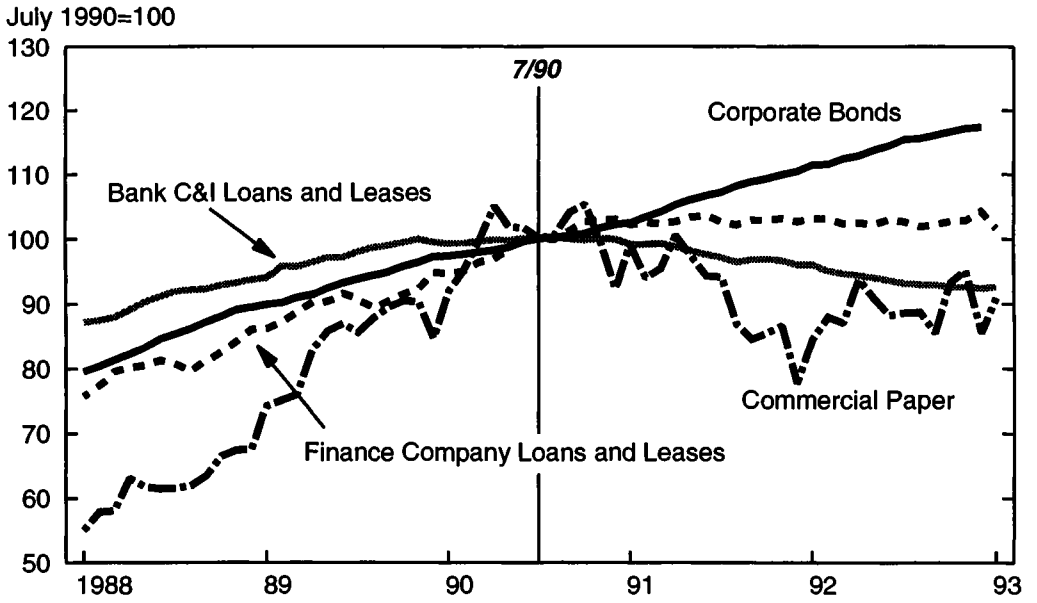
Chart 3 examines the real growth rates of bank C&I loans and nonbank credit—consisting of corporate bonds, commercial paper, finance company loans, and other loans (bankers acceptances, loans from savings and loan associations, and foreign loans)[7] — from eight quarters before to eight quarters after the onset of the recession. One of the lines on each chart represents real credit growth over the recent period (1988 to 1992) and the other represents an average of credit growth over four periods in which credit slowed abruptly.[8] Here we see that (1) the slowdown in bank loans was more gradual and began earlier in the current episode than in past credit crunches, and (2) nonbank

[6] Bank loans also grew slightly less than commercial mortgage lending but the drop in mortgage lending growth was significantly greater than in any other component of lending.

[7] The financial data for Charts 3-6 are for the nonfarm, nonfinancial business sector from the Flow of Funds, Board of Governors of the Federal Reserve System. The data on the gross domestic product and the price deflator are from the National Income Accounts published by the Department of Commerce.

[8] The four earlier episodes are centered around the following dates 1965-IV, 1969-IV, 1973-IV, and 1981-III. The 1965 period covers the 1966 credit crunch (bank lending growth on a four quarter basis began to

Chart 2: Selected Liabilities of the Nonfinancial Business Sector



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credit growth slowed continuously through the recent period; whereas, in past episodes, nonbank credit has tended to increase while bank lending was slowing.

In past periods of credit restraint, nonbank funding growth lagged bank loan growth fairly consistently—(1) trailing the surge in bank lending at the cycle peak, (2) growing more quickly than bank loans as the crunch began, and (3) eventually flattening out or slowing about a year later. Previous researchers have interpreted this pattern as evidence that, in these episodes, supply-side shocks to bank credit have led frustrated borrowers to substitute to nonbank sources of funds. In contrast, over the last few years, this substitution has not been evident. Of course, the bank loan growth level, as opposed to its rate of decline, is much lower than nonbank loan growth. This differential growth rate, however, opened up long before the recession and the difference has actually narrowed during the recent period of slow credit growth.

Footnote 8 continued
decline in 1965-IV) while the other central dates correspond to business cycle peaks. The 1980 credit crunch was not included because, being so brief and occurring so shortly before the next crunch, its data overlap with data from the 1981-82 recession. For the current recession, we centered the data around the third quarter of 1990, the NBER reference date for the business cycle peak. A reasonable alternative date for a recent turning point for the current credit cycle might be earlier, perhaps somewhere in mid-1989 when interest rates peaked and bank credit and economic activity had already started to slow.

Table 1: Business Credit Growth, Various Periods
Growth Rates Measured at Annual Rates, Dollar Figures in Billions

	1992-IV Level $ Bil.	1960-69	1970-79	1980-82	1983-88	1989-92
Credit source						
Bank loans	$661	11%	10%	12%	8%	0%
Finance company loans	297	13%	15%	6%	16%	5%
Commercial paper	108	n.a.	17%	15%	15%	6%
Trade debt	811	8%	8%	8%	8%	4%
Corporate bonds	1231	7%	10%	9%	12%	6%
Total liabilities[a]	$3307	9%	10%	10%	11%	4%
Activity measures						
GDP (current dollars)	$6082	7%	10%	7%	8%	5%
GDP deflator (1987=100)[b]	122	3%	7%	8%	4%	4%
Memo item						
Commercial and multifamily mortgages	$1022	10%	11%	6%	14%	1%

Source: Board of Governors, Flow of Funds, and Department of Commerce, National Income and Product Accounts.

a. Category includes items listed above plus other loans that are not shown separately: loans from thrifts, loans from foreigners, and bankers' acceptances.
b. Implicit deflator for GDP.

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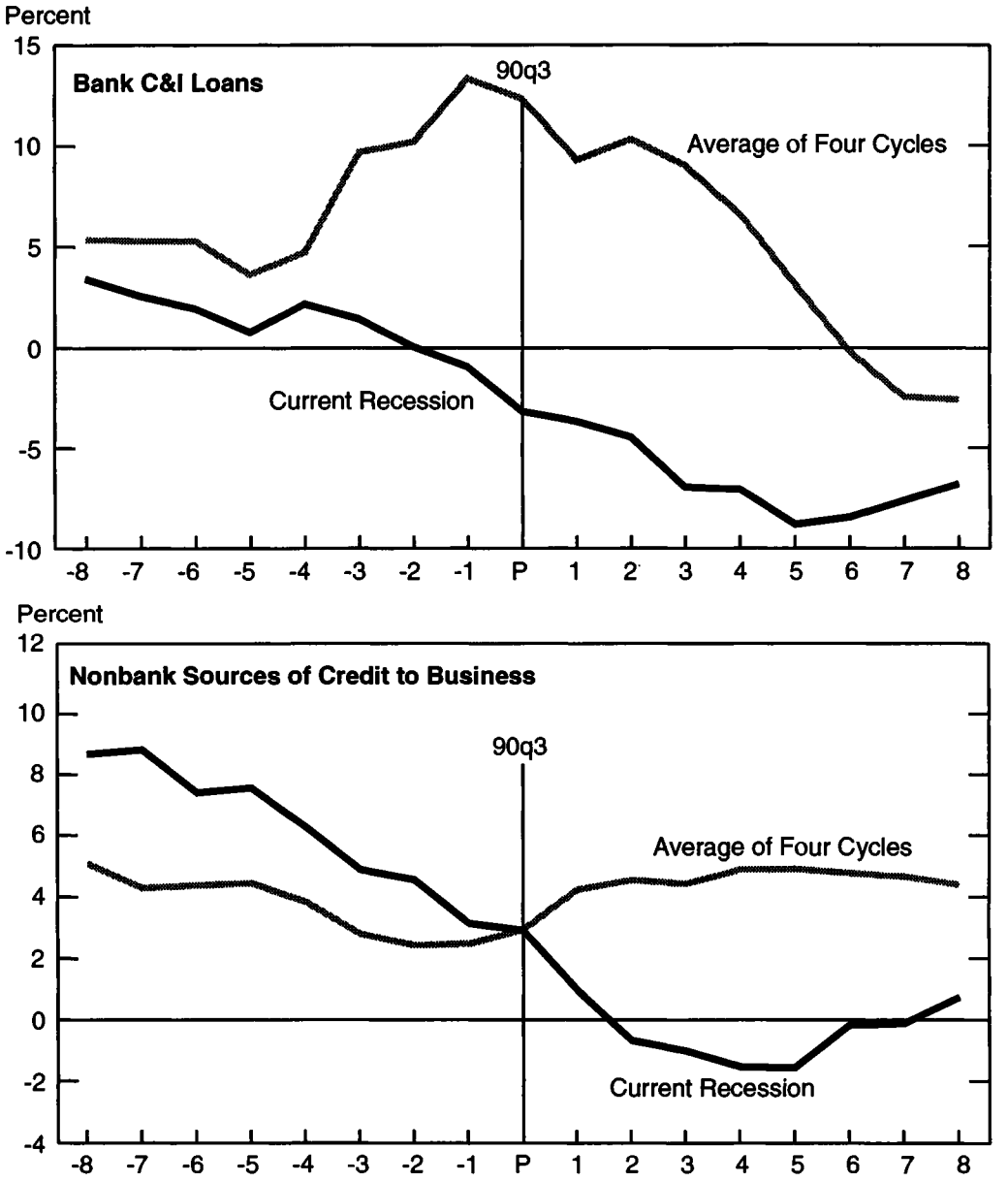
Chart 4 shows that economic activity[9] and inventory accumulation, the primary determinants of short-term credit demand, were weaker before the recent recession than during periods before previous recessions. We next consider whether firms with limited credit access may have attempted to finance additional inventory accumulation by increasing their trade debt, perhaps by stretching out their payables. The aggregate (gross) trade debt of the nonfinancial business sector is shown in Chart 4. Here we see that trade debt slowed more gradually and earlier than in past cycles, consistent with the economic

[9] Activity is measured by the real gross domestic product for the nonfinancial business sector.

Chart 3: Business Credit Growth



Note: The current recession is "centered" around 1990-III. The other cycles are centered around 1965-IV, 1969-IV, 1973-IV, and 1981-III.

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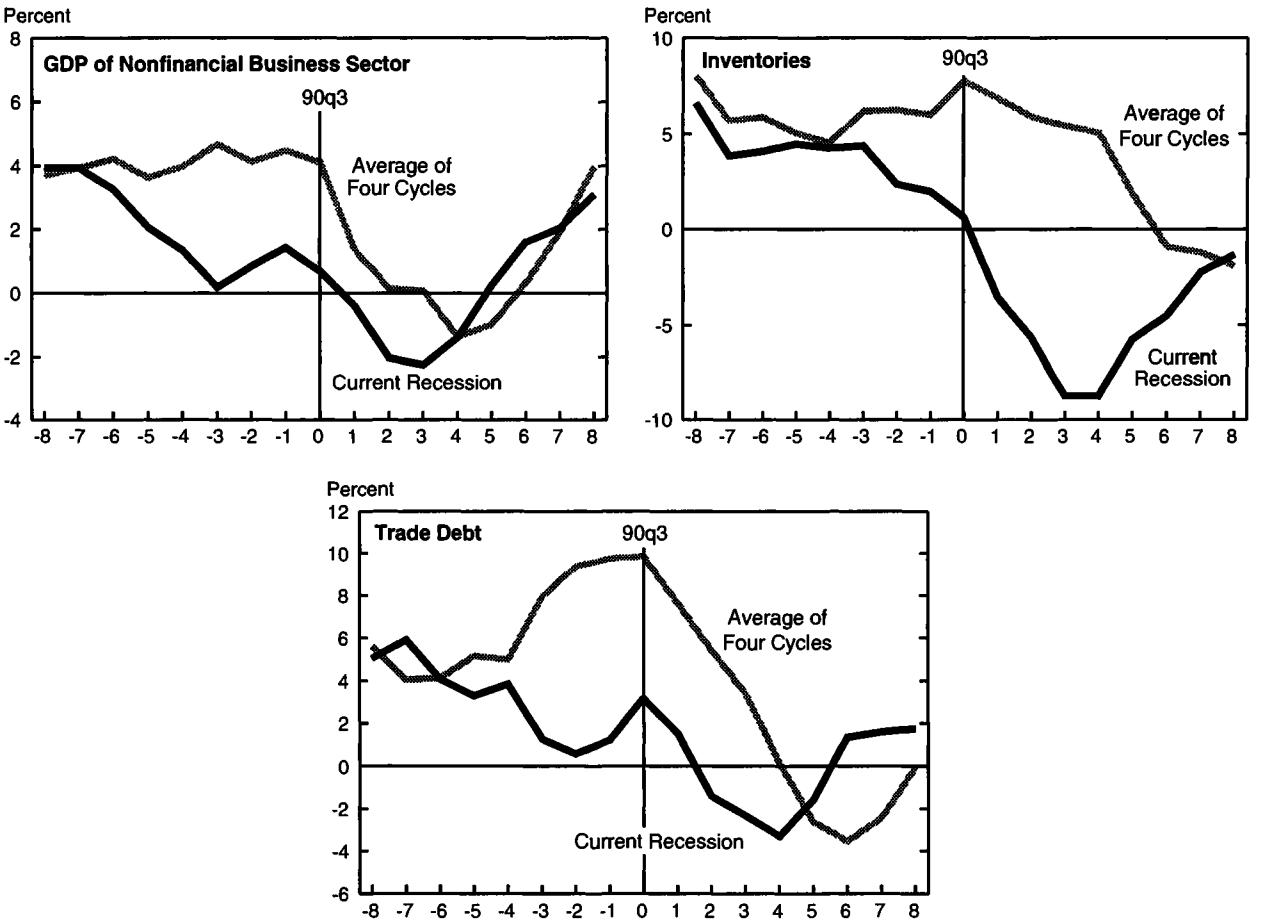
fundamentals. Hence, there is no clear evidence here that firms substituted away from credit markets to interfirm trade debt.

We turn now to a more detailed discussion of the components of nonbank credit. Nonbank funding did not surge in the beginning of this credit crunch as it had in past credit crunches (Chart 5). This observation holds particularly strongly for the commercial paper market. Unlike past credit crunches, in which large firms with access to markets clearly shifted away from bank loans to commercial paper, no such shift is evident in the current episode. Moreover, the amount of recent substitution away from bank loans to finance company loans or other funding sources (bankers' acceptances, loans by S&Ls, and foreign loans) seems small compared to past cycles.

So far the discussion has been limited to short- and intermediate-term credit. Some borrowers may have shifted from intermediated credit and commercial paper into bond financing during periods of credit restraint. As shown in Chart 6, real bond growth is normally strongly countercyclical,[10] and the current episode appears to be conforming

[10] The cyclical pattern of bond issuance is analyzed by Benjamin Friedman in "Substitution and Expectations Effects on Long-Term Borrowing Behavior and Long-Term Interest Rates," *Journal of Money, Credit, and Banking*, May, 1979. Interest rates cycles have coincided with business cycles and hence borrowers are likely reluctant to issue long-term bonds at the beginnings of recessions. Moreover, investment spending plans are typically scaled back at business cycle peaks. In the current recession, the decline in bond issuance pattern is probably better explained by the vicissitudes of the junk bond market, discussed below.

Chart 4: Real Business Activity and Trade Debt



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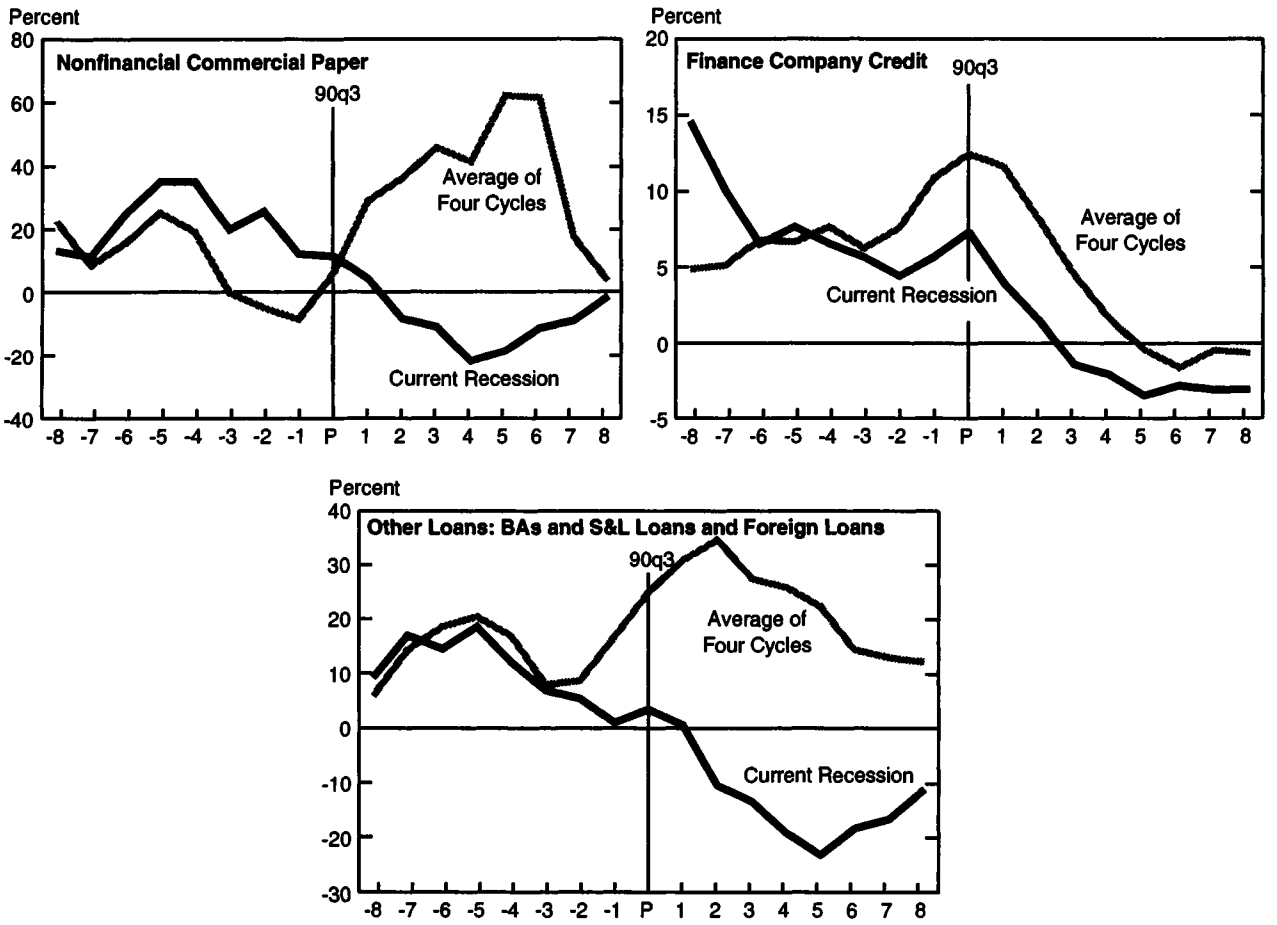
with previous patterns—although the decline before the recession was deeper and the rebound after was weaker than in past episodes.

The current credit cycle is complicated by the unusual behavior of net equity issuance since the early 1980s. In the latter half of the 1980s, net equity issuance was sharply negative as a result of M&A/LBO activities and stock repurchases. Consequently, total net financing from long-term capital markets (netting out the equity retired and bond growth) was not as strong as bond growth. When long-term funding growth is measured by bond growth adjusted for net equity issuance, funding growth appears slower than bond growth before the recession but faster afterwards. The recent strength in long-term securities issuance along with the relative weakness in commercial paper issuance may be explained, in part, by a shift toward longer-term financing by firms with access to organized credit markets in reaction to currently attractive long-term borrowing rates.

Regression Analysis

In this section, we examine in a more formal manner whether the recent behavior of bank and nonbank credit has been unusual in light of their traditional comovements with

Chart 5: Short and Intermediate Term Business Credit from Nonbanks



Note: The current recession is "centered" around 1993-III. The other cycles are centered around 1965-IV, 1969-IV, 1973-IV, and 1981-III.

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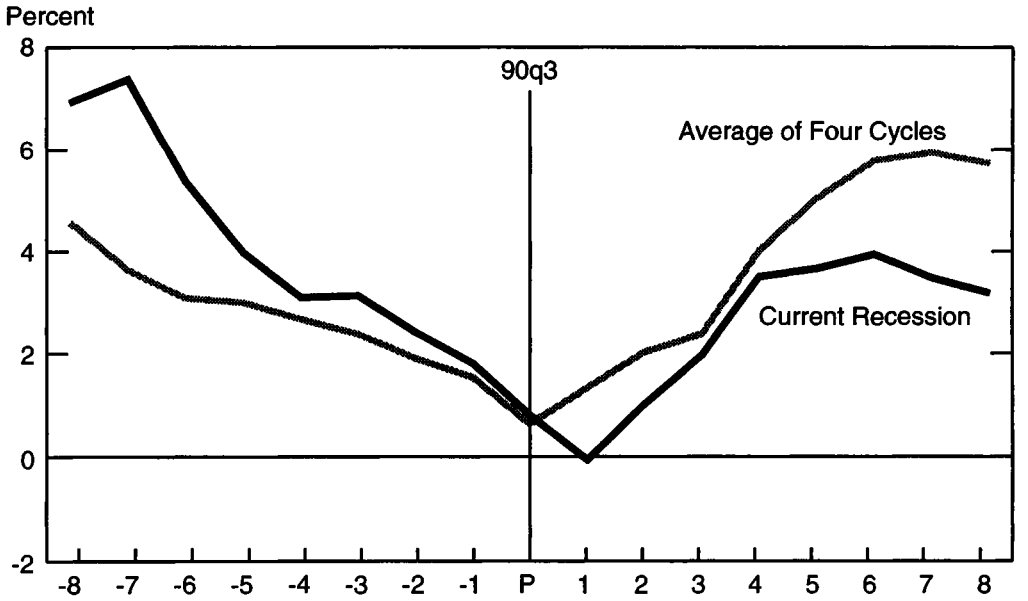
other macroeconomic variables. If the credit crunch were primarily reflective of problems facing the banking system, we would expect bank and nonbank credit to exhibit substantially different patterns of deviation from their historical relationships with other variables. In particular, borrowers would have substituted away from bank loans to nonbank credit—those with market access would have shifted to the bond and commercial paper markets and others would have turned to finance companies. Our regression analysis indicates that, even after accounting for the general weakness in economic activity, *both* bank and nonbank credit grew surprisingly slowly over the last three years. When measured as simply the number of percentage points by which the growth predicted by econometric equations exceed actual growth, the shortfall in bank lending was greater than the weakness in nonbank credit. If, however, the data is normalized to account for the historically greater volatility of bank credit relative to nonbank credit, the relative deviations between realized and predicted growth for the two credit aggregates appear more similar.

The analysis below compares bank loans to a nonbank credit aggregate consisting of nonfinancial corporate bonds, finance company loans and leases, and nonfinancial commercial paper. The data for these four sources of business finance are available on a consistent, seasonally adjusted basis from the Flow of Funds Release prepared by the Board of Governors of the Federal Reserve System.[11] We have chosen to study nonbank credit on an aggregated basis, rather than by individual components, because (1) the relative importance of different sources of finance has shifted dramatically over time and (2)

[11] We have not included certain components of nonbank business credit—such as thrift lending, government loans, and foreign loans—either because they are measured highly imperfectly at a quarterly frequency or because they are so small as to be negligible in the aggregate. We considered including trade credit in the nonbank credit aggregate but found that trade credit was extraordinarily correlated with GDP and inventories and suspect that its independent variations are dominated by measurement errors.

Chart 6: Nonfinancial Corporate Bonds



Note: The current recession is "centered" around 1990-III. The other cycles are centered around 1965-IV, 1969-IV, 1973-IV, and 1981-III.

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considerable substitution between short- and long-term financing occurs over time for reasons other than general credit availability.[12]

Although our econometric specifications include only lagged macroeconomic variables as determinants of credit growth, causality likely runs both ways between credit growth and economic activity. Our regressions should therefore be thought of as semi-reduced-form relationships designed to distinguish normal and unusual comovements in the data but incapable of independently identifying supply and demand shocks.[13]

Our basic regression models are given in Table 2. Here we relate the annualized quarterly percentage growth rates of bank loans and nonbank credit to growth rates of the stock of inventories, the stock of producer's durable equipment, and GDP of the nonfinancial business sector. Each regression includes two lags of each explanatory variable plus two lags of the dependent variable. (Estimates with four lags of each variable produced very similar results.) The estimation period, 1960-IV to 1992-IV, is determined by the first date at which business GDP is available and the required lags.

In light of the fact that the equations are specified in growth rates and that flow of funds data contain a lot of noise, the adjusted R^2, 0.35 and 0.52, for the bank and nonbank equations, respectively, are quite reasonable. Moreover, various robustness checks (e.g., splitting the sample, adding and deleting variables) revealed that the patterns of the regression errors were largely impervious to reasonable alternative specifications.[14] While the estimated coefficients are consistent with various stories one might propose, one should not place too much weight on specific coefficients because of the high degree of multicollinearity in the explanatory variables and the mixture of the supply and demand effects in the data. The residual standard error of the bank loan equation is more than twice as large as that of the nonbank equation, reflecting the weaker fit of the former equation and the greater variability of bank loans more generally. We therefore should not be surprised to find larger prediction errors for the bank equation than for the nonbank equation in any given subsample period, including the recent credit crunch.

The first line in Table 3, presents a very crude quantitative measure of unusual components of the credit slowdown. Here, we simply appended a dummy variable for the last twelve quarters (1990-I to 1992-IV) to our basic regressions. The estimated coefficients imply that banks loans grew slower than expected by 5.5 percent on an annualized basis; whereas, nonbank credit was 2.6 percent below expectations. We then inserted dummy variables for the last five recessionary periods in the specification, treating the mini-recession of 1980 as part of the 1981-1982 recession and including the slowdown (and credit crunch) of 1966 as if it were a recession. Here we see roughly the same pattern for the three quarters of the recent recession as for the last twelve quarters reported before. With regard to the other recessionary periods, only the 1966 experience is clearly identifiable as a period of slower than expected credit growth.

[12] Moreover, preliminary regression analysis on the disaggregated components revealed an unusual amount of instability between the credit components and macroeconomic determinants. The standard errors on individual coefficient estimates and for the regressions as a whole were unusually large.

[13] Our approach and purpose is very similar to the time series analysis conducted by Cara Lown and John Wenninger in their paper in this volume. For a formal attempt to identify the feedback to reduced credit availability on credit demand, see Patricia Mosser's paper in this volume.

[14] We experimented with including interest rates in the specification. However, we did not include interest rates in our final specifications because (1) we had trouble identifying the appropriate nonbank rate and (2) credit growth has historically been positively correlated with rising rates, leading to a positive coefficient estimate (presumably reflecting movements along a supply curve for credit in response to shifting demand) even though the basic specification appears closer to a demand than a supply equation.

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Table 2: Bank and Nonbank Credit Growth Equations

Explanatory Variables	Dependent Variables			
	Bank Loans		Nonbank Credit	
Dependent variable $_{t-1}$	0.25	(2.65)	0.26	(2.84)
Dependent variable $_{t-2}$	0.15	(1.57)	0.18	(2.00)
Inventories $_{t-1}$	-0.13	(0.43)	0.05	(0.37)
Inventories $_{t-2}$	0.48	(1.34)	0.20	(1.31)
Investment $_{t-1}$	7.64	(1.97)	1.29	(0.80)
Investment $_{t-2}$	-6.13	(1.77)	-0.45	(0.30)
Business GDP $_{t-1}$	0.33	(0.42)	0.71	(2.11)
Business GDP $_{t-2}$	0.55	(0.94)	0.21	(0.84)
Adjusted R^2	0.35		0.52	
Standard error	6.57		2.76	
Durbin-Watson	2.06		2.07	

Sources: Commerce Department and Flow of Funds.

Notes: Estimation period: 1960-IV to 1992-IV. Absolute t-statistics reported in parentheses. Regressions include a constant term, not reported above. All data are measured in nominal annualized percentage growth rates. Inventories = net growth in the stock, exclusive of price revaluations. Investment = gross investment in producer's durable equipment divided by the capital stock. Nonbank Credit = bonds + finance company loans + nonfinancial commercial paper.

Table 3: Coefficients on Dummy Variables for Credit Growth Equations

Period of Dummy Variable	Bank Loans		Nonbank Credit	
The recent experience				
1990-I to 1992-IV	-5.53	(2.38)	-2.58	(2.58)
Five recessionary periods				
1966-III to 1966-IV	-8.78	(1.79)	-4.47	(2.15)
1969-IV to 1970-IV	-3.74	(1.20)	-0.99	(0.75)
1973-IV to 1975-I	-0.51	(0.17)	0.26	(0.02)
1980-I to 1982-IV	5.33	(2.20)	1.15	(1.16)
1990-III to 1991-I	-4.18	(1.09)	-2.90	(1.77)

Notes: Absolute t-statistics are reported in parentheses. Regressions are estimated over 1960-IV to 1992-IV. The regression specifications and data definitions are those in Table 2.

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We next examine the prediction errors for the last twelve quarters in detail. We re-estimated the equations using data through year-end 1989 only and obtained the equations' predictions for the next twelve quarters. The results are presented in Table 4. Quite remarkably, the prediction errors are negative for every quarter for both the bank and nonbank specifications.[15] The average quarterly errors on a annualized basis are 5.7 percent the bank equation and 2.6 percent for the nonbank equation. (The close similarity to the dummy variable approach is not surprising.) The F-statistics based on the root-mean squared errors of the forecasts suggest that we cannot reject the stability of the nonbank and, particularly, the bank equations. However, these tests are highly misleading because they look only at the size of the errors and not their direction. As dis-

[15] We calculated static rather than dynamic forecasts; i.e., we inserted observed rather than forecasted values of the lagged dependent variables into the projections. Given the positive coefficients on the lagged dependent variables in both equations, this choice biased us against finding a large credit slowdown and against finding consecutive quarters in which the forecast errors were negative.

Table 4: Bank and Nonbank Credit Growth Equations Recent Forecast Errors

	Bank Loans			Nonbank Credit		
	Actual	Predicted	Error	Actual	Predicted	Error
1990-I	1.1	4.4	-3.3	4.7	7.1	-2.3
1990-II	3.4	6.3	-2.9	6.1	7.3	-1.1
1990-III	-0.9	4.1	-4.9	3.6	6.8	-3.2
1990-IV	0.3	7.0	-6.7	1.5	6.5	-5.1
1990-I	-1.6	3.5	-5.2	2.0	4.1	-2.1
1991-II	-7.9	-0.3	-7.6	1.5	2.9	-1.5
1991-III	-3.2	0.3	-3.5	1.8	3.8	-2.0
1991-IV	-9.0	2.1	-11.1	-1.6	4.3	-5.8
1992-I	-2.1	1.0	-3.1	3.2	3.6	-0.4
1992-II	-4.9	2.4	-7.4	1.6	4.5	-2.9
1992-III	-1.0	5.0	-6.0	3.1	5.1	-2.0
1992-IV	-1.7	4.8	-6.5	3.2	5.6	-2.4
Average error of the forecast			-5.67			-2.56
Standard error of the regression			6.72			2.78
Root mean squared error of the forecast			6.12			2.95
F-test significance			0.62			0.35

Notes: Absolute t-statistics are reported in parentheses. Regressions are estimated over 1960-IV to 1989-IV and forecast dynamically from 1990-I to 1992-IV. The regression specifications and data definitions are those in Table 2.

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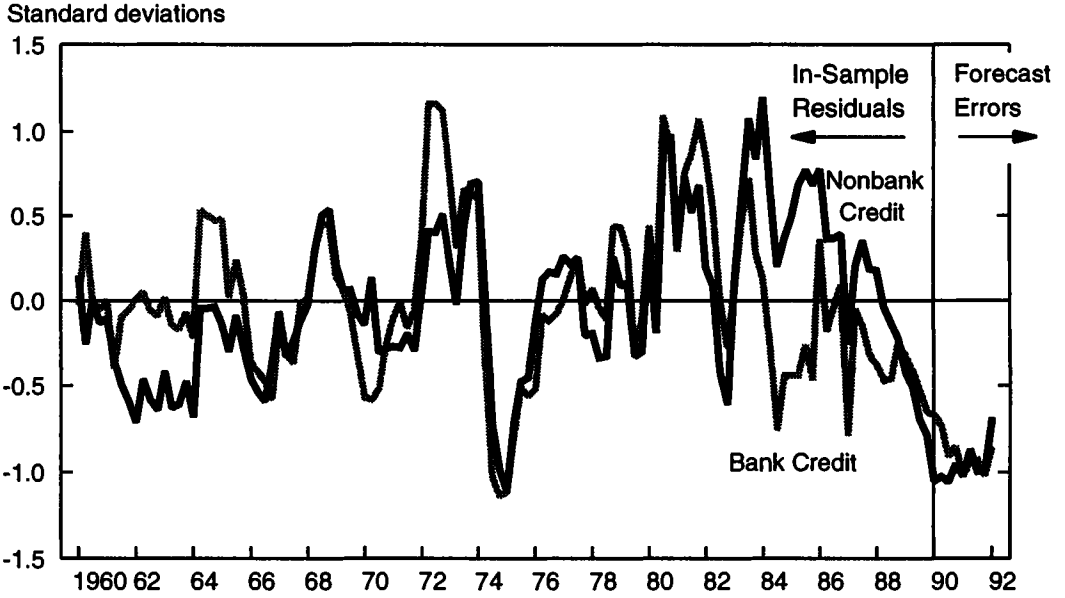
cussed above, the dummy variable approach shows that the average error is statistically different from zero. Moreover, the probability of getting twelve consecutive negative forecast errors from a stable regression equation is infinitesimal—roughly 1/2 raised to the 12th power. Clearly, the recent credit slowdown is not adequately explained by these regressions.

In order to see which category of lending declined the earliest and by the largest amount, we plot in Chart 7 both the in-sample regression errors and the out-of-sample forecast errors for both bank and nonbank regression errors. The data are presented on a four-quarter-moving-average basis and have been normalized by dividing by each equation's standard error so that the vertical axis measures the number of standard deviations that the errors stray from the mean error, zero. We see that in most periods, the bank and nonbank errors move together. In the mid-1980s, however, nonbank credit growth was unusually rapidly relative to bank loans. Starting from year-end 1986, the bank and nonbank credit prediction errors begin to decline in almost lock-step fashion until they reach their troughs, in early 1990 for nonbank credit and early 1991 for bank loans. These patterns argue strongly against the view that the credit crunch has been primarily a banking phenomenon. In fact, the standardized prediction errors of the nonbank equation have fallen more since 1986 than the bank equation errors, once we take into account the historical greater variability of bank lending.

Taken together, the evidence presented in this section suggests that the credit crunch was spread broadly across sources of business credit. Since economic activity slowed at the same time, one might conclude that the credit slowdown was primarily a demand phenomenon reflecting the slowdown in economic activity. However, the regression analysis indicates that it is difficult to explain the decline in credit growth on the basis of simple historical correlations with macroeconomic variables alone. The impression-

Chart 7: Banks and Nonbank Credit Growth Prediction Errors
Four-Quarter Moving Average



Note: Data were normalized by dividing both in-sample residuals and out-of-sample forecast errors by the estimated standard errors of the regressions from which they were derived.

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istic evidence reported in the next section, which describes the circumstances of various nonbank intermediaries and money and capital markets during this period, argues that supply factors likely played a significant role in the credit slowdown.

III. Factors Affecting Nonbank Credit Availability

Simple quantitative analysis of aggregative data ignores considerable available information concerning the recent credit crunch. The following section reviews the recent stresses experienced by nonbank financial intermediaries and the fragility visible in parts of the organized credit markets. This evidence suggests that credit availability from nonbank funding sources has been constraining for some borrowers, particularly firms that are small or rated below-investment grade. The asset-backed securities market, however, did help relieve some of the credit restraint pressures by easing balance sheet constraints at financial intermediaries. The following subsections discuss these developments at finance companies, life insurance companies, and in the commercial paper market, organized capital markets, and asset-backed securities markets.

Finance Companies

Financial problems among finance companies began at about the same time as those of the banks of New England.[16] Beginning in late 1989, many finance companies were downgraded by the credit rating agencies either because the financial condition of their parent companies had deteriorated or because they themselves had suffered major losses in their commercial lending businesses. These credit rating downgrades may have had a significant effect on lending because most finance companies raise the majority of their funds in short-term public credit markets.[17]

Following poor sales in the late 1980s, the major U.S. auto companies were repeatedly downgraded by the rating agencies and the ratings of their captive finance subsidiaries were similarly affected (see Chart 8A). In June of 1989, under threat of a further downgrade from already low ratings, Chrysler Financial Corporation gradually withdrew from the commercial paper market and began borrowing under more expensive bank facilities.[18] In addition, Chrysler stepped up its auto loan securitization program in order to reduce significantly the amount of loans on its books. The short-term credit obligations of GMAC appeared at times to be on the verge of being downgraded so that it too might have trouble funding itself in the commercial paper market.[19] The finance company commercial paper programs are generally backed up by credit lines at commercial banks. In response to their funding problems in the commercial paper market, finance companies increased their borrowings from banks (see Chart 8B), reversing a

[16] The problems in the banking system became increasingly apparent in the Fall of 1989 and throughout 1990, with the Fall of 1990 being the low point if one uses the stock market as a guide.

[17] In a pooled time-series, cross-sectional study, Remolona and Wulfekuhler show that credit ratings are the single most important determinant of finance company asset growth. See Eli Remolona and Kurt Wulfekuhler, "Finance Companies, Bank Competition, and Niche Markets," *Quarterly Review*, Federal Reserve Bank of New York, Summer, 1992.

[18] At year-end 1989, Chrysler Corporation had $10 billion in commercial paper outstanding and no bank loans. At year-end 1990, it had $1 billion in commercial paper outstanding and over $6 billion in bank loans.

[19] Weak sales by McDonnell Douglas and subsequent downgrades also drove its finance company from the CP market around the same time as Chrysler. GMAC's commercial paper rating was ultimately downgraded to P2 by Moody's in late 1992 and downgraded to A2 by Standard & Poors in early 1993.

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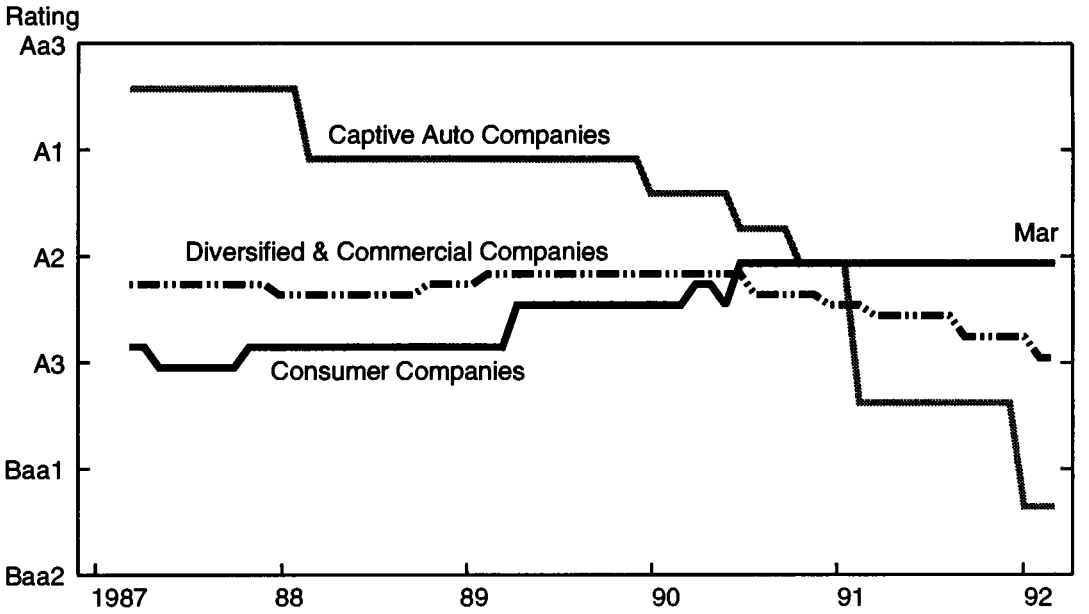
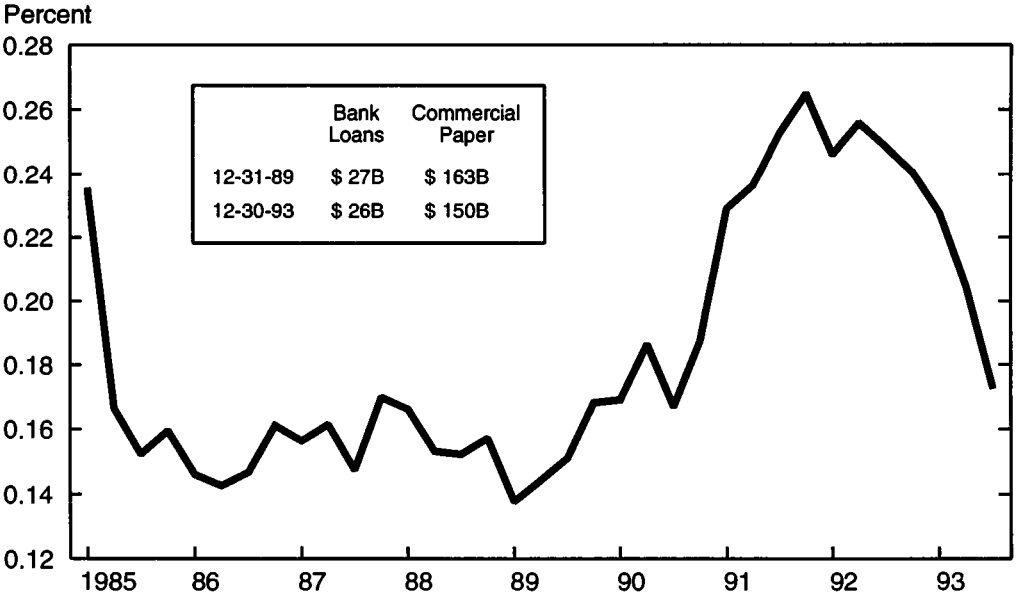
Chart 8A: Senior Debt Ratings of Financial Companies



Source: Moody's Investor Service.
Note: Sample consist of 22 life insurance companies, 20 banks, and 18 finance companies. Institutions that defaulted during period are not included.

Chart 8B: Finance Company Liabilities: Ratio of Banks Loans to Commercial Paper



Source: Board of Governors.

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long-term trend decline. Anecdotal evidence, however, suggests that the cost of backup lines has risen over the last few years, so that credit stringency at banks has had an adverse feedback on credit availability at finance companies.[20]

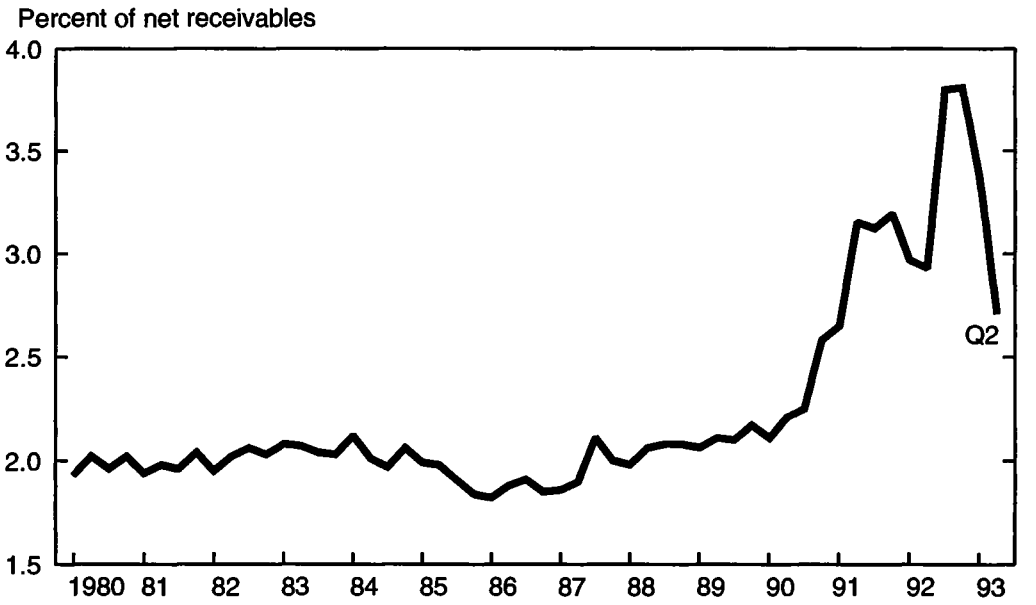
Diversified finance companies—those finance companies that make significant amounts of business loans (as opposed to firms that specialize in consumer finance)—also suffered numerous credit rating downgrades during the recession.[21] In the aggregate, finance companies were forced to put up unprecedented, large amounts of loan loss provisions (see Chart 8C) and subsequently experienced high charge-off rates (see Table 5).

Despite increased loss rates and rating downgrades, many finance companies were able to maintain reasonable profitability in 1990 and 1991 because of the dramatic decline in short-term interest rates and, hence, funding costs. Profitability remained particularly strong for finance companies that specialize in consumer lending (i.e., credit card loans, personal loans, sales finance loans, and home equity loans) because their loss experiences did not rise too severely in the recession.

[20] Independent mortgage bankers without access to the commercial paper market have traditionally relied on banks to fund inventories of mortgages until the inventory can be sold. Banks completely withdrew financing from mortgage bankers in late 1990 and 1991. The aggregate supply of mortgage credit was not significantly affected, however, because alternative means of financing were successfully arranged. These views were expressed by Lyle Gramley, Chief Economist of the Mortgage Bankers Association, at a colloquium on the credit crunch held at the Federal Reserve Bank of New York on February 12, 1993.

[21] The problems of Westinghouse Credit, made public in the beginning of 1990, were the most extreme: over a twelve month period, the company wrote off about $2.5 billion in commercial real estate loans, about 25 percent of its entire lending portfolio. (At year-end 1993, Westinghouse announced it was liquidating its finance subsidiary and expected $2.5 billion in additional, related losses.) The Westinghouse Credit shock did not, however, shatter the market for finance company securities because (1) Westinghouse Corporation stood behind its troubled subsidiary and (2) no other major finance company had that kind of exposure to commercial real estate although a few took significant real estate-related hits to earnings.

Chart 8C: Loan Loss Reserves at Finance Companies



Source: Board of Governors.

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From 1984 to 1988, total business credit extended by finance companies grew at an extraordinarily rapid pace—between 15 percent to 20 percent per year. Over the next two years, finance credit growth slowed considerably but continued to be stronger than bank loan growth. The source of this strong credit growth, particularly in recent years, has been primarily growth in leasing, which accounts for over one-third of all finance company business receivables outstanding.[22] The sluggish growth rate of the nonleasing component of finance company lending from late 1989 onward has been quite striking (Chart 9). The continued strength of leasing receivables growth, suggests that finance companies were more willing to make collateralized loans than unsecured loans during the recession. The decline in the nonleasing component of finance company credit presumably reflects not only the funding problems and lower credit ratings of the finance companies, themselves, but also the decline in demand and the tightening of credit standards that normally occurs in a recession.

The continuing presence of finance company assets "on the block and up for sale" may have reduced the incentive and capital support for asset growth through loan origination at healthy firms. The finance company industry has been consolidating in recent years as healthy firms, particularly GE Capital and Associates Corporation, have acquired the assets of weaker competitors. Finance companies that face high funding

[22] The tax and accounting benefits of leasing are discussed in the paper by Remolona and Wulfekuhler that was cited above. The ability of borrowers to shift from bank C&I loans to leasing is quite limited in the short run. C&I loans are often for general corporate purposes and are not intended to finance particular pieces of equipment that could alternatively be leased.

Table 5: Performance Measures for Finance Companies
In Percent

	Average 1987-89	1990	1991
Growth in assets			
Auto finance firms	8.0	0.9	-3.2
Consumer firms	13.9	14.4	11.3
Diversified firms	22.3	14.0	7.0
Return on assets			
Auto finance firms	1.2	1.1	1.3
Consumer firms	2.1	2.0	1.9
Diversified firms	1.8	1.0	0.5
Net chargeoffs (percent of receivables)			
Auto finance firms	0.9	0.9	1.1
Consumer firms	1.7	2.2	2.6
Diversified firms	1.0	3.0	3.5

Note: Table is based on estimates derived by Mitchell Post, Board of Governors, from annual 10K filings for largest twenty-five finance companies, comprising about three-quarters of the industry's assets.

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costs in the capital markets cannot compete and must either shrink assets or seek a stronger acquirer. Many of the finance companies whose assets were acquired by others were in fact healthy though hobbled in the capital markets by the troubles of their parents. U.S. bank holding companies, in particular, have been divesting themselves of their finance company subsidiaries in order to raise capital. Table 6 shows that, since 1988, finance company loans at subsidiaries of U.S. bank holding companies have been shrinking at a rapid rate, in fact, much more so than total loans at these bank holding companies on a consolidated basis.

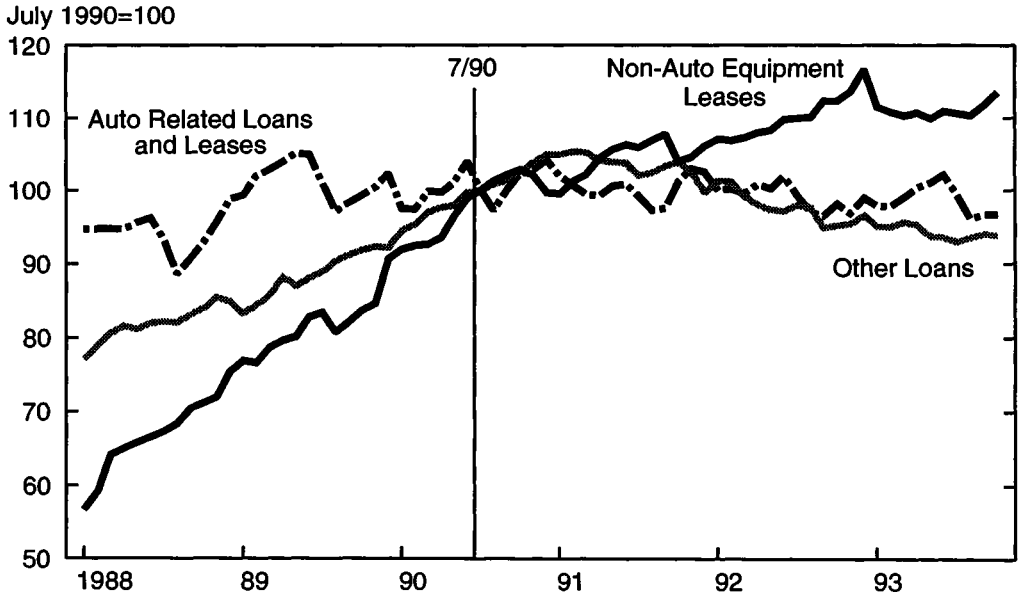
Life Insurance Companies

In past credit crunches, life insurance companies had to reduce their investments, particularly affecting the private placements market, because they, like depository institutions, experienced disintermediation as interest rates rose.[23] At those times, traditional life insurance products could not compete with variable rate savings instruments and, hence, insurers lost funds at the peak of each interest rate cycle. During the present cycle, however, life insurance company liabilities did not have to shrink because interest rates did not rise sharply and insurers now rely more on variable rate products for their funding.

During the current recession, some venerable firms in the life insurance industry suffered credit downgrades and faced unusual scrutiny by critics in Congress and the press for poor asset quality, insufficient capital, and inadequate regulatory supervision. In

[23] Past episodes of disintermediation at life insurance companies and the impact on the private placement market is discussed in Patrick Corcoran, "A Cyclical Perspective on Fixed-Income Private Placements," mimeo, Prudential Insurance, September, 1991. It is also worth noting that funding needs often rose at life insurance companies at interest rate cycle peaks due to increased demand by policyholders for (low interest) policy loans.

Chart 9: Components of Finance Company Business Credit



Source: Federal Reserve Board.

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January of 1990, First Executive Corporation announced a large write-down of assets because of losses on its junk bond portfolio.[24] In October of the same year, The Travelers announced substantial losses on its commercial real estate portfolio. Contagion effects emanating from these firms and from problems in the banking sector caused investors to question the soundness of many insurers, particularly after Equitable announced large losses, and First Executive, First Capital, and Mutual Benefit failed. Most of the industry's problems stemmed from commercial real estate lending (see Chart 10A),[25] poorly performing junk bond portfolios, and overly generous rates of return that had been promised to guaranteed investment contract investors in the mid-1980s.

The problems faced by insurers were similar to those faced by banks. Commercial real estate and highly-leveraged-transactions-related lending losses precipitated the troubles, but these problems were compounded by severely negative press coverage and public scrutiny following some prominent failures. The plunge in life insurance company stock prices occurred at the same time as the fall in bank stocks, although insurance stocks did not fall as far on average (see Chart 10B). The credit ratings of insurers also fell, but again by less than the ratings of other financial intermediaries (see Chart 10C). Insurers became preoccupied with maintaining liquidity and preserving their reputations for financial security, hoping to avoid the fate of Mutual Benefit Life, which col-

[24] First Executive's problems were first evident in 1987 when regulators in California and New York required that the holding company downstream equity to the two insurance subsidiaries in those states.

[25] The severity of the recent problems in commercial real estate is most evident in the unprecedented rate of foreclosures and not as evident in the rate of mortgage delinquencies. Real estate losses are primarily recognized when a foreclosure takes place, and a rise in foreclosures actually reduces the reported delinquency rate.

Table 6: Loans at Bank Holding Companies and Their Finance Subsidiaries
Year-End, in Billions of Dollars

	1988	1989	1990	1991
U.S. bank holding companies				
Total loans and leases	1,533	1,658	1,703	1,619
C&I loans and leases	498	524	507	455
Real estate loans	542	615	671	685
Consumer loans	287	300	302	292
Other loans	95	102	97	84
Finance company subsidiaries				
Total loans and leases	54.4	43.2	35.3	26.4
C&I loans and leases	n.a.	n.a.	17.2	12.3
Consumer loans	n.a.	n.a.	6.6	5.4
Real estate loans	n.a.	n.a.	10.1	7.4
Other loans	n.a.	n.a.	1.4	1.1

Source: FR Y-9C and FR Y-11AS filings.

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lapsed suddenly in the middle of 1991 as a result of a run on its liabilities by pension investors.

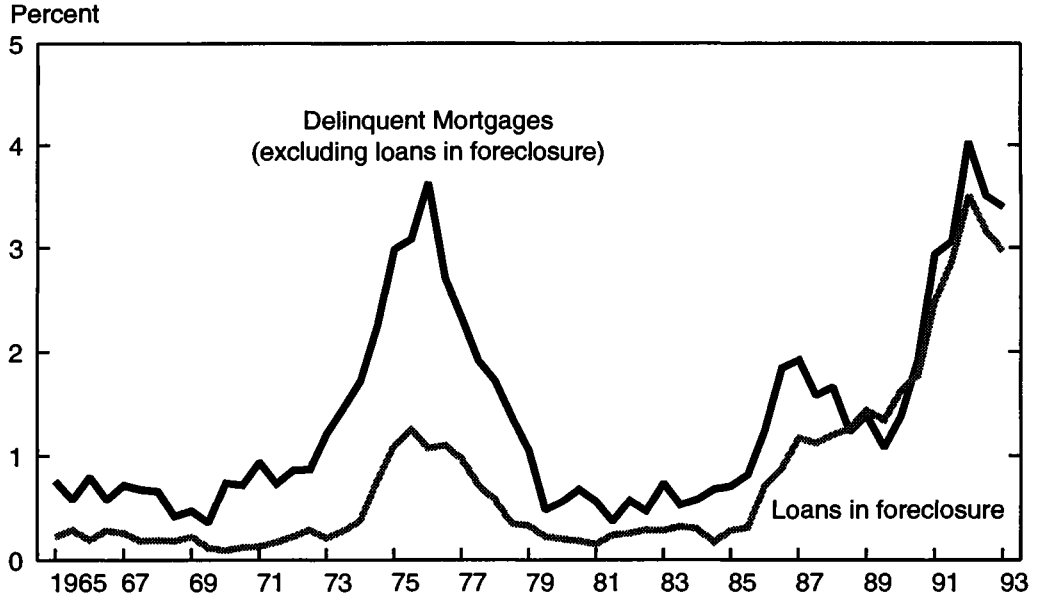
As a result of the problems of Executive life and other insurers, the National Association of Insurance Commissioners ("NAIC") adopted rules in mid-1990 that required greater disclosure and reserves against below-investment grade bonds. In addition, the new rules required that insurers classify (based on internal ratings) private placements as if they were public firms for reserves and capital purposes. These developments not only reduced the willingness of insurance companies to invest in below-investment grade bonds (see Table 7), they induced a shift toward low risk assets more generally.

These developments appear to have restrained credit availability in the market for privately placed bonds, an important source of finance for below-investment-grade or unrated middle market firms.[26] The ratio of private placements to public offerings of corporate bonds has plummeted over the last three years (Chart 11). While a relative decline in private placement issuance is not unusual going into a recession, the depth and persistence of the recent decline is surprising.[27] The new NAIC rules and additional scrutiny of insurer portfolios by rating agencies and investors did apparently affect the

[26] This section borrows heavily from the analysis contained in a paper by Mark Carey, Stephen Prowse, John Rea and Gregory Udell, " Recent Developments in the Market for Privately Placed Debt," *Federal Reserve Bulletin*, February, 1993 and a paper by Patrick Corcoran, "The Credit Slowdown of 1989-1991: The Role of Demand," published in *Credit Markets in Transition*, Federal Reserve Bank of Chicago, 1992.

[27] The share of privately placed bonds in total bond issuance has historically followed a clear cyclical pattern. The private market's share tends to fall in the latter half of expansions, to remain low in recessions, and to pick up early in the recovery. The common explanation for this pattern prior to the 1980s is that life insurance companies, which are the primary investors in the private market, experienced disintermediation when interest rates rose. Today, however, insurers' liabilities are more interest sensitive and, thus, investments in private placements tend to decline late in the cycle as borrowing demand decreases. (These developments are discussed in Patrick Corcoran, "A Cyclical Perspective on Fixed-Income Private Placements," op. cit.)

Chart 10A: Problem Commercial Mortgages at Life Insurance Companies



Source: American Council of Life Insurance.

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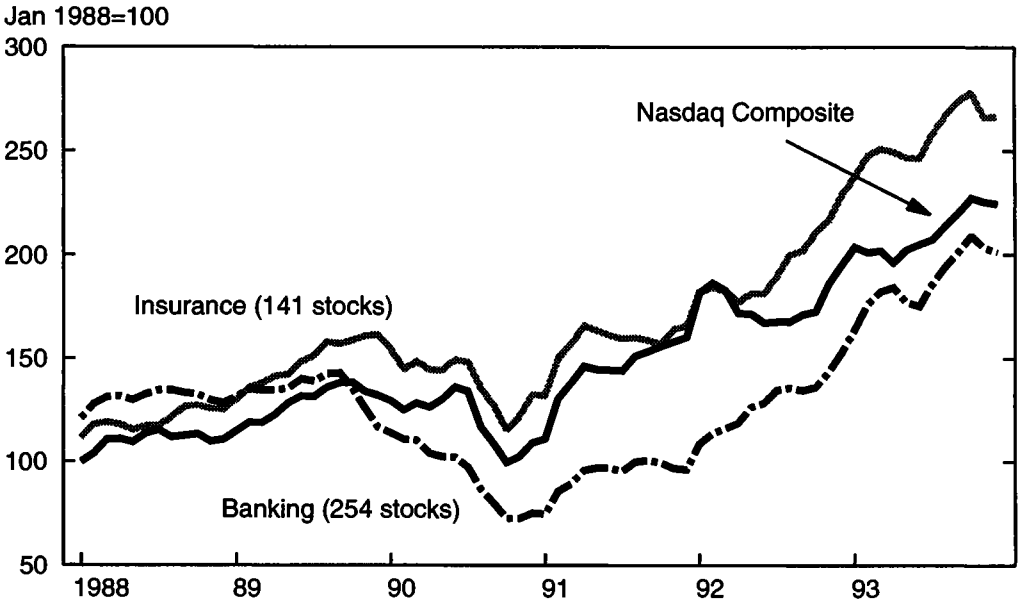
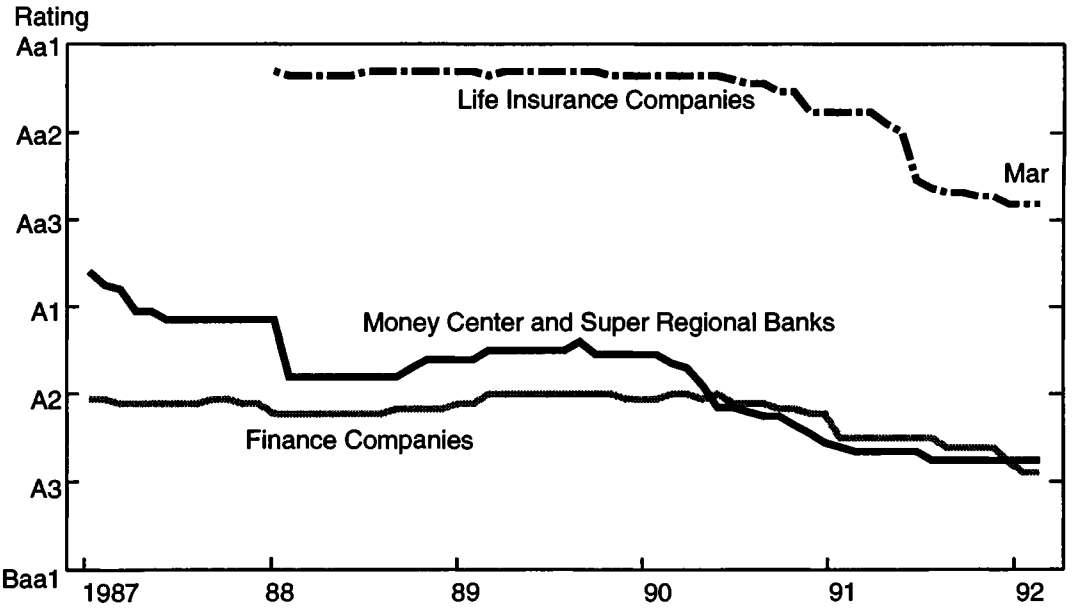
Chart 10B: NASDAQ Stock Indexes



Sources: DRI and FRBNY estimates.

Chart 10C: Senior Debt Ratings of Financial Institutions



Source: Moody's Investor Service.
Note: Sample consists of twenty-two life insurance companies, twenty banks, and eighteen finance companies.
Institutions that defaulted during period are not included.

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willingness of insurance companies to purchase below-investment-grade private placements. The share of these purchases as a proportion of life insurance companies' private placement investments dropped off sharply in 1990 and has not recovered (see Chart 11). Moreover, the spread between private and public below-investment-grade bonds widened at the same time.[28]

The Commercial Paper Market

Unlike earlier credit crunches, on this occasion nonfinancial firms did not increase their rate of issuance of commercial paper (see Charts 2 and 5). Chart 12, which depicts the spread of commercial paper rates over comparable Treasuries, suggests that during the credit slowdown period, the market was quite receptive to new issuance. While this interpretation may be correct for the highest quality issuers, the CP market has expanded in recent years to lower quality issuers and for them the recent story is quite different.

Perceived credit risk in the commercial paper market grew in the late 1980s because of a series of defaults and an increase in the number of credit rating downgrades relative to upgrades in 1988 and 1989 (See Chart 12). Prior to June of 1989, there were only two defaults in the history of the U.S. commercial paper market, Penn Central in 1970 and Manville in 1982. However, ten issuers defaulted during the year prior to the recession and five additional issuers have subsequently defaulted. Although many of these defaulting issuers were small, obscure and unrated, the confidence that investors, particularly mutual fund investors, previously had in the safety of commercial paper was rat-

[28] Although data are not readily available, the papers cited in the previous footnote state that dealers in private placements at investment banks reported a sharp widening of spreads between privately and publicly placed below-investment-grade securities during 1990 which has continued through 1992.

Table 7: Below-Investment-Grade Bond Holdings of Twenty Large U.S. Insurance Companies
Thousands of dollars

Year	(A) Total Bond Holdings	(B) Rated "B" or Below Holdings	(C) Rated "BB" Holdings	(D) (B)/(A)	(E) (C)/(A)
1987	$211,637	$17,545	n.a.	8.3%	n.a.
1988	255,089	17,810	n.a.	7.0	n.a.
1989	281,881	19,604	n.a.	7.0	n.a.
1990	303,548	17,504	$15,659	5.8	5.2%
1991	334,965	16,502	13,962	4.9	4.2
1992	350,186	15,523	13,330	4.4	3.8

Source: Conning and Company; Federal Reserve Bank of New York estimates.

Notes: Data for TIAA-CREF not available. Table does not include some companies with large holdings of low-rated bonds, but relatively small total bond holdings, First Capital and Executive Life.

Sample: The top twenty life insurance companies in terms of corporate bond holdings.

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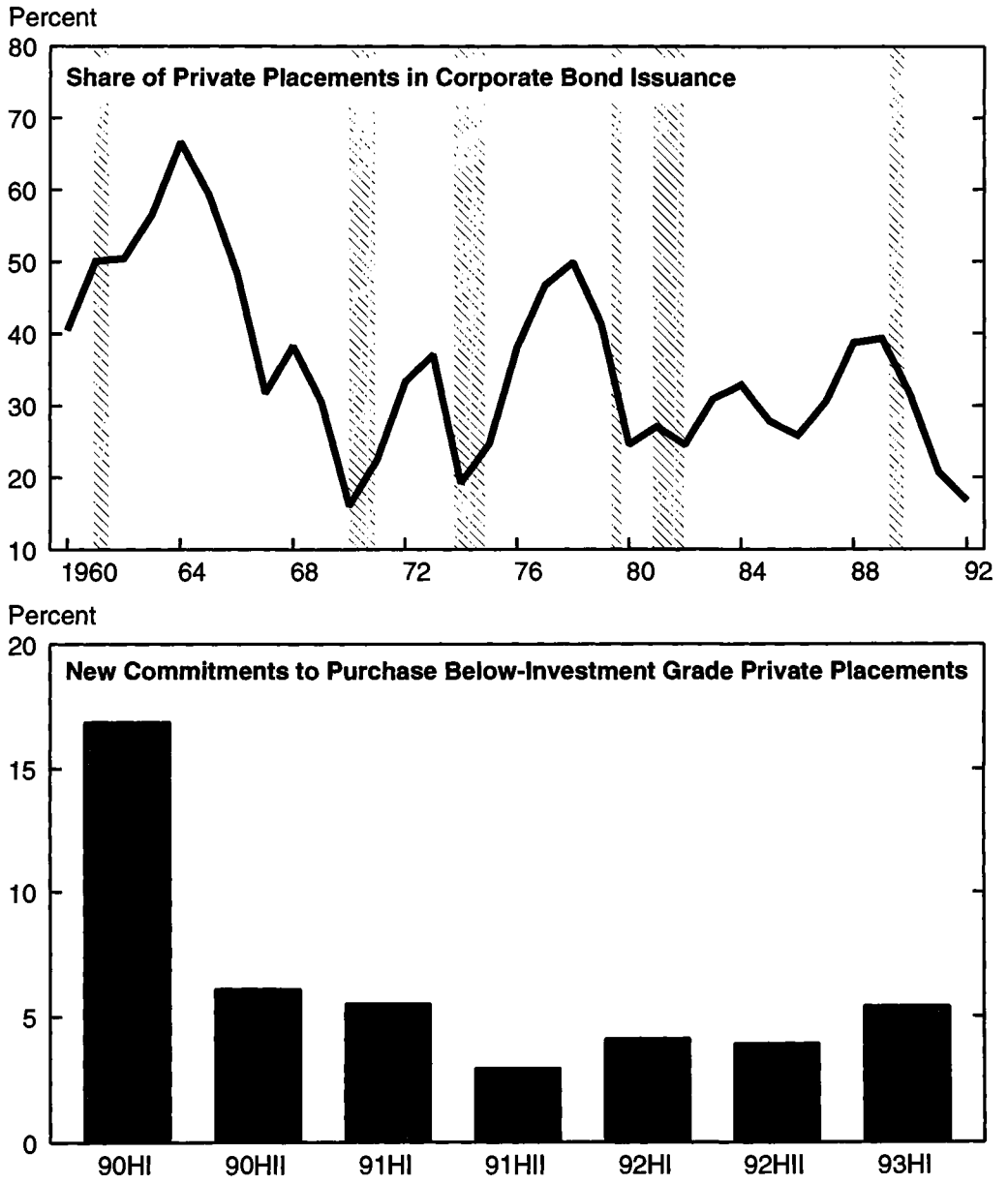
tled. In at least one default, two money market funds were faced with the possibility that their share values would fall below one dollar, prompting parents of the funds to buy defaulted commercial paper at a loss in order to avoid "breaking the buck."

In response, mutual funds began to shun all commercial paper except that with the highest ratings in mid-1990. The industry was concerned that some mutual fund might end-up breaking the buck because it had over-invested in risky commercial paper. Such an event might trigger a "run" on the entire industry. In order to protect small investors and the reputation of the money market fund industry, the SEC adopted rules in July

Chart 11: Indicators of Demand for Privately Placed Bonds



Sources: SEC, Investment Dealers Digest, FRB Capital Markets, American Council of Life Insurance.

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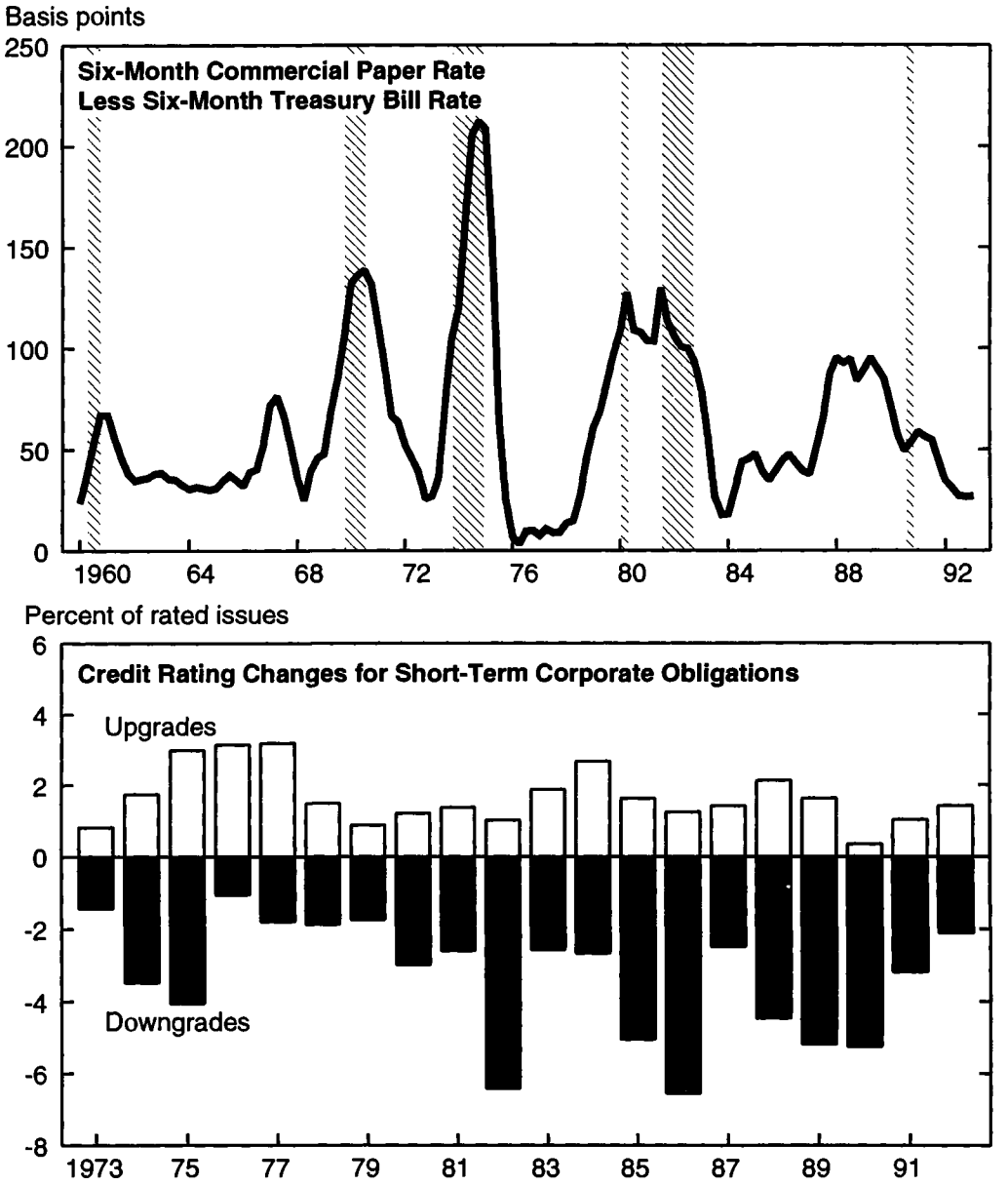
1990 that imposed strict limits on the amount the so-called "second tier" paper that funds could hold.[29] At the time of the announcement, the Investment Company Institute, a trade group that represents the mutual funds industry, made a statement to the press that the new rules were perhaps not strong enough.[30]

Chart 13 presents the total amount of low quality commercial paper held by mutual

[29] These rules were formally announced on July 25, 1990. See "Revisions to Rules Regulating Money Market Funds: Proposed Amendments to Rules and Forms," (Release Nos. 33-6870; IC-17589, S7-13-90) SEC Docket., vol. 46, pp 1247-61.

[30] "Money Market Funds Shedding Lower-Grade Paper," *Wall Street Journal*, October 22, 1990, p. C1.

Chart 12: Short-Term Corporate Credit Quality



Source: FRBNY Market Reports and Moody's Investor Service.

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funds and the total amount issued over the last few years. Mutual fund holdings of tier 2 paper fell from a high of $25 billion to about zero at year-end 1992. The aggregate amount of second-tier paper fell from $100 billion to $37 billion outstanding at year-end 1992. These declines probably reflect the credit quality concerns of investors as much as the direct impact of the new regulations.[31]

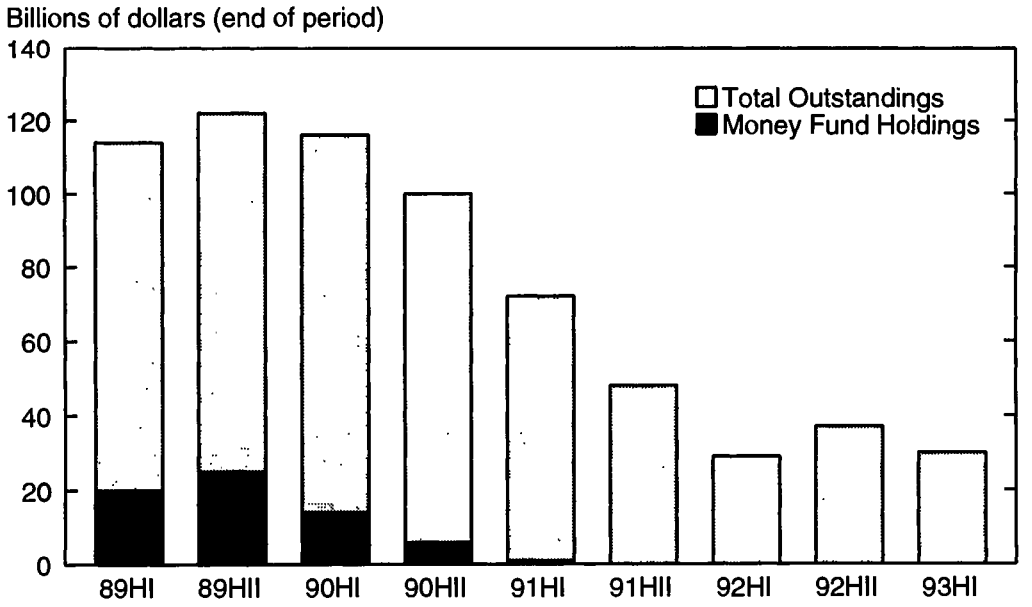
The spread between top-rated commercial paper and treasury bills was never particularly large during the current recession. However, the spreads on A2/P2 paper relative to A1/P1 paper were unusually high during 1990 and 1991, with dramatic year-end spikes, reflecting the desire of investors that such risky holding not show up on their public accounting statements (see Chart 14). The spread itself may understate the true extent of credit quality concerns because second-tier issuers are often "rationed" out of the market before they drive up rates. As a result of this investor flight to quality, lower grade commercial paper issuers exited the market in 1990 and 1991 and likely found financing available at commercial banks. Their increased demand for bank loans, however, may have caused other potential borrowers, further down the credit quality spectrum, to be turned away by the banks.

The Public Bond Market

In the late 1980s, bond issuance soared while net equity issuance was negative for most of the decade because of the huge amounts of equity retired through mergers and acquisitions, leveraged buyouts and stock repurchases. During the credit crunch, the market for publicly placed investment-grade bonds demonstrated remarkable strength despite the slowdown in economic activity and the surge in defaults and credit rating down-

[31] This topic was first examined comprehensively by Mitch Post and Leland Crabbe, "The Effect of SEC Amendments to Rule 2A-7 on the Commercial Paper Market," Finance and Economics Discussion Series Working Paper #199, Federal Reserve Board, May, 1992.

Chart 13: Second-Tier Commercial Paper Held by Money Market Mutual Funds and the Size of the Second-Tier Market



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grades. In contrast, after robust growth throughout the previous decade, the market for below-investment grade public bonds virtually disappeared in 1990 (Chart 15).[32]

The flight to quality that occurred in 1990 is not surprising given the relaxation of credit standards that had occurred in the preceding years. Leverage rose and interest coverage fell within individual S&P rating categories throughout the decade.[33] With this apparent shift in the meaning of the ratings, investors may have required higher yields to compensate for this apparent deterioration in credit quality. Not surprisingly, Aaa and Baa spreads over Treasuries were fairly high in the second half of the 1980s (Chart 16). Further, credit rating downgrades exceeded upgrades for industrial bonds by a wide margin in 1988 and 1989, in spite of the generally favorable economic environment. The surge in the ratio of downgrades to upgrades in 1990 and 1991, however, was not unusual for a recession.

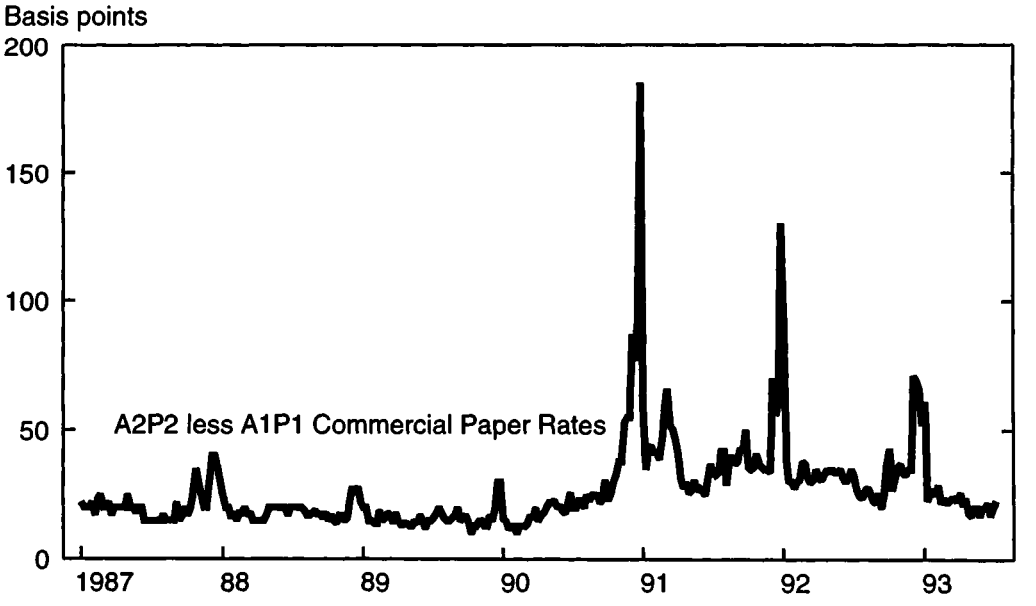
In contrast, credit to the below-investment-grade sector was sharply curtailed in 1990 and 1991 when junk bond issuance virtually halted. The credit ratios of firms issuing junk bonds had deteriorated sharply over the course of the 1980s.[34] Despite this apparent credit quality deterioration, junk bond spreads over Treasuries had remained fairly stable through mid-1989 (Chart 17). But the junk collapsed in late 1989, following the adoption of the thrift-bailout legislation (FIRREA) in August 1989 which pro-

[32] In a pattern similar to the junk market growth, public markets also provided a substantial amount of equity capital to small- and medium-sized firms during the mid-1980s through initial public offerings and venture capital funds, but dried up in 1989 and 1990.

[33] Standard and Poor's *CreditStats* shows that pretax interest coverage deteriorated from 1987-89 to 1990-92 in all ratings categories except AAA while the debt/capitalization ratio deteriorated for all ratings except B.

[34] See Barrie Wignore, "The Decline in Credit Quality of New-Issue Junk Bonds," *Financial Analysts Journal*, Sept.-Oct., 1990.

Chart 14: Quality Spreads in the Commercial Paper Markets



Source: Moody's Investment Service and Federal Reserve Bank of New York, Market Reports.

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hibited thrifts from investing further in junk bonds, the unsuccessful leveraged buy-out of United Airlines in October 1989, and the failure of Drexel in February 1990. Default rates on corporate bonds, mostly original-issue junk bonds, began to reach unprecedented heights (see Chart 17). New issuance of publicly traded junk bonds had virtually ceased in 1990 and spreads on junk bonds soared.

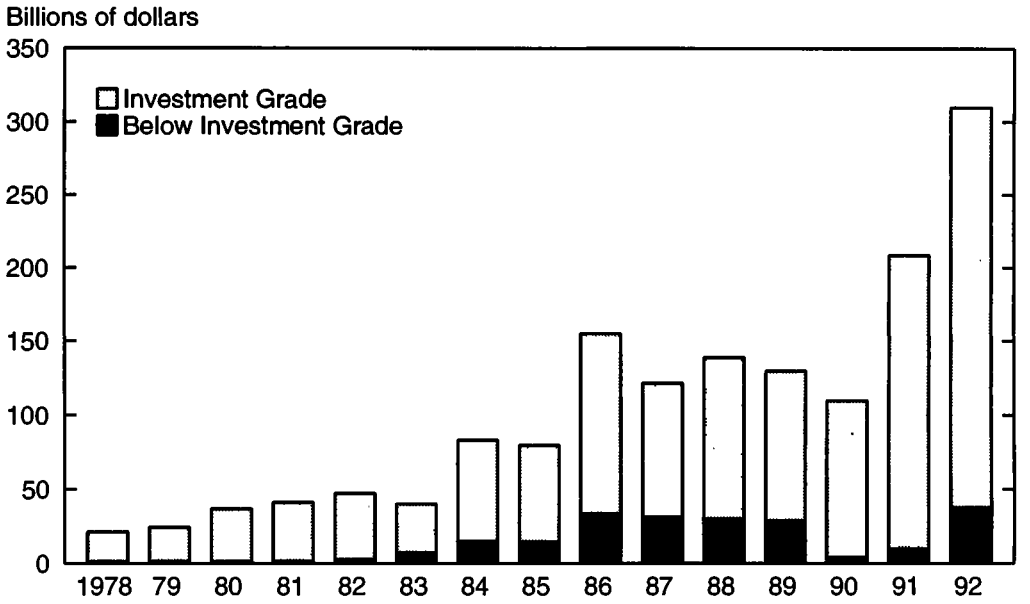
In addition to directly reducing the availability of bond finance for new M&A/LBO activity, the collapse of the junk bond may have squeezed bank credit for traditional C&I loan customers as banks' "bridge loans" that could no longer be refinanced in the bond market became an extra burden. Recently, the market for publicly issued junk bonds has rebounded with low spreads over Treasuries and record issuance in 1992. For privately placed junk bonds, however, there is still no evidence of a recovery.

Securitization of Receivables

Over the past four years, securitization continued the rapid growth that began in 1970 and has helped relieve the capital constraints on credit growth at financial intermediaries. Despite the continued contraction of the thrift industry, residential mortgage credit remained plentiful over the past few years largely because of the mortgage-backed securities market. In addition, the growing securitization of nonmortgage credit limited the potential restraint on credit created by the capital shortages faced by banks, thrifts and finance companies. Although the market is still developing, securitization of consumer and business loans has already enabled many intermediaries to raise their capital ratios and to reduce their funding requirements without necessarily cutting back on loan origination.[35]

[35] Besides securitization, banks can sell their loans outright to banks and other investors, thereby maintaining origination while limiting balance sheet growth. For a review of securitization and loan sales during the credit crunch period, see Richard Cantor and Rebecca Demsetz, "Securitization, Loan Sales, and the Credit Slowdown," *Quarterly Review*, Federal Reserve Bank of New York, Summer, 1993.

Chart 15: Nonconvertible Public Domestic Debt Issuance



Source: Morgan Stanley.

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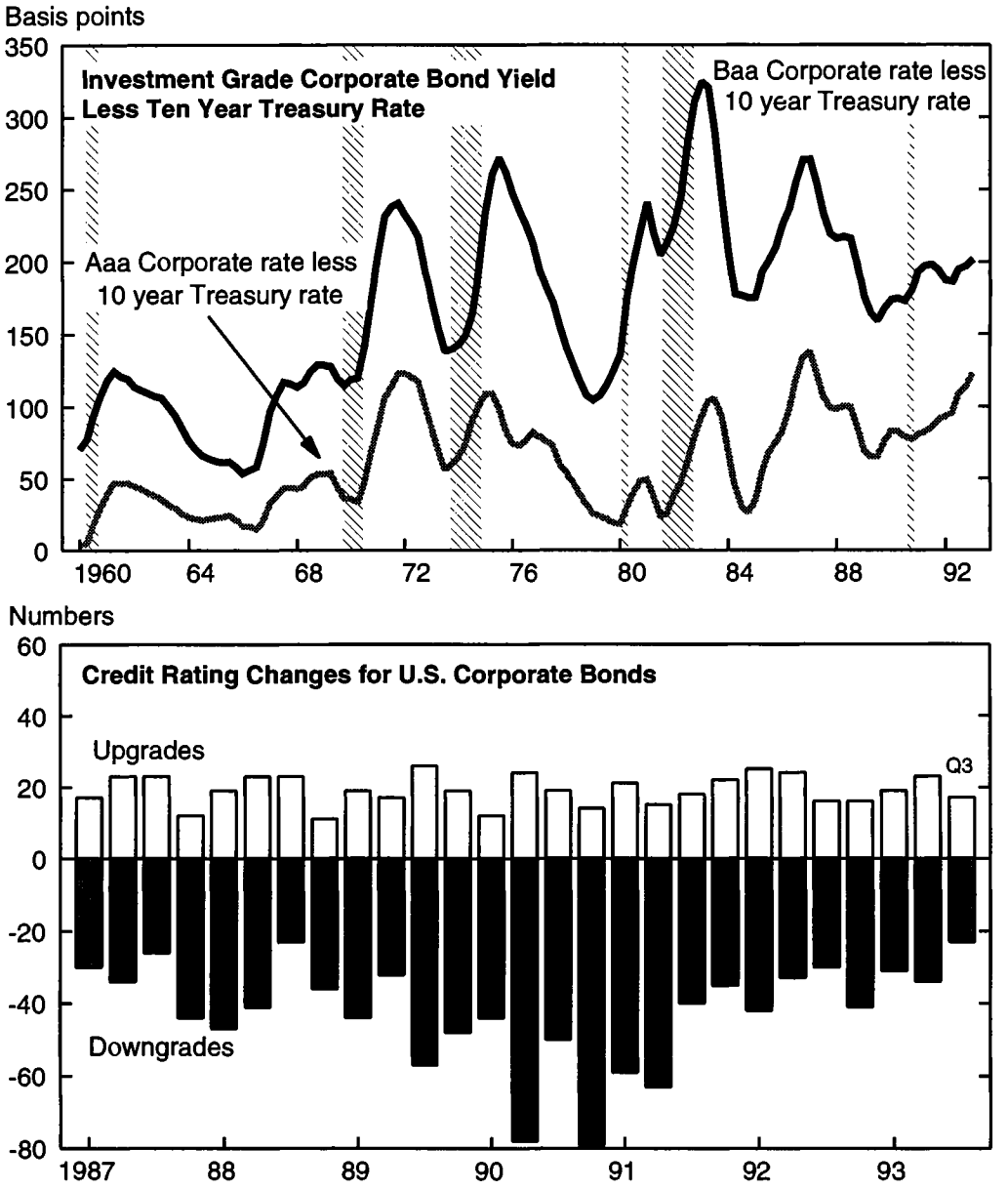
At year-end 1992, home mortgage-backed securities (at $1.4 trillion) exceeded the amount of home mortgages held on the books of depository institutions and mortgage companies (at $1.3 trillion).[36] Over the prior four years, mortgage-backed securities grew about 70 percent ($584 billion) while home mortgages at depository institutions and mortgage companies grew about 10 percent ($120 billion) (see Chart 18).

The rate of growth of securitization of consumer credit over the past few years has been even more rapid than the growth of mortgage-backed securities. In total, securi-

[36] We have included the home mortgage holding of government-sponsored enterprises in the stock of mortgage-backed securities because these mortgages are in the process of being packaged for sale.

Chart 16: Long-Term Corporate Credit Quality Indicators



Source: Moody's Investor Service, FRBNY Market Reports.

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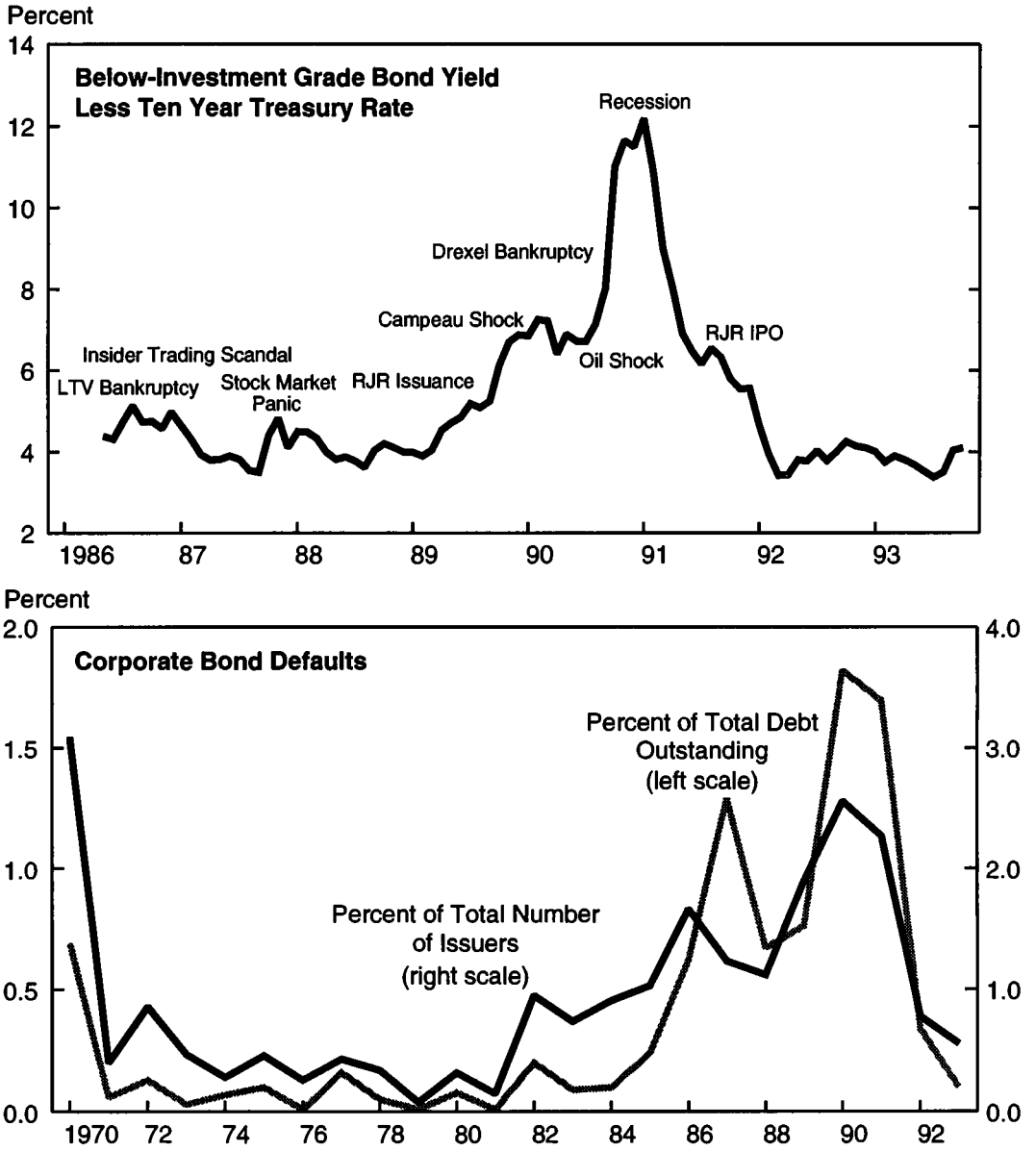
tized consumer credit rose $95 billion, from $30 billion to $125 billion between year-end 1988 and 1992 (see Chart 19). Banks and thrifts have been the leading issuers of securitized revolving credit, and finance companies have led the securitization of consumer auto loans.

Although somewhat harder to package than consumer credits, business loans are now being securitized as well. Finance companies have begun to securitize a wide variety of business credits, including leases. These programs have increased from $1 billion to $12 billion over the past four years (see Chart 19). Asset-backed commercial paper, in existence since 1983, is another way in which commercial credits are securitized. As shown in Chart 20, the amount of commercial paper issued by asset-backed

Chart 17: Developments in the Below-Investment Grade Corporate Bond Market



Source: Morgan Stanley, Moody's Investor Service.
Note: Data for 1993 reflects the number of defaults through September and the dollar value of defaults through August.

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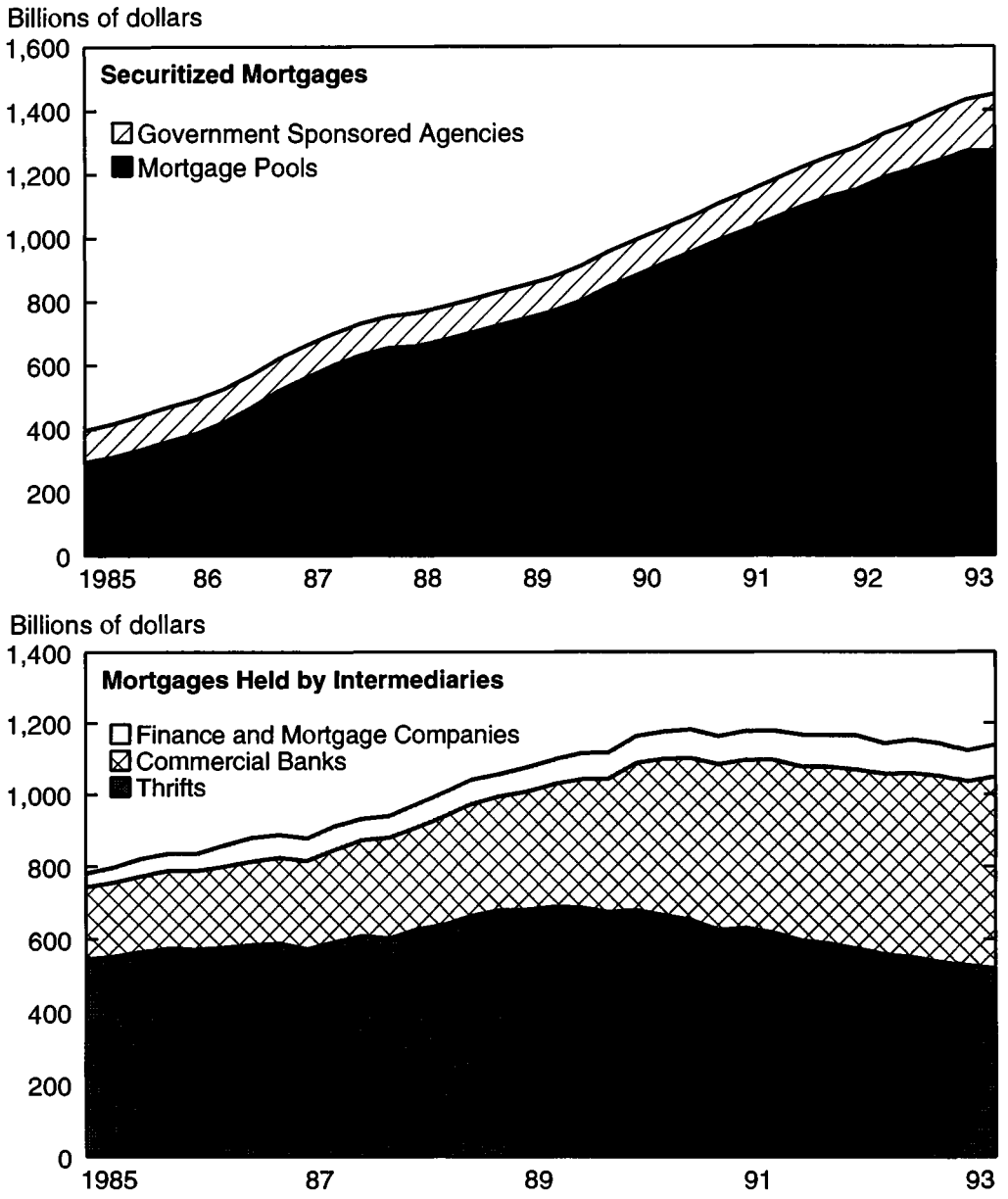
programs has grown from roughly $7 billion to approximately $58 billion between year-end 1988 and year-end 1992. The commercial paper issued by these special purpose corporations is collateralized by a diversified pool of credits, often business trade receivables. When this asset-backed structure is combined with some other form of credit support, such as a third-party guaranty, the commercial paper often receives a top rating from the credit rating agencies. Banks or investment banks that arrange these programs for their clients are, in effect, using the capital markets to provide inexpensive funding to businesses that cannot access the markets directly, as cheaply, or at all.

The extent to which securitization has relieved the pressures on financial intermediaries can be measured in part by the net increase of $635 billion in asset-backed securities over the last four years. However, the intermediaries that do securitize their assets

Chart 18: Home Mortgage Funding



Source: Flow of Funds, Board of Governors of the Federal Reserve System.

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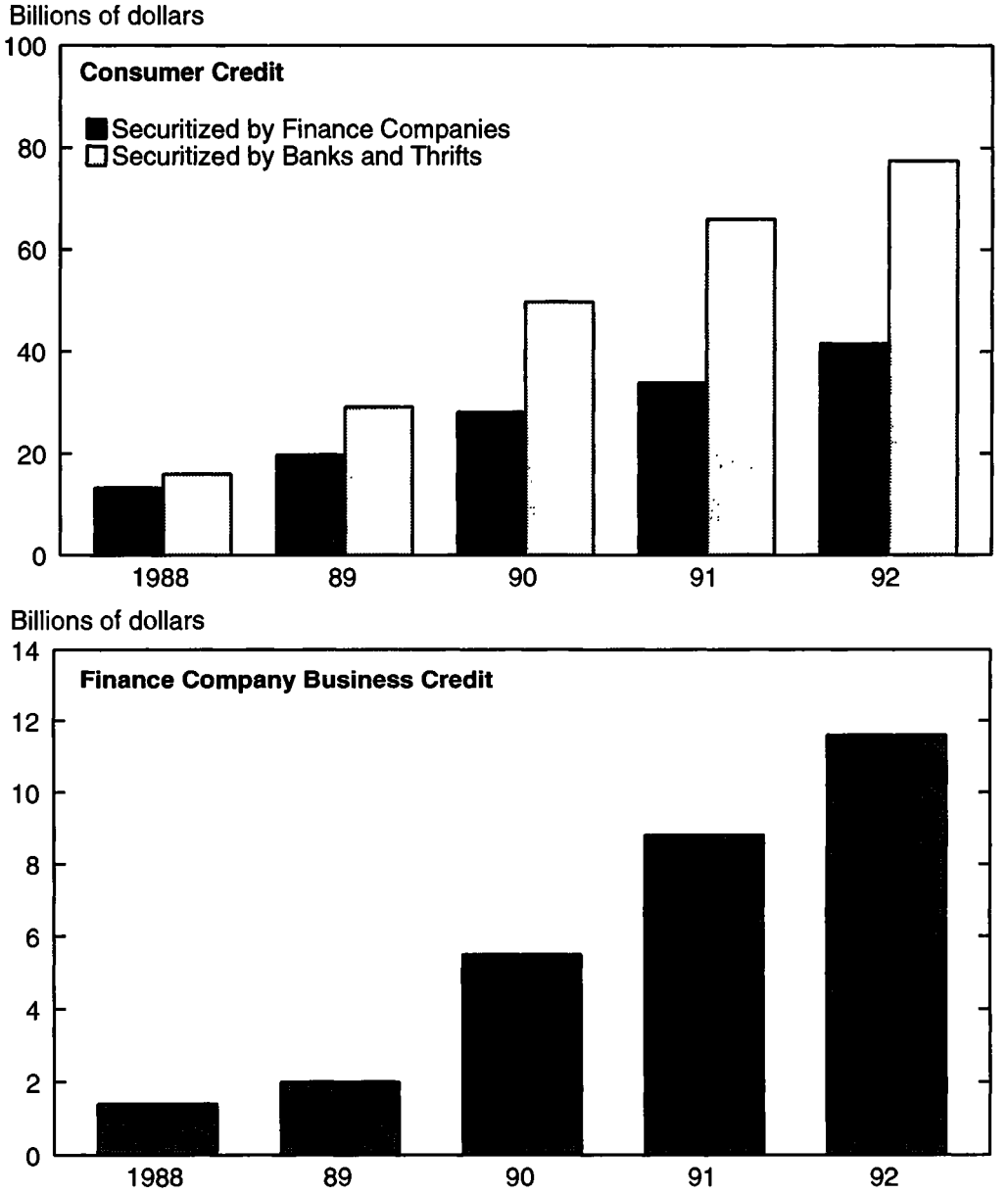
may be those most under financial stress. Hence, securitization may have had a larger impact on credit availability than suggested by the aggregate data. The asset-backed securities market enabled many financial intermediaries to continue their function as "loan originator" while passing on their role as "asset holder" to individual investors and better capitalized institutions.

IV. Summary

This paper provides a quantitative analysis and qualitative discussion of the recent behavior of the major sources of nonbank business credit—loans by finance companies, commercial paper issuance, and bond issuance. The unusual weakness in nonbank

Chart 19: Asset-Backed Securities Outstanding



Source: Federal Reserve Board.

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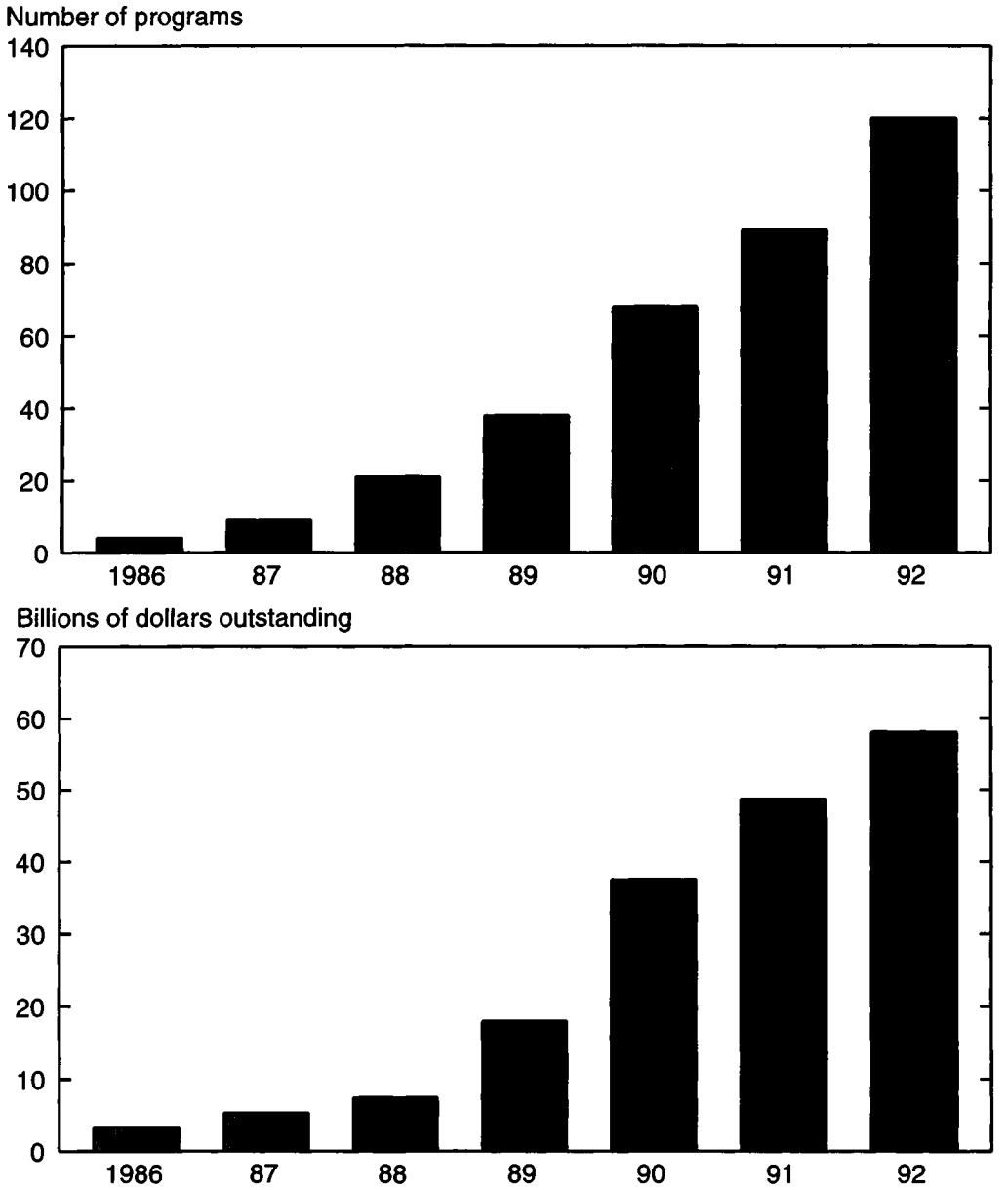
credit over the 1989-1992 can be traced to (1) financial distress at many finance companies and life insurers, (2) a rash of downgrades and defaults in the junk bond and commercial paper markets, and (3) changes in attitudes by investors and regulators. These factors and similar developments occurring at the same time in the banking system likely reduced credit availability for below-investment-grade and unrated commercial borrowers.

Nonbank business credit began to slow sharply beginning in late 1989, in parallel with the decline in bank credit. This pattern contrasts sharply with that observed in past credit crunches in which the growth of nonbank credit accelerated (at least briefly) to offset a decline in bank credit. Our analysis of the time series data finds (1) little evi-

Chart 20: Asset-Backed Commercial Paper



Source: Calculations provided by Mitch Post of the Federal Reserve Board.

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dence of a shift from bank to nonbank sources of funds during the current slowdown and (2) the declines in bank and nonbank credit growth far exceed the amount predicted by their historical relationships with the business cycle-related determinants of credit demand.

On previous occasions, the precipitating factor behind a credit crunch was disintermediation; whereas, in the recent episode, the primary causes of the declines in bank and nonbank credit growth are similar. In late 1989, the junk bond market collapsed following a rise in bond defaults and a failed attempt to buy United Airlines. At the same time, large losses announced by the Bank of New England, among others, made the public aware that the commercial real estate bubble had already burst. Like numerous banks, many finance companies and insurance companies suffered poor performance in loans to highly leveraged companies and in commercial real estate mortgages combined with insufficient capital to cushion against the related losses. Moreover, again like banks, finance companies and life insurance companies were pressured by the actions of the credit rating agencies, private investors, and regulators to improve asset quality, strengthen capital bases, and limit balance sheet growth. At the same time, a rash of commercial paper downgrades and defaults raised concern about the safety of money market mutual fund investments, reducing the demand for lower quality commercial paper and causing the SEC to limit the money market fund holdings of lower quality paper.

Beginning in late 1989, virtually all investors shunned commercial real estate and junk bonds. Junk bond issuance halted and the yield spread between above- and below-investment-grade bonds widened dramatically. The private market for below-investment-grade bonds was particularly hard hit as its major investor, life insurance companies ceased purchasing. In 1990 and 1991, both banks and finance companies raised their credit standards and widened their lending spreads. Commercial paper issuance by firms that lacked top credit ratings fell dramatically. As a result, below-investment-grade and unrated firms experienced a decline in credit availability across a wide spectrum of funding sources.

Nonfinancial firms with strong credit ratings, however, had uninterrupted access to credit in the money and capital markets—as investment-grade quality yield spreads, both at short and long maturities, remained relatively flat throughout the recession. Moreover, the market for high quality fixed-income securities remained strong, and many financial intermediaries were able to issue asset-backed securities that relieved, in part, their balance sheet constraints and allowed them to continue lending.

Appendix. A Review of Sources of Business Credit

Among the various types of business credit, commercial bank lending is unique in the breadth of its customer base (across firm size and credit quality) and the flexibility of its terms. For large corporations, however, borrowing in the direct capital markets, through bond or commercial paper ("CP") issuance, is generally less expensive compared to funding through commercial and industrial ("C&I") bank loans. Small and medium-sized firms, without direct access to the capital markets, generally borrow from commercial banks, but they do have access to other important sources of credit. In particular, they often borrow from finance companies, whose business loans are usually more specialized and require more collateral than traditional C&I loans. Another important source of funding for small- and medium-sized firms is interfirm trade debt which enables the business sector as a whole to reduce its external borrowing needs. Some less quantitatively significant sources of funds—such as venture capital funds and business lending by thrifts—may also be of particular importance for the small business sector.

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Table A1 provides estimates of selected liabilities of the nonfinancial business sector.

Commercial and Industrial Bank Loans

Commercial banks provide business credit to a wide variety of borrowers, ranging from small start-up companies to the largest corporations. U.S. money center banks and U.S. branches and agencies of foreign banks specialize in the provision of credit to large corporations and partnerships. Borrowers with strong credit ratings, however, generally meet most of their funding requirements in the direct capital markets and tend to borrow from banks only on a short-term basis for temporary liquidity. Large corporations with lower credit ratings, however, rely more heavily on large banks to meet working capital needs and to provide medium-term financing for capital expansion or financial restructurings. Some loans are too large to be financed by one bank alone and are funded jointly by many banks through loan participations which are sometimes traded in the secondary markets.

Regional banks may participate in the large credits described above, but they also tend to specialize in middle-market lending, funding working capital needs or capital expansion programs of medium-sized companies. In addition to regional banks, community banks also lend to small businesses through traditional C&I loans or with Small Business Administration loan guarantees. Bank credit is normally extended only to small and medium-sized firms that (1) possess strong balance sheets and collateral, and (2) can present evidence of a strong credit history and banking relationships. Lesser quality credits are more likely to be able to obtain funds from nonbank lenders.

The terms to maturity of individual C&I loans vary widely, ranging from overnight

Table A1: Selected Liabilities of the Nonfinancial Business Sector
Billions of Dollars

	Year-End 1992	Year-End 1988	Percent Change
Bonds[a]	$1,231	$969	27
Privately placed bonds[b]	250	n.a.	n.a.
Bank C&I loans[a]	661	670	-1
Finance company loans[a]	297	245	21
Commercial paper[a]	108	86	26
Thrift C&I loans[a]	8	34	-76
Venture capital funds[c]	35	n.a.	n.a.
Trade debt[a]	811	686	18
Securitized business credit[d]	64	8	689

Sources:
a. Board of Governors, *Flow of Funds.*
b. Estimate for 1991 found in Mark Carey, Stephen Prowse, John Rea, and Gregory Udell, "Recent Developments in the Market for Privately Placed Debt." *Federal Reserve Bulletin*, February 1993.
c. Steven Bavaria, "Will Venture Capital Bloom in the 1990s?" *Investment Dealer's Digest*, May 25, 1992.
d. Federal Reserve Bank of New York estimates of the sum of securitized finance company loans and leases and asset-backed commercial paper supporting business credit.

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(e.g., for cash management), to under a year (e.g., for working capital), to multi-year (e.g., for equipment purchases or LBO-related financings). Moreover, many C&I loans have no explicit maturities, rather they are extended under lines of credit that can be drawn down on demand by the borrower, and perhaps can be called on demand by the lender as well.

The majority of bank C&I loans are at least partially secured by the borrowers' assets. The details of the collateralization, however, are often left imprecise and the bank credit review process traditionally decides on the acceptability of a particular loan application as if the loan were to be made on an unsecured basis. This informal method of collateralization and greater stress on balance sheet/cash flow considerations contrasts strongly with secured loans made by finance companies. Finance companies typically look much more closely at the quality of the collateral as a basis for credit approval.

Commercial Paper

Large firms with strong credit ratings often have commercial paper ("CP") programs which provide funds for their daily cash management and working capital needs. To be exempt from registration requirements, the SEC requires that CP mature in less than 270 days and be issued for working capital purposes such as inventory or accounts receivable financing. In practice, almost all CP issuers have investment-grade credit ratings and have back-up bank credit facilities for their commercial paper programs. The largest purchasers of CP are money market mutual funds. In addition, commercial paper is held by pension funds, insurance companies, households, and corporate accounts managed by bank trust departments.

Commercial paper issuance is highly concentrated among a small number of firms, most of which have "Tier 1" credit ratings (i.e., rated P-1 by Moody's or A-1 by S&P or D-1 by Duff and Phelps or F-1 by Fitch) Smaller firms or large firms with weak credit ratings generally do not have access to the commercial paper market. Recently, however, special purpose funding vehicles have been set up by bank holding companies and securities firms to issue highly rated CP often backed by pools of trade receivables of firms that do not, themselves, have top credit ratings. The total amount of receivables outstanding that are currently securitized in this manner is about $58 billion.[37]

Long-Term Capital Markets

For large corporations, long-term funding for business expansion or general corporate purposes is generally obtained in the public bond and equity markets. For small and medium sized businesses, venture capital funds and initial public offerings of equity are important sources of risk capital (see Chart A1). Prior to the 1980s, access to the public bond market was generally available only to firms with investment-grade credit ratings. The subsequent development of the junk bond market, however, extended market access to the below-investment-grade sector as well. This sector now represents almost 20 percent of the public debt market. Net issuance of publicly traded bonds was extremely rapid during the 1980s, but much of the funds raised with bonds was used to retire corporate equity.

The private placement bond market competes more directly with banks for market

[37] An excellent introduction to this topic has been written by Barbara Kavanaugh, Thomas Boemio, and Gerald Edwards, Jr., "Asset-Backed Commercial Paper Programs," *Federal Reserve Bulletin*, Vol. 78, Num. 2, February, 1992, pp 107-116.

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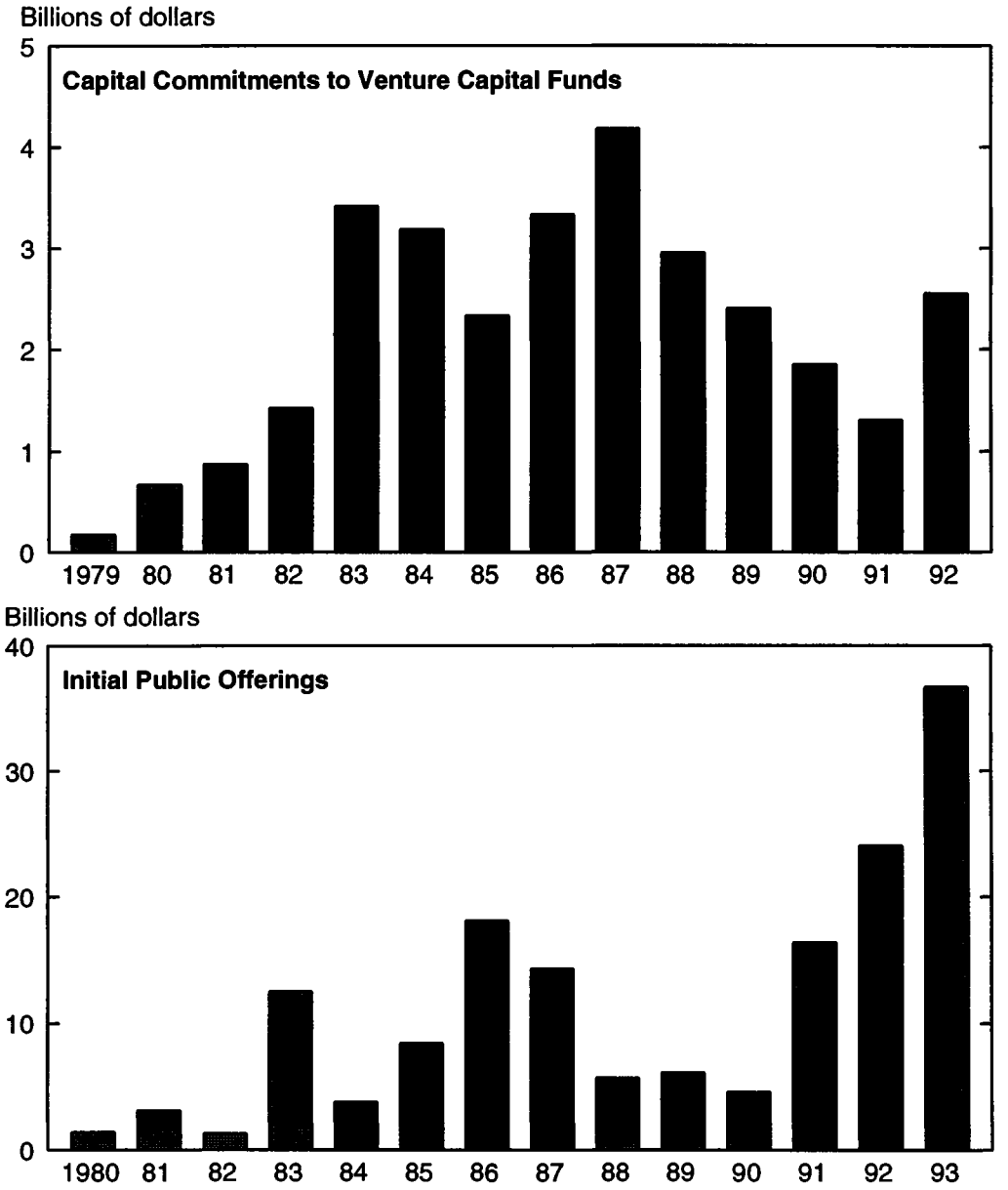
share in lending to middle market corporations. Medium sized-firms with moderate funding needs and varying credit quality often either cannot or choose not to borrow in the public markets and instead obtain long-term and medium-term funding in the private placement market. Bonds and stocks that are sold privately are not subject to the Securities and Exchange Commission's registration requirements and disclosure rules, which require that borrowers report actual and potential obligations affecting their ability to repay debt. By issuing privately, companies can save the direct and indirect costs of these requirements. Privately placed securities have disadvantages, however, in that the SEC restricts the extent to which they can be resold to other investors. Because they are

Chart A1: Trends in Venture Capital and IPOs



Source: National Venture Capital Association.

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therefore less liquid, private placements must typically offer investors a compensating premium in yield relative to public securities for the borrowers of the same risk class.

The primary investors in the private placement market are life insurance companies and a few pension funds. The market is like an intermediated credit market in that the lenders need to perform their own credit evaluation of the borrower and tend to monitor closely his financial condition over time. At year-end 1991, life insurers held about $212 billion in privately placed corporate bonds. At the time, the total stock of privately placed, nonfinancial corporate bonds outstanding was about $250 billion.[38]

Life Insurance Companies

Life insurance companies are major suppliers of business credit through their purchases of foreign and domestic corporate bonds and commercial real estate mortgages. At year-end 1992, life insurers held $650 billion in foreign and domestic corporate bonds and $250 in commercial mortgages. During 1990 through 1992, insurers' bond holding grew roughly 8 percent per year while their holdings of commercial mortgages remained virtually unchanged. These patterns of growth were quite similar to the growth rates observed over the same time period for corporate bonds and commercial mortgages in the aggregate. Life insurers, however, serve a key role in financing business credit because they, like banks, specialize in providing credit to borrowers that cannot easily obtain funds from the direct credit markets. In particular, of the $250 billion privately placed bonds that have been issued by U.S. nonfinancial corporations, about two-thirds have been purchases by life insurers. Moreover, of this roughly $165 billion in private placements, about 17 percent are issued by below-investment-grade borrowers.

Finance Companies

Finance companies are major providers of business credit to a wide variety of firms.[39] The lenders in this industry are extremely diverse and include (1) so-called "captives", subsidiaries of manufacturing companies that mainly provide sales finance, leases, and dealer loans for their parents' products, (2) large diversified lenders that often are subsidiaries of industrial firms, financial firms, or utilities and provide a wide array of services, ranging from factoring, to small and large ticket leasing, to mergers and acquisition financing, (3) independent companies often specializing in either small business finance and/or leasing.

The traditional customer base of finance companies consists of small and middle market companies, with perhaps lower than average credit quality and without access to bank credit. The captive finance companies, in part to meet the sales objectives of their parents however, often compete with banks for the business of lending to borrowers of higher credit quality . Moreover, independent finance companies often compete successfully with banks for financing large investment grade borrowers when the funding arrangement requires highly specialized "niche" expertise, such as knowledge of the aircraft or other "large-ticket" leasing businesses.

[38] These estimates, as well as a wide ranging discussion of the private placement market, are contained in Mark Carey, Stephen Prowse, John Rea, and Gregory Udell, "Recent Developments in the Market for Privately Placed Debt," *Federal Reserve Bulletin*, February, 1993.

[39] The finance company industry is surveyed in a paper by Eli Remolona and Kurt Wulfekuhler, "Finance Companies, Bank Competition, and Niche Markets," *Quarterly Review*, Federal Reserve Bank of New York, Summer, 1992, pp. 25-38.

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Trade Debt

The interfirm transactions that support the production and merchandising of goods are facilitated by a substantial volume of trade debt and trade credit. At year-end 1991, outstanding trade debt was about $780 billion, roughly equal to the total volume of outstanding C&I loans. In the aggregate data, trade debt tracks the business cycle and inventories, in particular, very closely. As a result, fluctuations in trade debt may reveal only scant independent information about economic activity or credit conditions.[40] A closer examination of the data, however, can reveal other patterns. Firms in the wholesale trade sector and small manufacturing firms tend to rely more on trade debt than other firms as a means of inventory finance.[41] Businesses that lack current funds but need to acquire raw materials, intermediate goods, or inventory for final sale can, within bounds, increase their credit by "stretching-out" their payables.

[40] Only a few macroeconomists have studied trade credit in great detail, either from theoretical or empirical perspectives. A recent paper by Valerie Ramey examines the correlations between fluctuations in trade credit and the monetary aggregates and cites the related literature. See her paper, "The Source of Fluctuations in Money: Evidence from Trade Credit," NBER working paper #3756, June, 1991.

[41] See the *Quarterly Financial Report for Manufacturing Corporations*, Department of Commerce, various issues.

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Survey Evidence on Credit Tightening and the Factors Behind the Recent Credit Crunch

by Kausar Hamdani, Anthony P. Rodrigues, and Maria Varvatsoulis[1]

Media reports that some firms were having trouble obtaining loans, coupled with a sharp and persistent decline in bank loans to business (Chart 1), have led some commentators to suggest that a credit crunch occurred during 1989-92. However, the drop in bank lending could have been caused by a decline in either loan demand or loan supply, arising from the recession and subsequent slow economic growth. Surveys of borrowers and lenders can indicate the relative importance of demand and supply factors for the decline in business loans. In this paper, we analyze both survey evidence and macroeconomic data to investigate the effects of supply and demand factors on the observed credit tightness.

Other researchers have also examined survey evidence to explain credit developments in the recent period. In contrast to much of this literature, which focusses on surveys of either borrowers or lenders, we examine both borrower and lender surveys for evidence of credit tightness.[2] We also analyze large and small business borrowers, reviewing the extent and the form of the credit tightening that both classes of borrowers experienced. Where possible, we compare the current period with historical episodes.

The paper is structured as follows: The first and second parts of the paper are narrative analyses of credit conditions in the mid-1980s and in 1989-92. The later analysis suggests that, while demand factors contributed to the 1989-92 slowdown, supply factors played an important role, particularly in 1990, and that the tightness faced by small businesses has been longer-lived than the credit restraint on large firms. In the third and fourth parts of the paper, we motivate and use regression models to purge the survey variables of their cyclical component, providing noncyclical measures of credit supply.

[1] The authors wish to thank Akbar Akhtar, Richard Davis, Valerie LaPorte, Patricia Mosser, Charles Steindel, and John Wenninger for helpful suggestions on earlier drafts of this paper.

[2] For example, S. Schreft and R. Owens, in "Survey Evidence of Tighter Credit Conditions: What Does It Mean?" Federal Reserve Bank of Richmond, *Economic Review*, March/April 1991, focus on lender surveys while W. Dunkelberg, in "Small Business Credit Crunch," The NFIB Foundation, December 1992, examines surveys of small business borrowers.

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In the fifth part of the paper, we introduce survey measures of credit supply into loan growth models. Both the survey and loan growth regression models suggest that tight credit supply contributed to the recent weakness in loan growth. Finally, a description and history of the major systematic surveys is provided in the Appendix.

I. Survey Evidence for the Mid-1980s: The Benchmark Period

Nonfinancial business credit boomed in the mid-1980s (Chart 2). Bank lending to businesses also grew quickly in this period, although not at the pace of other components of credit. The demand for debt was driven by merger and acquisition activity and corporate restructuring. At the same time, financial innovations and the deregulation of financial institutions supported the supply of credit.

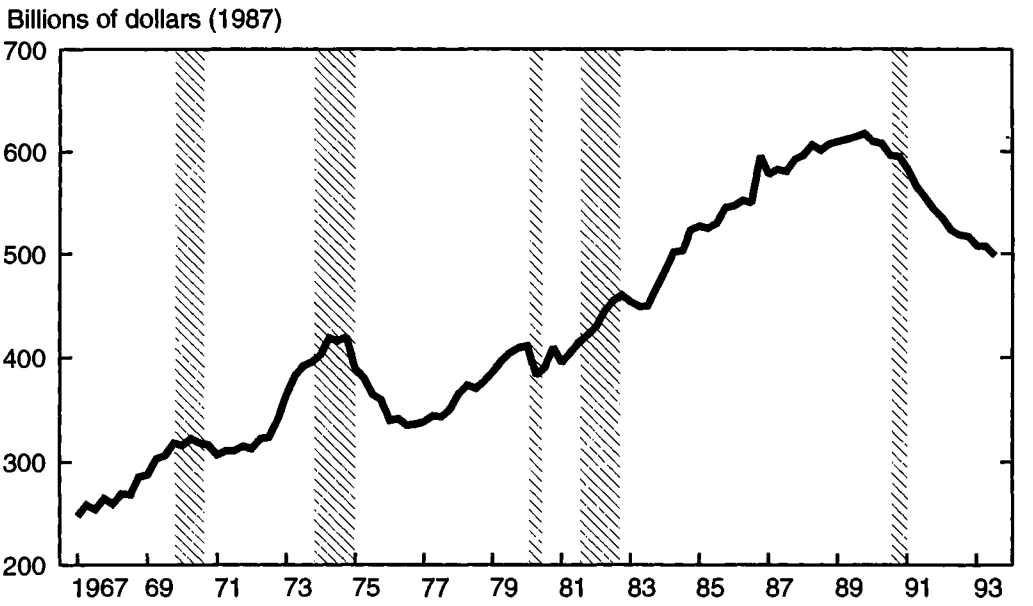
Three major surveys provide insight into bank loan behavior. Small business borrowers are surveyed by the National Federation of Independent Business (NFIB).[3] Bank lenders are represented by the Federal Reserve's Senior Loan Officer (SLO) survey.[4] The perceptions of large and middle market business borrowers are recorded in the Goldman Sachs & Co. survey of Fortune 1000 chief financial officers (CFOs).[5]

[3]The National Federation of Independent Business (NFIB) has surveyed small businesses about credit availability and business activity since late 1973. Since small businesses rely heavily on bank credit, their perceptions of credit conditions most likely reflect bank loan availability.

[4] The Federal Reserve System has conducted the Senior Loan Officer Opinion (SLO) survey since 1964. The information elicited is primarily qualitative and indicates the loan policy stance of each participating bank. If respondents have changed their loan policies, they are asked to report the direction and degree of the change. Questions on credit availability and loan demand were asked only occasionally during the mid-1980s.

[5] Goldman Sachs & Co. has surveyed the chief financial officers (CFOs) from the Fortune 1000 industrial

Chart 1: Commercial and Industrial Loans at U.S. Commercial Banks



Source: Flow of Funds, Bureau of Economic Analysis.

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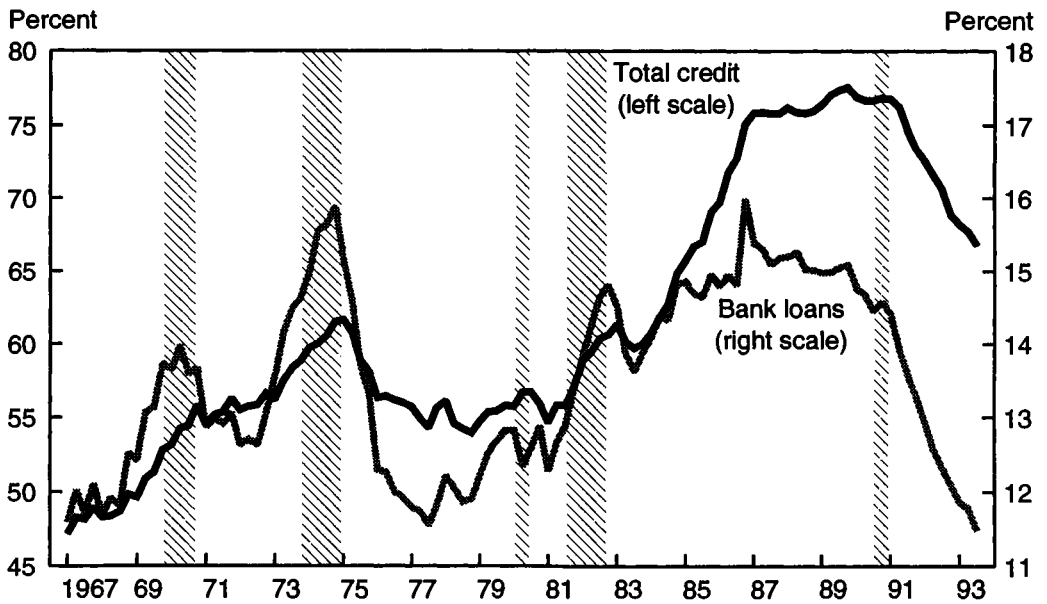
Large and Middle Market Business Borrowers

The SLO surveys of banks during the mid-1980s suggest that loan growth was mainly demand driven and that insufficient supply of bank credit was not a major problem. Weak demand was mentioned more often than tighter standards as a source of slow loan growth in the surveys from 1984 to 1988 (Table 1). When weakness in loan demand existed, it was largely attributed to declines in firms' financing needs, although the increased use of nonbanks and capital markets was also occasionally cited as a factor (Table 2). Furthermore, in 1986 a majority of banks reported undertaking several marketing changes specifically to increase loan issuance, suggesting that supply was supporting loan growth.

The CFO surveys show that the fraction of large businesses planning to increase bank loans during 1985-88 averaged slightly below the levels of 1976-83 (Chart 3). Using reported CFO expectations of growth in inventories, capital spending, and cash flow, we can construct a rough proxy for net demand for external funding since 1985 (presented in Chart 3). The relatively close association between the proxy for demand for external funds and the fraction of Fortune firms intending to increase their borrowing suggests that any weakness in loan growth over 1985-88 was mainly demand driven. Decomposing the respondents by size and industry, we find that the weakness in demand during 1985-86 was pervasive with demand strengthening later in the period, particularly in 1987 (Chart 4).

Footnote 5 continued
companies semiannually since 1976. A question on expected borrowing from banks, for the upcoming six months, relative to the previous six months, has been asked consistently since the inception of the survey.

Chart 2: Nonfinancial Business Credit
Relative to Business GDP



Source: Flow of Funds, Bureau of Economic Analysis.

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Small Business Borrowers

The NFIB surveys indicate that small businesses shared in the general economic prosperity of the mid-1980s. From 1986-88, a growing fraction of firms reported higher sales and increasing inventories (Table 3). This economic buoyancy implied healthy small business loan demand.

Supplementary survey data for this period are limited. One 1988 survey, the NAM Small Manufacturers Operating Survey, reports a large fraction of firms experiencing better sales and suggests a relatively strong loan demand over 1987 and early 1988 (Table 4).[6]

[6] The National Association of Manufacturers surveys its members early in the spring of each year. Since the credit availability question asks respondents to compare current conditions with those in the prior year, the data likely reflect changes in conditions during the preceding calendar year.

Table 1: Reports of Weaker C&I Loan Growth
Senior Loan Officer Survey, Percent of All Banks

Survey Date	Sources of Weaker C&I Loan Growth				Banks Reporting Weaker C&I Loan Growth
	Weaker Business Loan Demand		Tighter Credit Standards or Decreased Willingness to Lend		
	Percent	Net Percent	Percent	Net Percent	Percent
1984					
Jun.	-	-	27[a]	-	-
Sep.	37	-	5	-	43
Nov.	22	-	7	-	25
1985					
Feb.	27	-	5	(3)[b]	30
1986					
Aug.[c]	7	(16)	4	(16)	11
1987					
Sep.	42	34	5	-	53
1988					
Nov.	28	-	0	-	28
1989[d]	33	-	26	-	51
1990					
May	27	-	24	-	44

Source: Federal Reserve System.

a. Percent of banks reporting tighter standards, but not attributing weaker loan growth to them.

b. Net percent of banks reporting a decreased willingness to lend, but not attributing weaker loan growth to it.

c. For middle market borrowers only.

d. Information regarding 1989 was provided in the May 1990 survey.

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Credit supply conditions were neutral for small businesses during the mid-1980s. Over 1985-88, the net percent of NFIB regular borrowers who reported that credit was more difficult to obtain increased slowly, remaining below the series' average value (Chart 5). Financing costs were not a sustained problem because interest rates declined on average following the 1982 recession even though a significant fraction of borrowers reported a higher loan rate in 1984 and 1987.

The NFIB survey indicates, however, that credit supply conditions worsened in 1988 (Chart 5). Concurrently, the percent of NFIB firms reporting a higher borrowing rate increased sharply, suggesting that rising loan rates were the main reason for the growing reported incidence of credit stringency.

Table 2: Sources of Large and Middle Market Firm Weaker Loan Demand
Senior Loan Officer Survey, Net Percent of All Banks

	Reduced Funding Needs			Substitution to Nonbank Financing		
Firm Size/ Survey Date	Large		Medium	Large		Medium
1984						
Apr.		(42)			(13)	
Sep.		18			17	
Nov.		17			14	
1985						
Feb.		15			8	
1987						
Sep.		19			17	
1988						
Nov.		17			0	
1989		33			21	
1990						
May	22		27	11		5
1991						
Aug.	16		10	2		(2)
Oct.	25		31	8		3
1992						
Jan.	24		31	10		0
May	2		(9)	15		0
Aug.	10		3	5		0
Nov.	2		(2)	0		3
1993						
Feb.	(11)		(16)	(5)		0
May	0		(5)	18		4
Aug.	(7)		(16)	4		0
Nov.	(3)		(10)	8		3

Source: Senior Loan Officer Survey, Federal Reserve System.
Note: As of 1990, banks have responded separately for large firms (those with sales greater than $250 million) and middle market firms (those with sales between $50 million and $250 million).

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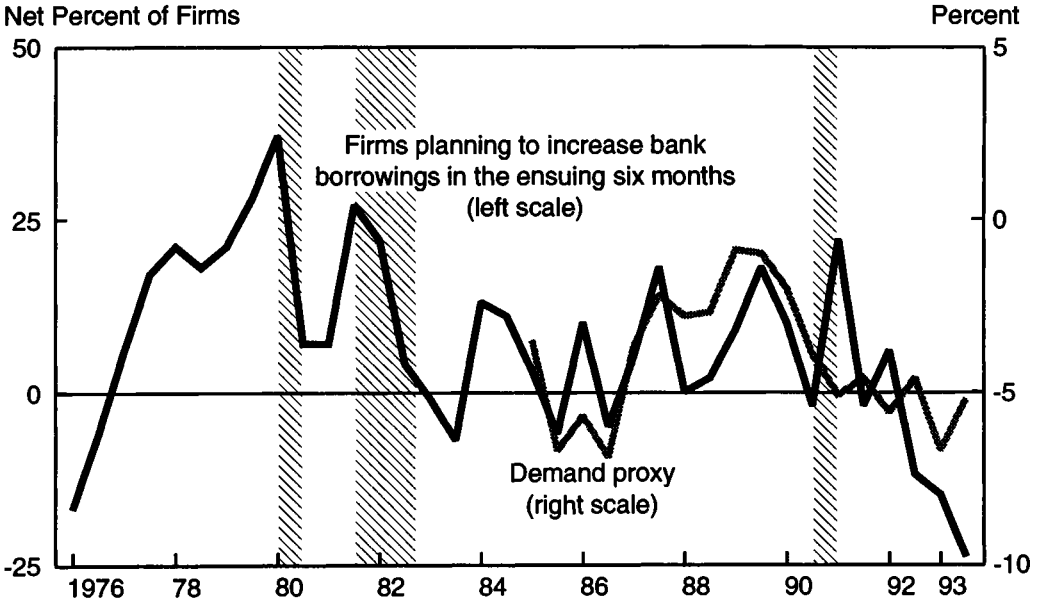
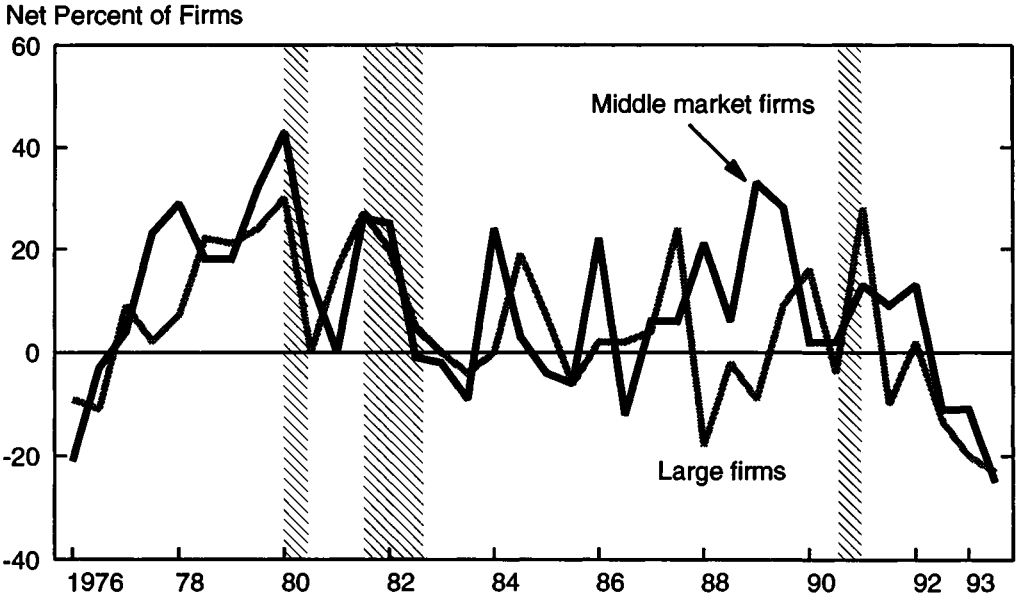
Chart 3: Indicators of Bank Loan Demand
Goldman Sachs Survey of Fortune 1000 CFOs



Source: Goldman, Sachs & Co.
Note: The correlation between the two series is 0.70 in 1985H1 to 1990H1, and 0.21 in 1990H2 to 1993H1. The proxy for external funds is capital spending plus inventory growth minus internal cash flow growth, all projected over the next six months.

Chart 4: Large and Middle Market Firm Bank Loan Demand
Goldman Sachs Survey of Fortune 1000 CFOs



Source: Goldman, Sachs & Co.
Note: Firms planning to increase bank borrowing in the ensuing six months.

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II. Survey Evidence for 1989-92

The 1989-92 credit slowdown can be divided into two subperiods: 1989-91 and 1992. The first represents a period of credit weakness and decline; the second coincides roughly with the credit trough. The first period began with softening loan demand in 1989 while lenders, responding to deterioration in the quality of loan portfolios, became more cautious. During 1990-91, both loan demand and credit availability dropped relative to 1989 and the mid-1980s. By mid-1992, loan demand began to recover and credit conditions stabilized with the absence of further tightening in credit availability.

Large and Middle Market Business Borrowers

Loan Demand

SLO surveys of banks reported shrinking demand from middle market and large business borrowers between 1990 and 1992, with more pervasive demand weakness for larger customers (Chart 6). This weakness was attributed primarily to reduced funding needs, though large firms' tendency to substitute to nonbank sources of funds[7] was also noted (see Table 2).

By the end of 1992, the SLO surveys reported that loan demand was recovering at middle market and large corporate borrowers. The demand at mid-sized firms seemed driven primarily by the need to finance inventories and plant and equipment, while demand at large borrowers arose from a shift toward bank financing from nonbanks and the capital market.

Confirming the evidence from the SLO surveys, anticipated bank borrowing by large

[7] These alternative funding sources include commercial paper, junk bonds, and investment grade bonds.

Table 3: Indicators of Small Business Economic Activity
NFIB Survey, Net Percent of Firms Noting an Increase

Year	Net Earnings	Sales	Inventory	Capital Outlays[a]
1986	(10)	7	1	55
1987	(7)	10	3	55
1988	(7)	11	5	55
1989	(13)	9	1	56
1990	(18)	4	(3)	56
1991	(25)	(4)	(10)	53
1992	(17)	3	(6)	52
1993	(21)[b]	1[b]	(1)[b]	60[c]

Source: National Federation of Independent Business.

a. Percent of firms making capital expenditures in the previous six months, as of the first month of the quarter.

b. Based on data available through the second quarter only.

c. Based on data available through the third quarter only.

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and mid-sized Fortune companies weakened from 1989 to 1992, albeit erratically. The CFO measure of net demand for external financing also dropped strongly (see Chart 3). This retrenchment in borrowing plans was often stronger at the larger firms (see Chart 4).

Unfortunately, the two CFO survey indicators are not entirely consistent on the pattern of business loan demand during the period. Both indicators of demand showed declines throughout 1990. However, movements in the first indicator, the net percent of firms planning to increase their bank borrowing, coincided with the general expectations about the economy's behavior. The indicator rose sharply in the first half of 1991, paralleling the optimism surrounding the recession's apparent end. It subsequently fell in the second half of 1991, when the economy appeared to have stagnated. A slight recovery appeared in the first half of 1992, when the economy seemed to be slowly growing again. More recently, the series dropped in late 1992 and early 1993 as the slow-to-moderate pace of the recovery became evident. By contrast, the second indicator of demand, the proxy for net demand for external funding, shows no such recovery, running below 1987-89 rates through 1991 and 1992.[8] One interpretation of the inconsistency between the two CFO survey indicators is that the actual weakness in loan growth that appeared in 1990-92 arose largely from demand, and that the optimism exhibited in the borrowers' stated plans in the first half of 1991 was premature. The subsequent realignment with the downward trending proxy for net demand suggests demand continued to be the impetus behind borrowing plans.

Loan Supply

The supply of credit to large and middle market borrowers appears to have tightened during 1990-92. By the second quarter of 1990, a large fraction of the SLO banks re-

[8] The lower levels of the proxy were driven by expectations of both slowing expenditures and growing cash flow.

Table 4: Indicators of Small Business Economic Activity and Credit Availability
NAM Survey, Net Percent of Firms Noting an Increase

	Actual				Expected	
Date of Survey[a]	Sales	Capital Spending	Debt to Cash Flow	Credit Stringency	Sales	Capital Spending
1988	55	-	(9)	20	54	-
1989	40	45	(5)	(8)	(60)	-
1990	5	28	(24)	(2)	47	14
1991	(12)	7	4	18	(8)	1
1992	-	-	11	5[b]	39	17

Source: National Association of Manufacturers.
Note: Net percent is the percent of firms reporting an increase minus the percent of firms reporting a decrease, relative to the prior year.

a. Because the survey is conducted in February of each year and asks about conditions relative to a year ago, it likely reflects conditions during the prior calendar year.

b. Percentage of firms which reported not successfully obtaining credit.

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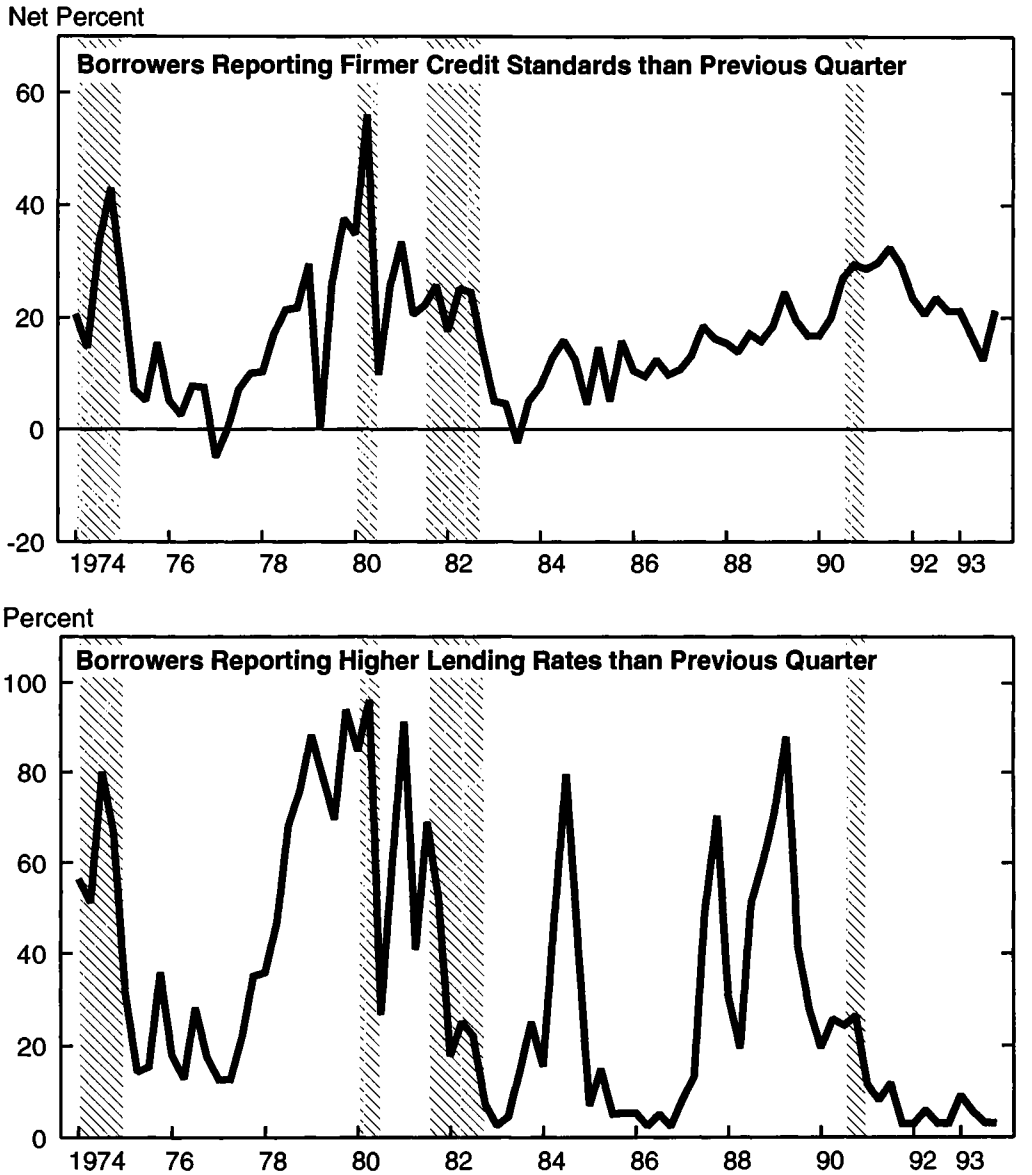
ported additional tightening of standards; this tightening continued through early 1992, although it declined in degree over time (Chart 6). By 1992, the SLO surveys show that any further tightening for large customers had virtually ceased. Mid-sized customers, however, continued to face further tightening through mid-1992.

The main reason given by bank SLO respondents for the stricter credit standards was a less favorable economic outlook, followed by industry-specific problems (Chart 7). The other reasons cited by the respondents varied in prevalence and importance. Capital pressures were almost as important as loan portfolio quality during 1989 and 1990. These pressures declined in 1991 and were hardly mentioned or ranked subsequently. Regulatory pressures, which had received prominent media attention, were cited almost as frequently as industry specific problems during 1990, but were subsequently most of-

Chart 5: Credit Availability to Small Firms
NFIB Survey



Source: National Federation of Independent Business.

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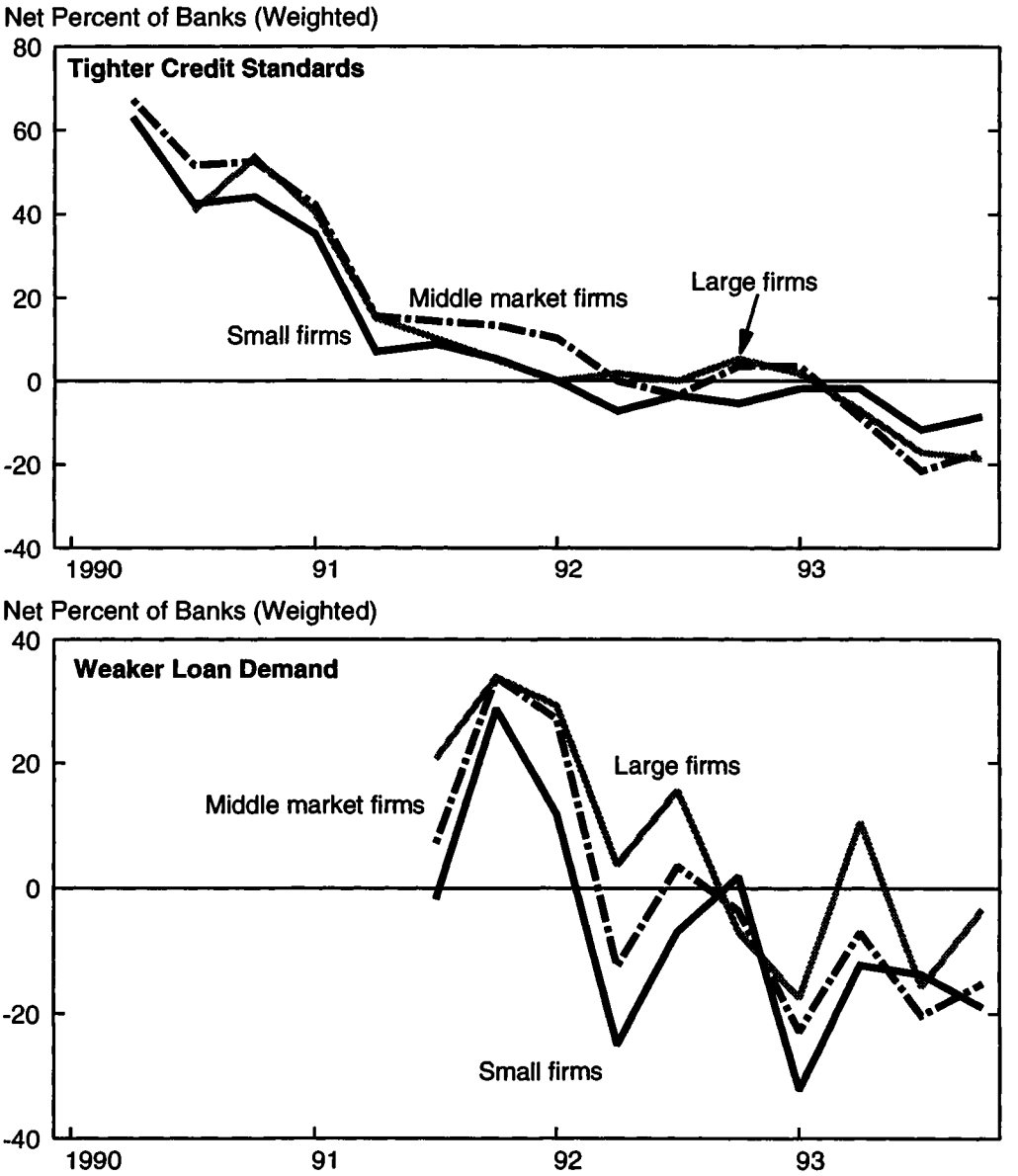
ten ranked lower than both the adverse outlook and the industry problems.

Consistent with the SLO surveys, the Fortune CFO responses to questions about bank credit tightening, initiated in October 1990, indicate that credit stringency steadily worsened through 1991 (Table 5). Even after the onset of easing, 30 percent of all large business borrowers still reported some form of credit tightening as of October 1992.[9]

The perceived credit tightening reported by the CFOs varied somewhat by size of firm. For most of the period, the Top 500 industrial firms experienced tightening a little less frequently than the second 500 firms. However, this pattern was reversed in October 1992, when fewer mid-sized firms than large firms reported tightness.

[9] This question was not asked in the April 1993 CFO survey.

Chart 6: Sources of Business Loan Growth
Senior Loan Officer Survey



Source: Senior Loan Officer Survey, Federal Reserve System.

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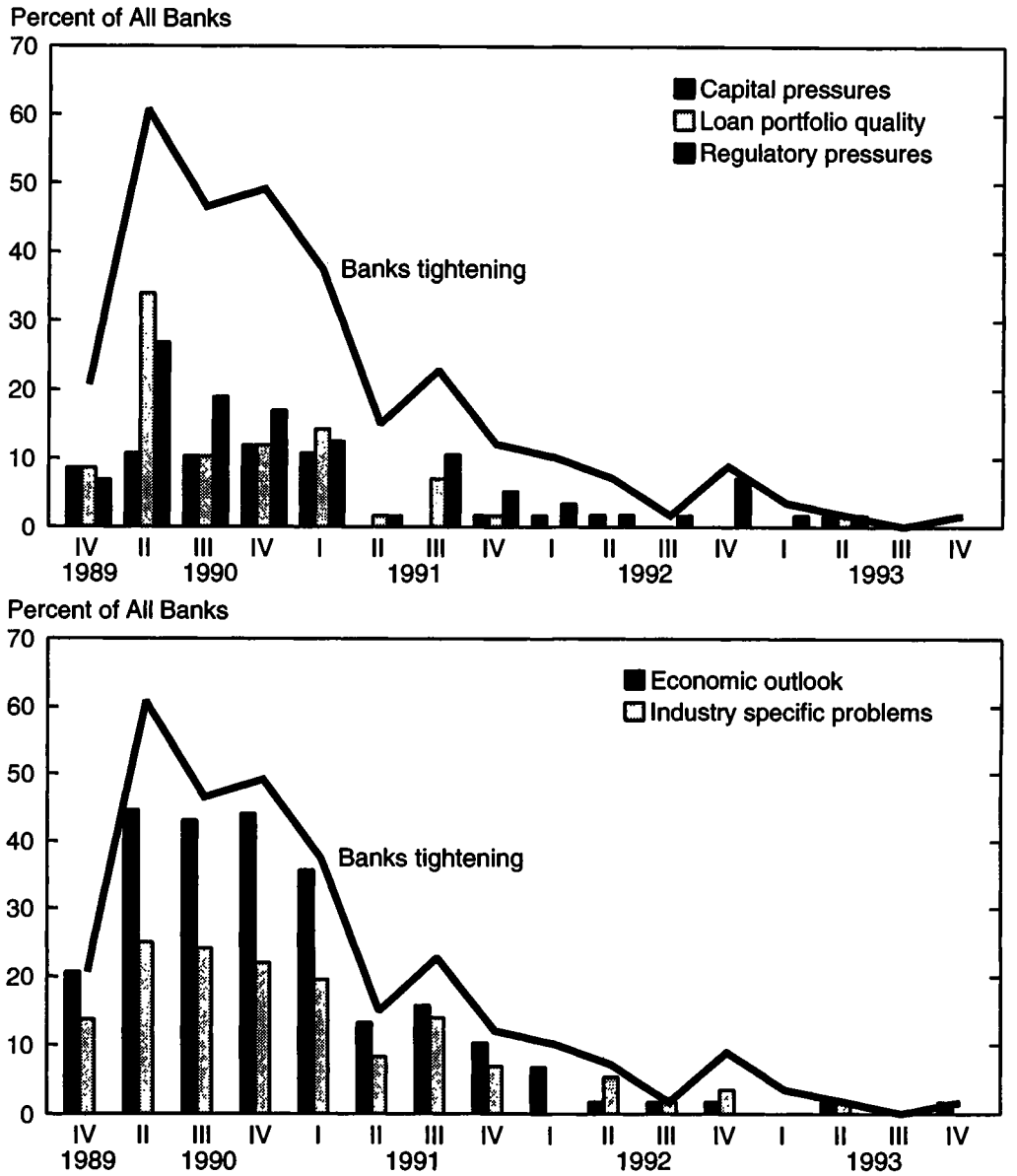
The form of tightening appears to have shifted during the period. Initially, stiffer nonprice standards were more prevalent than higher pricing. Beginning in 1991, however, tighter price terms became more common as the credit stringency worsened. This confirms the evidence from the SLO surveys, which agree that the form of tightening shifted from stricter nonprice to higher price terms of credit, particularly for middle market firms in late 1990 and early 1991 (Charts 8 and 9).[10] Unfortunately, more recent

[10] The Fortune CFO data also indicate that, during 1990 and 1991, larger businesses encountered tightening of price terms more frequently than smaller Fortune firms, who more often faced tougher underwriting

Chart 7: Reasons for Credit Tightening
Senior Loan Officer Survey



Source: Includes all banks tightening standards to either large, middle market, or small firms.
Note: Senior Loan Officer Opinion Survey, Federal Reserve System.

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CFO information on the form of tightening was unavailable because Goldman Sachs dropped the question from the survey in 1992.

Additional information about borrowers' perceptions of credit supply can be extracted from the question on bank borrowing plans. The drop in expected borrowing in the first and second halves of 1990 is consistent with tightening supply of credit. Although the sharp increase in plans in the first half of 1991 was probably motivated by economic optimism, it suggests that either borrowers no longer perceived credit tightness or they expected the tightness to be short-lived and unrestraining. Some analysts interpreted the declines in borrowing plans apparent in the second half of 1991 as evidence of a credit crunch,[11] but the proxy for net demand suggests that a lack of a need for external funds justified the drop in plans (Chart 3). Furthermore, if borrowers perceived a credit crunch, it was not sufficient to preclude them from stating that they expected to increase

Footnote 10 continued
standards. This behavior may reflect a variety of factors such as banks' attempts to retain their largest customers because of risk considerations, the borrowers' ready access to alternative sources of funds, and the profitability of the overall banking relationship.

[11] Goldman Sachs & Co., "The Survey of Fortune Chief Financial Officers," Oct. 1991, pg. 3.

Table 5: Large and Middle Market Firm Credit Availability
Goldman Sachs CFO Survey, Percent of Firms Reporting Tight Credit Standards

	1990	1991		1992	
	Oct.	Apr.	Oct.	Apr.	Oct.
All respondents	46	48	51	39	30
First 500 industrials	43	48	49	35	32
Second 500 industrials	48	48	52	40	23
Memo: form of tightening					
Nonprice terms					
All respondents	69	40	49	–	–
First 500 industrials	60	40	30	–	–
Second 500 industrials	77	40	68	–	–
Price terms					
All firms	42	63	60	–	–
First 500 industrials	53	69	67	–	–
Second 500 industrials	30	56	52	–	–

Source: Goldman, Sachs & Co.
Note: The survey did not report the form of tightening after October 1991.

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bank borrowing again in the second half of 1992.

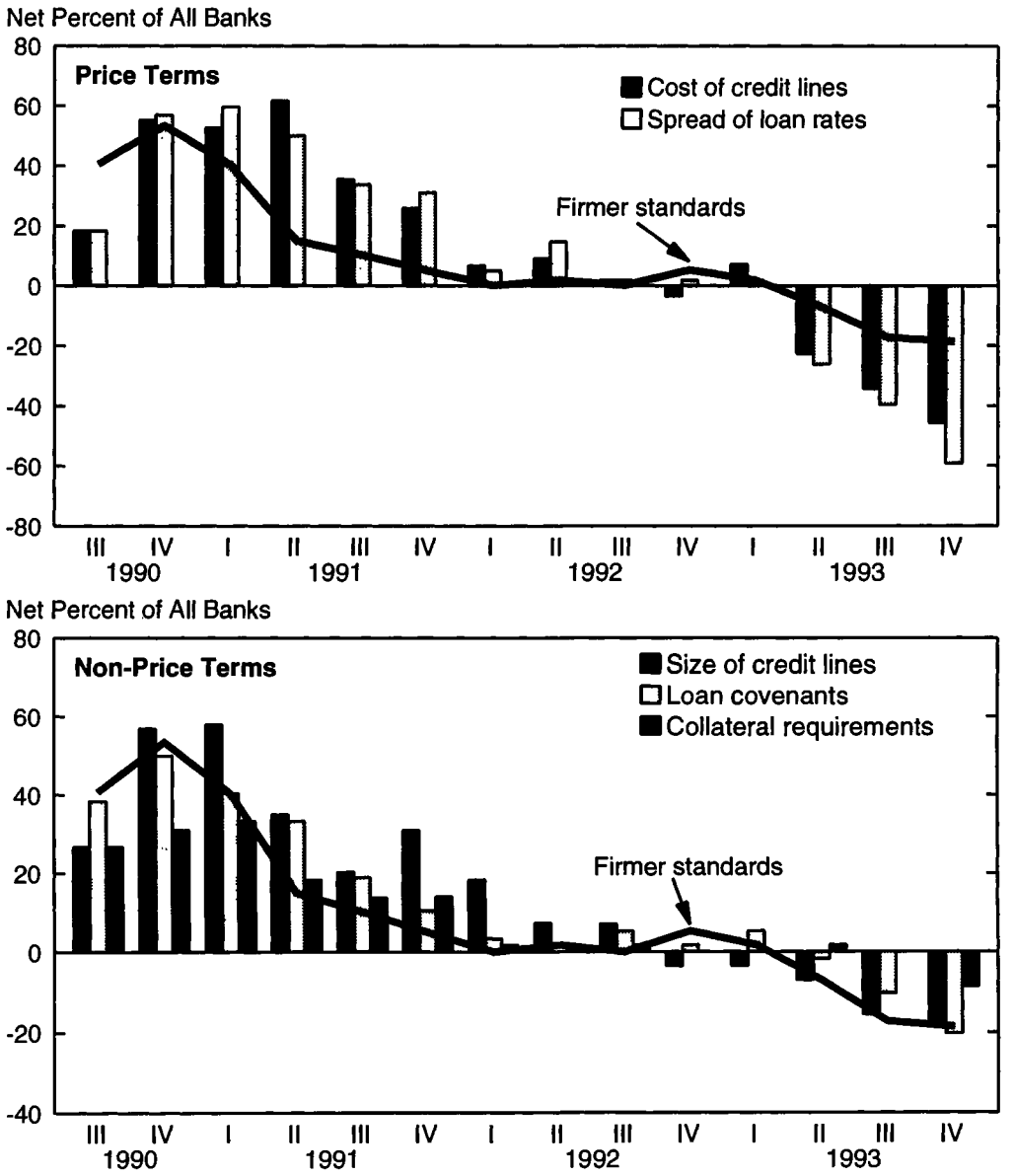
Hence, the consistent picture the SLO and CFO surveys present of tight credit conditions for 1990-92 suggests that the credit tightness to large business evident in 1990 and 1991 was short-lived and no longer restraining by the end of 1992.

Small Business Borrowers

Loan Demand

The major influences on small business loan demand shifted dramatically over 1989-92 as initial expectations of robust growth were disappointed. Small business respondents

Chart 8: Form of Credit Tightening to Large Firms
Senior Loan Officer Survey



Source: Senior Loan Officer Opinion Survey.

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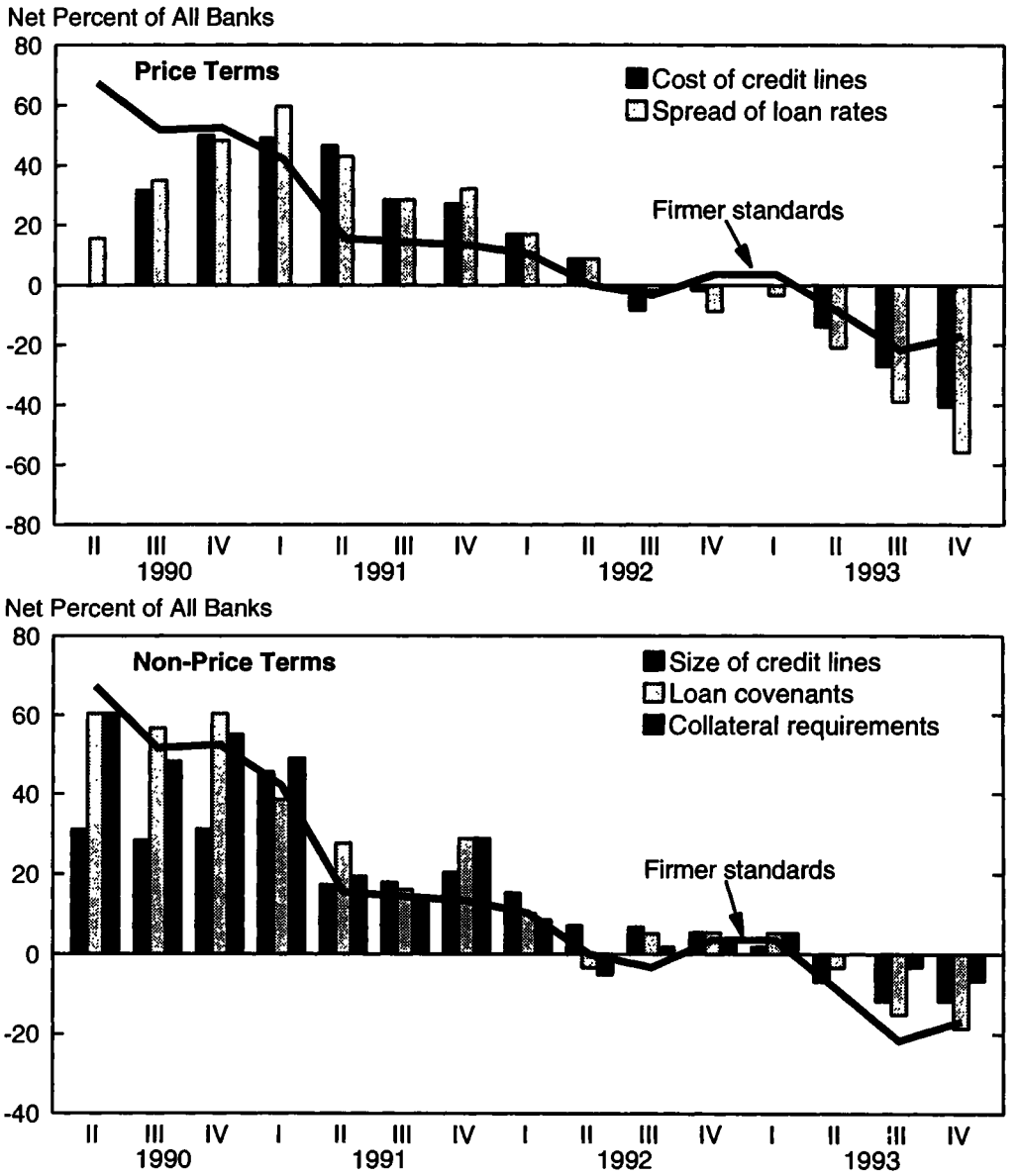
to the NFIB survey anticipated that sales growth would be strong at the start of 1989. In January, a large fraction of firms expected to make capital expenditures in the first six months of the year, and more firms, on balance, expected sales and inventories to rise than decline (Chart 10).

In the event, these expectations did not materialize. Actual earnings and sales growth slowed during 1989, after a very weak first quarter. This sluggishness continued into 1990-92 as a shrinking fraction of firms reported improving sales, net earnings, and inventories (see Table 3). Moreover, both the NFIB survey (Chart 10) and the NAM surveys (see Table 4) show a drop in the fraction of firms planning to add to inventories or

Chart 9: Form of Credit Tightening to Middle Market Firms
Senior Loan Officer Survey



Source: Senior Loan Officer Opinion Survey.

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to undertake new capital expenditures, particularly in 1990-91. The NFIB Small Business Optimism Index, which fell severely in 1990 and largely remained below values observed over 1987-89, illustrates this deterioration in small business expectations (Chart 11).

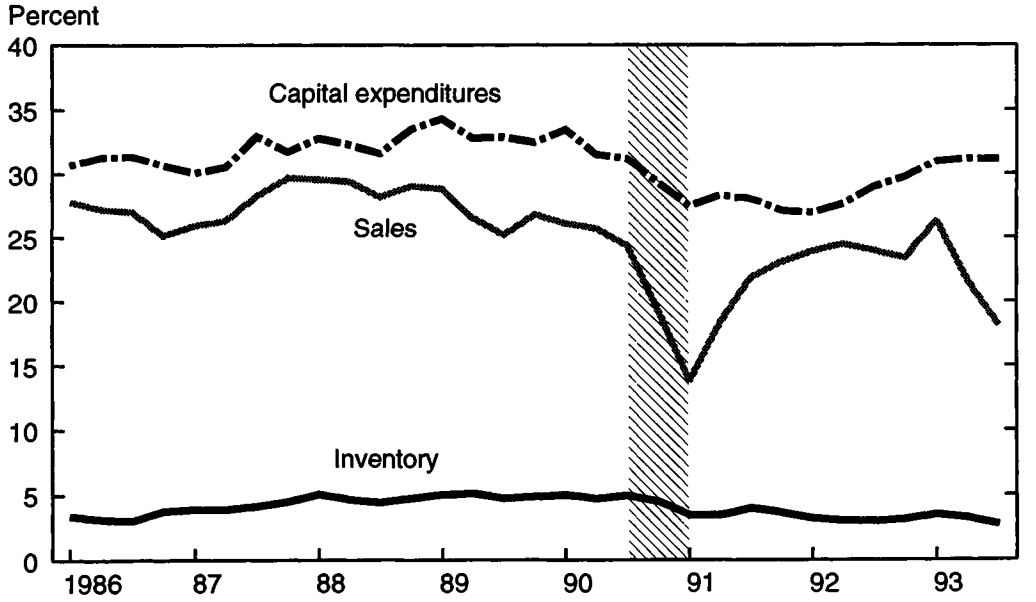
Slowing economic activity seems to have restrained small business loan demand after 1989. Although the SLO surveys report that loan demand was strong in 1989, some weakness in loan demand developed in 1990 (Table 6). This weakness was most often attributed to reduced needs for external funding. Substitution of funding sources either to other banks or to nonbanks and the capital market was infrequent for small companies who often simply reduced their financing from all sources.

By mid-1992, the SLO surveys indicated that small business loan demand had begun to improve. Credit demand to finance inventories and plant and equipment expenditures was the primary reason for strength, just as it had been the main source of weakness. This recovery continued, with varying degrees of intensity, into early 1993. However, the revival in loan demand reported by SLO lenders is not reflected in the NFIB surveys.

Loan Supply

Demand weakness was, however, not the only restraint on small business borrowing during 1989-92. NFIB borrowers reported that credit conditions deteriorated markedly during the first three quarters of 1989. The average interest rate paid on short-term loans rose steadily and was on average about 1 percentage point higher in 1989 than in 1988 (Chart 12). This rise in rates was pervasive, with almost 90 percent of NFIB regular borrowers experiencing higher interest rates than in the preceding three months in 1989-II (Chart 5). At the time of the survey, financing costs were mentioned by 11 percent of the sample as the single most important problem facing businesses. Simultaneously, the net

Chart 10: Indicators of Small Firm Loan Demand
NFIB Survey



Source: National Federation of Independent Business.
Note: Net percent of firms expecting an increase as of the first month of the quarter.

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percent of borrowers reporting that loans were currently harder to obtain increased sharply, implying a tightening not seen since 1982.

By year-end 1989, the pace of tightening temporarily stabilized. Interest rates dropped slightly and concerns about current and expected loan availability subsided to 1988 levels. The NAM surveys also reported that no noticeable credit tightening existed as of early 1990.

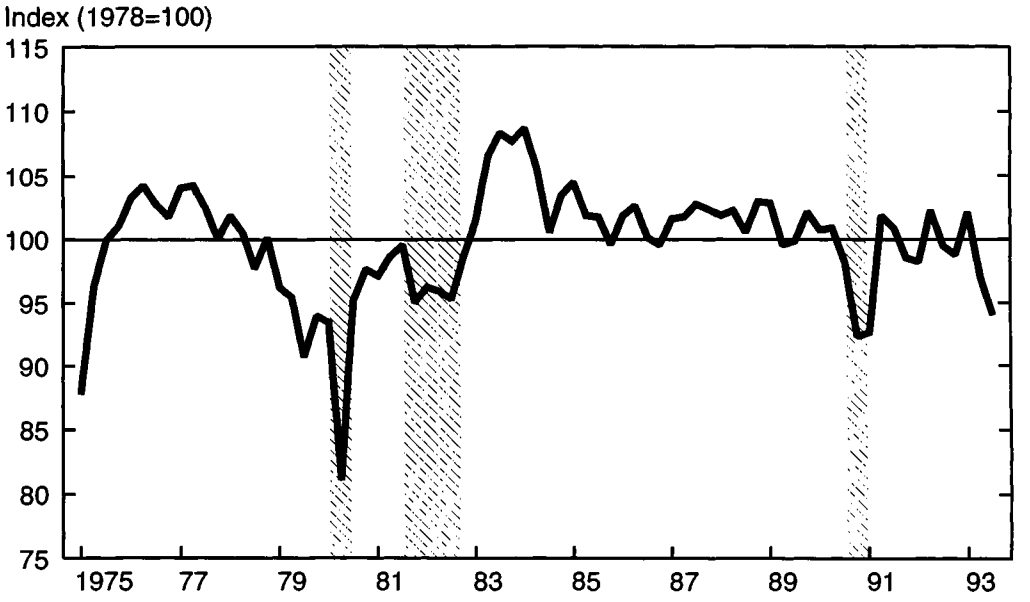
However, late in 1990, the fraction of NFIB and NAM businesses reporting that credit was harder to obtain grew again and has subsequently recovered only gradually (Chart 12 and Table 4). This credit tightness was reported even as lending rates began to decline. Moreover, in late 1990, NFIB borrowers expected future financing conditions to deteriorate.

The SLO survey respondents generally confirm small business borrowers' perceptions of credit stringency at least since 1989. Loan standards were tightened quite sharply in 1990 and early 1991, with additional tightening throughout the remainder of 1991 (Chart 13).[12] An actual easing of standards for small business loans did not emerge until 1992. Given the modest degree of recent easing, it would seem that most of the tightening implemented during 1990-91 is still in place.

Small borrowers were more frequently subject to tightening in the form of stricter loan covenants and collateralization requirements than in the form of higher spreads of

[12] Overall, the main reasons for the credit tightening were the deteriorating economic outlook and industry-specific problems (see Chart 7).

Chart 11: Index of Small Business Optimism
NFIB Survey



Source: National Federation of Independent Business.
Note: Weighted average sum of the [percent favorable - percent unfavorable] responses to questions in three categories: general expectations (expected business conditions, the climate for expansion, expected real sales volume, and expected credit conditions); current status (current job openings, current inventory satisfaction, and change in net earnings from prior quarter); and spending plans (plans to hire, to make capital outlays, and to add to inventories); indexed to 1978.

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loan rates over base rates (Chart 13). Nonprice tightening may have been more common because commercial and industrial loans to small firms are often collateralized with real estate to reflect their higher riskiness. However, when banks eased their credit standards in 1992 for small firms, they relaxed both price and nonprice terms, offering, for example a lower cost and a larger size of credit line.

Other surveys of borrowers and lenders in 1990 also reported credit tightening for small businesses (Table 7). A U.S. Chamber of Commerce survey highlighted that the smallest businesses were having the most trouble. The media also carried interviews with bankers who admitted to greater caution or "more prudential" lending practices.[13]

Anecdotal reports from other organizations were carried by the media in 1990 and were consistent with the survey evidence. For example, the National Association of Investment Companies claimed that companies with sales between $5 million and $15 million "were returning to investment companies two and three times for loans, rather than simply asking for early-stage financing. The National Minority Business Council reported that members who had initially found longer term loans harder to get than in the past were by mid-1990 having trouble securing even shorter term loans and working capital. The media also carried many stories of individual firms facing more stringent standards in the form of greater documentation, higher equity requirements, increased collateral, and stricter loan covenants.[14] Other reports told of outright denial of credit or canceled credit lines and recalled loans. [15]

In 1991, ad hoc surveys were less frequent. A Coopers and Lybrand survey reported

[13] "Lenders Juggle Credit and Toxic Waste," *ABA Banking Journal*, July 1990, pp. 83-87.

[14] Jeanne Saddler and Udayan Gupta, "Small Businesses Say They Don't Feel Credit Crunch," *Wall Street Journal*, May 25, 1990, pg. B2.

[15] Joel Brenner, "U.S. Banks Time Lending to Consumers, Businesses," March 28, 1990. Also, Monroe

Table 6: Sources of Small Firm Weaker Loan Demand
Senior Loan Officer Survey, Net Percent of Banks

Survey Date	Reduced Funding Needs	Subsititution to Nonbank Financing
1990		
May	9	0
1991		
Aug.	7	(7)
Oct.	17	2
1992		
Jan.	16	(2)
May	(11)	0
Aug.	(2)	0
Nov.	3	0
1993		
Feb.	(19)	0
May	(4)	2
Aug.	(11)	2
Nov.	(12)	0

Source: Senior Loan Officer Survey, Federal Reserve System.

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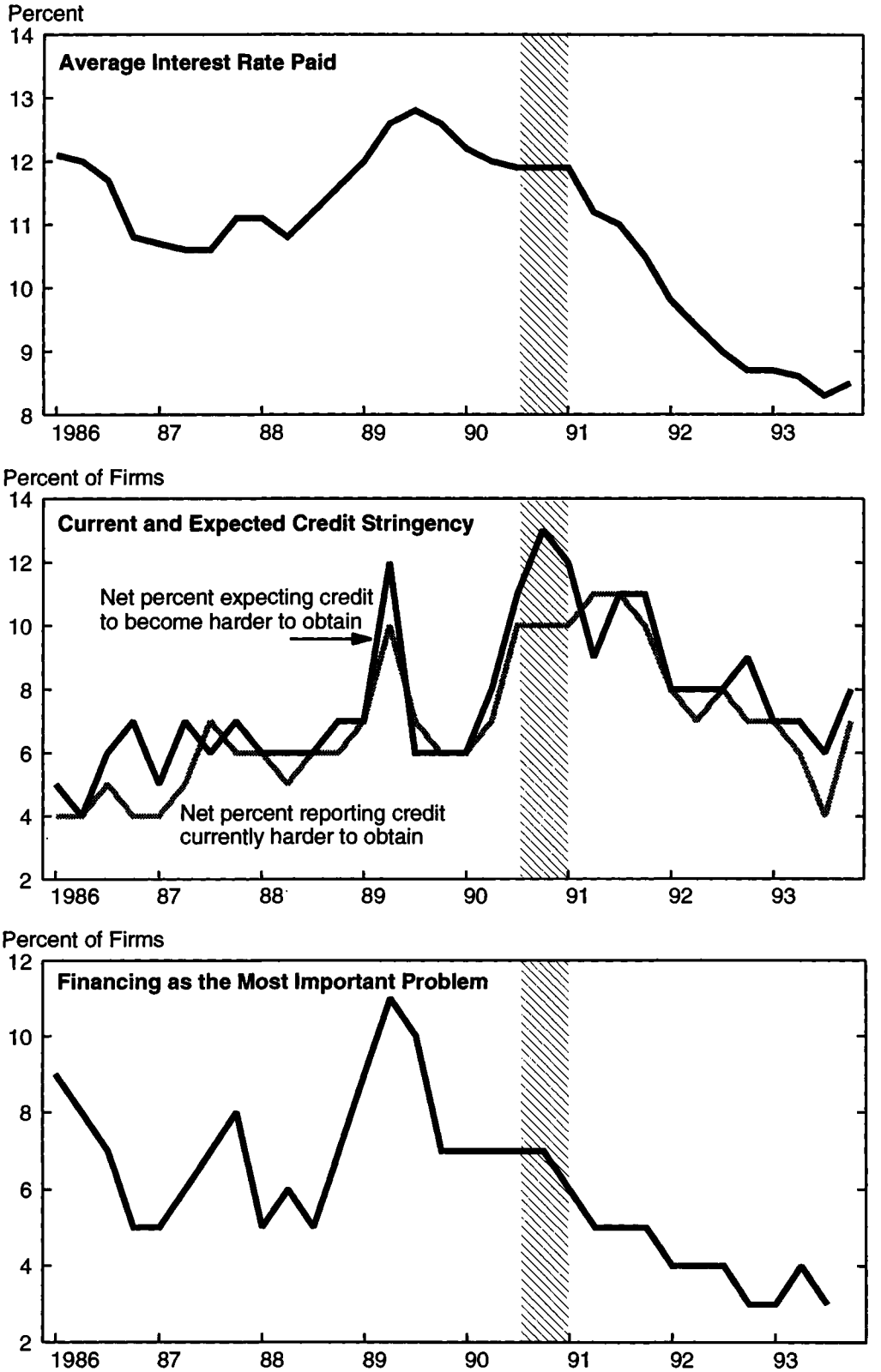
Chart 12: Indicators of Small Firm Credit Conditions
NFIB Survey



Source: National Federation of Independent Business.

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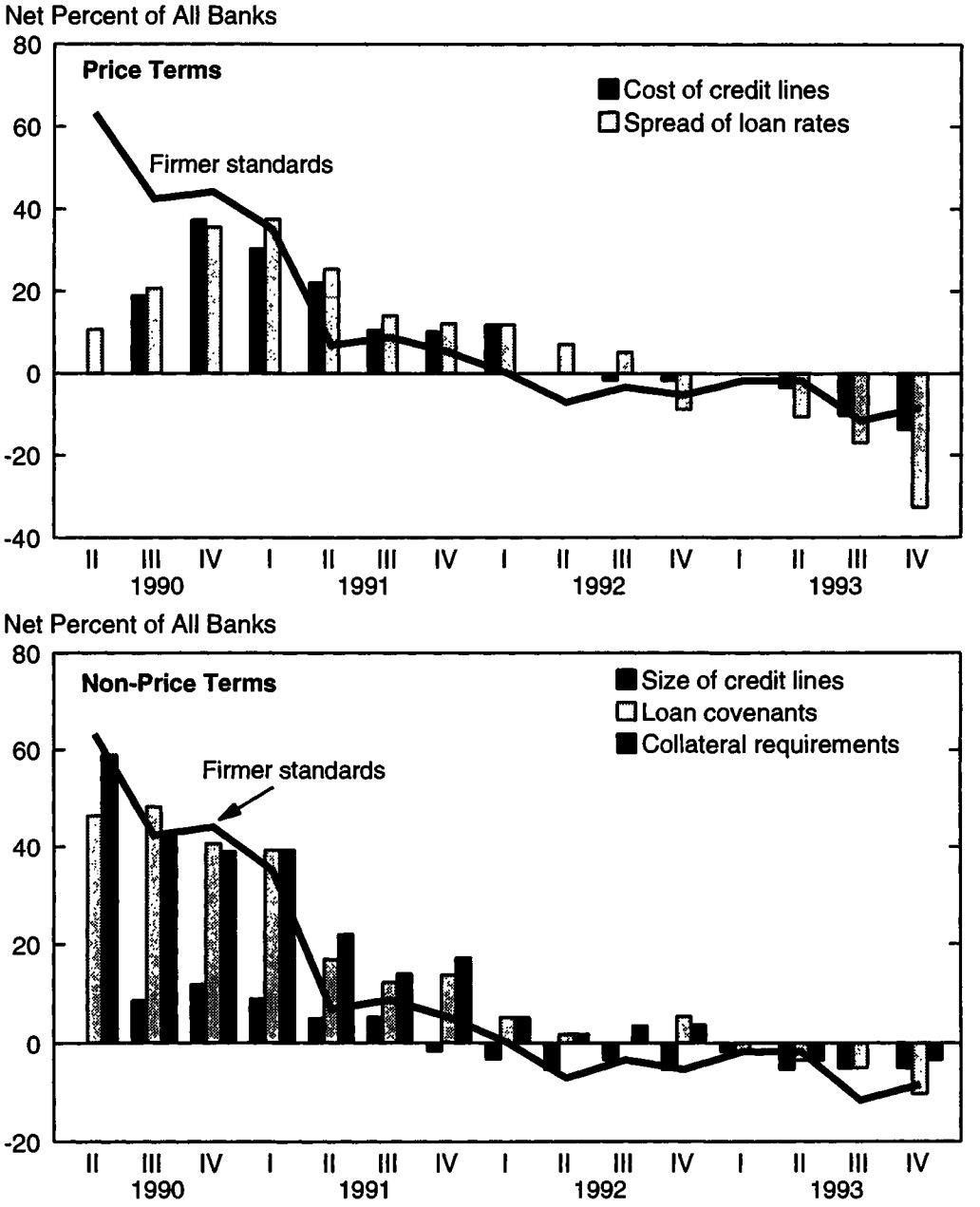
that while 34 percent of companies were able to increase their bank borrowing in the third quarter, only 24 percent of the respondents were able to do so in the fourth quarter.[16] Firms reported that banks had raised their lending criteria by demanding higher eq-

Footnote 15 continued
Karmin and Robert Black, "Ouch! The Squeeze is On," *U.S. News and World Report*, April 23, 1990, pp. 51-52; and Gene Koretz, "The Bank Credit Crunch Stymies the Small Startup," *Business Week*, October 29, 1990, pg. 22.

[16] "Trendsetter Barometer," a publication of Coopers and Lybrand, the accounting firm, tracks the quarterly performance and business concerns of over 200 growth companies. Both manufacturing and service com-

Chart 13: Form of Credit Tightening to Small Firms
Senior Loan Officer Survey



Source: Senior Loan Officer Opinion Survey.

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uity, collateral, and cash flow coverage. Fully 9 percent of all respondents reported that their efforts to increase credit had been rebuffed by bankers. This behavior existed even as bankers lowered the interest rate on loans.

Despite the media reports, contemporary analysts resisted diagnosing credit conditions as a "credit crunch." They were chiefly interested in whether the credit stringency was sufficient to trigger an economic recession. For example, in 1991, Jerry Jasinowski, President of the NAM, concluded that "the credit rationing process is limited to specific sectors and regions, and is not a systemic or economy-wide phenomenon." [17]

In addition, the tightening was hard to document as a "crunch," except in an anecdotal sense, because credit-squeezed businesses were reluctant to identify themselves, according to the National Small Business United. They did not want their suppliers or their bankers to know of their difficulty in obtaining credit.[18]

Moreover, some lenders maintained that there was no credit crunch if the term was interpreted to mean that creditworthy borrowers were being denied credit. The weak loan growth was instead attributed to decreased borrower creditworthiness and loan demand. In fact, many lenders contended that credit standards, as such, had not been tightened. Instead, implementation had relaxed during the 1980s and bankers were now simply returning to earlier practices.[19]

Footnote 16 continued
panies are covered. Company size ranges from revenue/sales of $1 million to $50 million, with a median value of $6.4 million and 50 employees. These firms are characterized as among the fastest growing U.S. companies.

[17] Jerry Jasinowski, "The Credit Crunch and the Export Surge," June 27, 1990, pg. 2.

[18] Saddler and Gupta, op. cit.

[19] Brian Dittenhafer, President of FHLBNY, "Statement before the Invitational Hearing," New York Senate

Table 7: Results of Other Recent Surveys on Credit Availability: 1990
Percent of Sample

	Percent Reporting Tighter Credit Conditions
Connecticut Business and Industry Association May Survey	
1. Percent reporting credit harder to obtain relative to one year ago	76.2
U.S. Chamber of Commerce July Survey	
2. Percent reporting credit harder to obtain over the last six months	21.5
Percent of businesses with sales less than $1 million reporting credit harder to obtain over the last six months	27.4
Percent of businesses with sales over $10 million reporting credit harder to obtain over the last six months	12.3
ABA Banking Journal November Survey of Banks	
3. Percent reporting contracting credit in their primary market	22.0
4. Percent reporting contracting credit for marginal borrowers	85.0
5. Percent reporting tightening lending standards	49.0
6. Percent reporting weak loan demand	69.0

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Overview of Survey Evidence on Loan Demand and Supply for 1989-92

Surveys of lenders and borrowers agree that both loan supply and demand weakened during 1989-1991. These weaknesses arose largely from the poor economic performance of the period. Specifically, an adverse economic outlook was the most frequently cited reason for the credit tightening by banks while reduced financing needs was the most frequently cited reason for weak loan demand.

The surveys, particularly the SLO, indicate that weak loan growth by small businesses was more often due to credit stringency than to weak loan demand during the period. For large and medium sized firms, however, the supply restraint may have been most important in 1990 with subsequent slow loan growth associated with soft demand for loans.

The survey evidence also suggests that credit tightening had largely stopped and actually began to reverse by 1992 and early 1993. Large business borrowers did not indicate strong borrowing plans, at least compared to mid-1980s levels, suggesting that weak demand for bank loans was the primary influence on large business borrowing. In contrast, small business borrowers reported an increased demand for bank loans by 1992 but bank willingness to lend had improved less for them than for large borrowers.

Even so, it is not possible to determine from the narrative analysis whether the supply constraint was unusually strong given the weak economic climate of the period. In the remainder of the paper, we use statistical models of credit to determine whether the recent credit tightening was similar to the tightening in earlier business credit crunches.

III. A Framework for Modelling the Survey Data

The descriptive analysis of the surveys suggests that both demand and supply for business bank loans weakened during 1990-92 relative to the mid-1980s. Although descriptive analysis can identify possible tightness, it cannot easily indicate the relative importance of supply and demand in generating slow loan growth. In this section, we outline a model of the market for bank credit and use that view to motivate adjustments to the survey variables that are designed to measure the noncyclical component of shifts in loan supply. The following section presents our adjustments and uses them to measure the extent of credit tightness in the recent period.

Our model of the bank credit market is based on a stylized description of credit demand and supply. We assume that a borrower's demand for credit is derived from the need for external funds — financing needs minus cash flow. In this model, both cash flow and financing needs depend on the projected demand for the firm's output which will, in turn, move with the economy-wide level of activity. The cost of loans should also influence the attractiveness of borrowing. However, a firm is likely to reduce its borrowing and spending plans if it will not receive the amount of loans that it wishes at current borrowing rates.[20] In aggregate, the demand for loans should increase with the level of activity while it should decline when either the cost of borrowing or perceived credit rationing tightens.

Footnote 19 continued
Committee on Banks and New York State Senate Committee on Housing and Community Development, March 26, 1992, pg. 2.

[20] Albert Wojnilower has argued that direct restrictions on credit supply have played a central role in macroeconomic fluctuations in "The Central Role of Credit Crunches is Recent Financial History," *Brookings Papers on Economic Activity*, 1980:2 and "Private Credit Demand, Supply, and Crunches - How Different in the 1980's?" *American Economic Review, Paper and Proceedings*, May 1985.

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To model lenders, we follow the literature on lending behavior when borrower quality is observed imperfectly.[21] We assume that the market for bank loans is competitive so that the supply of loans will increase as the lending rate rises relative to the general level of interest rates, primarily because the cost of raising deposits will likely rise as more funds are required for lending. The creditworthiness of the pool of potential borrowers should also affect lenders' supply of loans. More specifically, a deterioration in creditworthiness should be associated with a reduction in the supply of loans and, consequently, with an increase in the observed loan rate relative to market rates. However, banks may also react to worsening creditworthiness by adjusting standards or other terms of lending. Stricter standards or other terms can reduce the fraction of high-risk potential borrowers in a borrowing pool. For example, high-risk borrowers would be more reluctant than low-risk borrowers to provide loan collateral that would be forfeited if the project failed. While raising collateral requirements raises the cost of loans for all borrowers, the higher probability of failure associated with high-risk borrowers increases the expected value of their loss.

In a recession, both loan demand and supply should shrink. Initially, loan demand might actually increase as firms borrow to solve what are viewed as temporary cash flow problems. Eventually, however, as the extent of the downturn in demand becomes evident, the demand for loans drops both because firms attempt to reduce inventory and because fewer investment projects seem profitable. Similarly, loan supply contracts as the actual or perceived creditworthiness of borrowers drops, signalled by a deterioration in the quality of loan portfolios.[22] As a consequence, loan growth slows as the price and nonprice terms of loans rise.

There are three survey measures of credit market conditions that are available in reasonably long time series: the net percent of small business borrowers reporting that loans are harder to obtain, a figure drawn from the NFIB surveys; the net percent of banks reporting a further tightening of credit standards, from the SLO surveys; and the net percent of the Fortune 1000 Industrial firms planning to increase their bank borrowing, from the CFO surveys. These measures provide different information about loan supply and demand and, thus, require somewhat different adjustment to obtain measures of loan supply shifts.

The NFIB measure of borrower perceptions of credit tightness probably reflects both supply and demand conditions. Since borrowers are likely to report an increase in credit tightness whenever a restriction of price or nonprice terms occurs, the NFIB variable could indicate tightness if either a reduction in loan supply or an increase in loan demand happened.[23] For example, as the economy grows, an increase in loan demand that results in higher price terms is likely to lead to increased reports of difficulty in obtaining credit, as occurred in 1988. However, such reports would also occur if both credit-

[21] For an overview of this literature, see D. Jaffee and J. Stiglitz, "Credit Rationing," in B. Friedman and F. Hahn, *The Handbook of Monetary Economics*, Vol 2.

[22] Ben Bernanke and Cara Lown, in "The Credit Crunch," *Brookings Papers on Economic Activity*, 1991:2, also attempt to isolate unusual movements in loan supply, defining a credit crunch as "a significant leftward shift in the supply for bank loans, holding constant both the safe real interest rate and the quality of potential borrowers.".

[23] The NFIB reports a credit availability measure based on all respondents to its survey. A second credit availability measure for respondents who borrow regularly (at least once a calendar quarter) can be derived from the NFIB reports. (See the Appendix for details.) We emphasize the measure using the number of regular borrowers because these respondents sample lending conditions regularly and thus are most able to determine if credit conditions have changed.

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worthiness and economic activity deteriorate, raising nonprice terms of lending. To purge the NFIB measure of demand-related variation, we removed from the measure those movements correlated with both general economic activity (business GDP) and the cost of funds (spread of the prime rate over the six-month CD rate). Since these macroeconomic variables will reflect, to some extent, cyclical movements in supply, our adjusted NFIB measure should not be interpreted as a proxy for all shifts in loan supply. Rather, the adjusted NFIB series gives an indication of noncyclical movements in supply, including movements previously identified as credit crunches.[24] In fact, to the extent that the spread may be capturing some noncyclical supply shifts, the adjusted measure may understate noncyclical movements in supply.[25]

In contrast, the SLO questions on credit standards provide a direct proxy for shifts in the loan supply.[26] Lenders use standards as a screening device that can be adjusted to achieve a particular level of quality in the potential borrower pool. However, the supply of loans is likely to vary with the level of economic activity as banks adjust their credit standards to reflect changes in creditworthiness as well as changes in the cost of funds to banks. Hence, in our subsequent statistical work, we purged the SLO series of variation related to economic activity (the growth rate of real business GDP) and to the cost and availability of funds to banks (proxied by the change in the six-month Treasury rate). This adjusted SLO series may be interpreted as an indicator of noncyclical shifts in loan supply since it measures loan supply shifts unrelated to changes in activity or the cost of funds. Again, to the extent that changes in the cost of funds proxy supply shifts unrelated to cyclical developments, the adjusted SLO measure will understate noncyclical credit supply shifts.

Unlike the other two survey measures, the CFO measure of firm borrowing plans most likely reflects only loan demand which, in turn, should be closely related to firms' demand for external funds. Thus, the CFO series for borrowing plans should be closely related to the components of demand for external funds (growth in cash flow, inventories, and capital spending) and past borrowing (lagged loan growth). We removed from the CFO series the component related to demand for external funds and to past borrowing, yielding an adjusted series measuring shocks to loan demand. While this adjusted series partly measures the extent that borrowers are discouraged from borrowing by perceived credit restrictions, it also captures innovations in funding that discourage businesses from bank borrowing.

Although the adjusted CFO measure provides some insights about demand shocks

[24] William Dunkelberg has used the survey series directly to detect credit crunches, arguing that a credit crunch occurs when there is "widespread reluctance of banks to lend to borrowers to whom they would have lent eagerly under similar economic circumstances" in "Small Business Credit Crunch," The NFIB Foundation, mimeo, December 1992. This comparison would include in a credit crunch those shifts in loan supply that accompany deterioration in borrower quality during a recession.

[25] Since the spread of the prime rate over the CD rate probably responds to supply shifts, inclusion of the spread in the regression model removes some part of noncyclical supply shifts from our adjusted NFIB measure. For example, a restriction in supply, whether arising from deteriorating borrower balance sheets or simply from bank decisions to reduce lending, will lead to measures that reduce the attractiveness of bank borrowing, often including a combination of both increases in the interest rate on loans as well as tighter standards. To the extent that we purge these elements from the NFIB measure, changes in our adjusted measure should underestimate actual shifts in supply.

[26] The SLO survey questions about credit standards for business lending have changed over time. Hence we allow for differences across survey questions in our empirical analysis. In addition, since the SLO questions on business credit standards were discontinued from 1983 to 1989, we use interpolation procedures, described in the appendix, to fill in the missing values.

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and may occasionally reflect perceived credit restrictions, the focus of this analysis is on the NFIB and the SLO measures. The residuals from our regression models for the NFIB and SLO survey variables, our adjusted survey measures, indicate loan market tightening beyond that explainable by activity or interest rates. These adjusted survey variables should not be interpreted as indicators of all supply shifts, since they are constructed by removing changes attributable to activity or to interest rates—some of which may reflect supply movements. Since supply is likely to move with activity (and negatively with interest rates), our adjusted measures are likely to understate the overall size of the supply contraction accompanying an economic slowdown. However, these adjusted series do allow us to measure the average tightening in loan availability observed in past recessions and to compare 1990-92 to earlier credit crunch periods, such as 1974 and 1979-82, to determine if this period was similar to those earlier periods. Of course, this analysis cannot identify the causes of tightening, for which many possibilities exist.

We also developed loan growth models that measured the impact of loan supply after allowing for the effect of major determinants of loan demand, including demand for funds (proxied by growth in capital spending and in inventories) as well as the cost of bank loans (proxied by the spread of the prime rate over the six-month commercial paper rate). We tested whether either the SLO or the NFIB survey measures help predict loan growth after accounting for economic activity and lending rates. Finding this to be the case, we use this specification to see whether supply restraint induced particularly slow loan growth over the past three years compared to both earlier average experience and to earlier credit crunch periods.

IV. Regression Analysis of Survey Measures of Credit Availability and Loan Demand

Our empirical analysis used regression models to purge survey data of cyclical movements that typically accompany a slowdown in activity. These models allowed us to measure the size of the recent shift in loan supply. The residuals from our regressions indicate whether recent supply shifts are atypical, compared both with the last fifteen to twenty years and with credit crunch periods. Our detailed specification varied by survey because the NFIB, the SLO, and the CFO surveys have different information about shifts in loan supply.

Small Business Borrowers: NFIB Surveys

The NFIB regular borrower series is an indicator of small business credit conditions. By this measure, the period containing the second half of 1990 and 1991 exhibited significant tightening of credit, exceeded only by two or three episodes in the past (see Chart 5).

However, as noted earlier, the NFIB series likely measures movements in both loan supply and loan demand since increases in demand may raise loan rates and, as a result, cause some respondents to report that credit is harder to obtain. To extract the component of the NFIB series that cannot be attributed to demand shifts, we estimated a regression model relating the series to variables that might influence loan demand. These explanatory variables include the growth of business GDP, business GDP growth during recessions (allowing for possible asymmetry in the response of loan demand to activity), and the spread of the prime rate over the secondary market six-month CD rate (Table 8).[27]

We estimated the component of the NFIB series not directly influenced by demand

[27] The NFIB reports that nearly half of all small business loans are floating rate loans that are priced off the prime rate.

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using the residuals from our regressions estimated through 1988 and then extrapolated out of sample (Chart 14). These residuals show that the recent credit episode was at least comparable to earlier episodes that are viewed as credit crunches. A simple statistical test of the hypothesis that the mean survey tightness in the recent period was the same as that observed during the credit crunch episodes in 1975 and 1980-1982 was constructed by rerunning the regression over the entire sample and testing whether dummy

Table 8: Models of Credit Stringency

NFIB Credit Availability Series, Dependent Variables: NFIB Credit Availability; 1973-IV to 1988-IV

	Model I Percent of Regular Borrowing	**Model II Percent of All Respondents**
Independent Variables	Coefficients	Coefficients
Constant	30.06 (6.71)	12.53 (3.21)
Business GDP growth		
t	-.40 (.23)*	-.14 (.10)
t-1	-.33 (.27)	-.11 (.12)
t-2	-.31 (.27)	-.16 (.12)
t-3	-.18 (.25)	-.17 (.11)
t-4	-.01 (.22)	-.01 (.10)
Business GDP growth when negative		
t	-.68 (.50)	-.39 (.22)*
t-1	.13 (.59)	.00 (.26)
t-2	.49 (.61)	.30 (.27)
t-3	-.14 (.58)	.01 (.26)
t-4	-.24 (.46)	-.06 (.21)
Spread of prime rate over six-month CD rate		
t	2.03 (1.39)	1.24 (.63)
t-1	-8.23 (1.33)**	-3.84 (.60)**
ρ	.85 (.08)**	.88 (.08)**
Ljung-Box Q-Statistic (15 df)	10.93	15.68
Adj. R^2	.80	.82

Note: Independent variables include the annnualized one-quarter growth rate in real business GDP, the one-quarter real business GDP growth when negative and zero otherwise, and the quarterly average spread of the prime rate over and the secondary market six-month CD rate. The dependent variables are the firms reporting credit harder to obtain relative to three months earlier. In the first model, the dependent variable is the net percent of borrowers; in the second model, it is the net percent of all respondents. Standard errors are reported in parentheses. R^2 reported for model in ρ-differences.

* Statistically different from zero at 10 percent level.

** Statistically different from zero at 5 percent level or lower.

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variables for the credit crunch periods have the same coefficient.[28] The data are consistent with the hypothesis that loan supply dropped by the same amount in the three credit crunch periods.[29]

Overall, the statistical results for the NFIB consistently indicate that the 1990-92 episode was a period of tight credit supply to small business borrowers. In addition, controlling for the macroeconomic environment suggests that credit tightness was at least as severe as tightness during earlier credit crunch periods.

Bank Lenders: Senior Loan Officer Survey

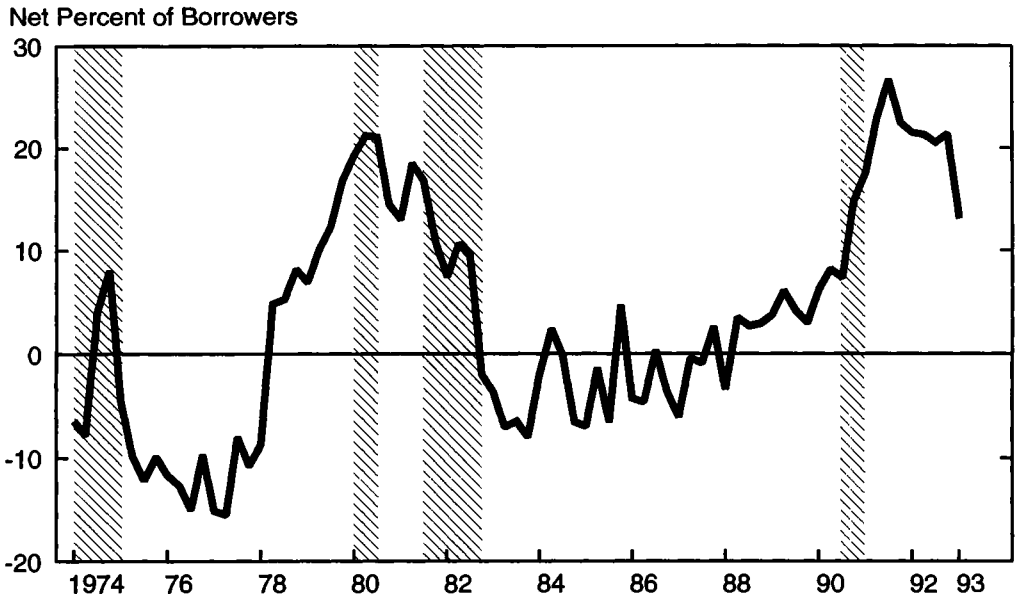
The SLO survey gives a fairly direct measure of shifts in the loan supply schedule of banks, the net fraction of banks tightening standards. Our measure, described in more detail in the Appendix, was developed from three SLO survey questions. Although there is a gap in the SLO series from 1983 to 1989, the survey was quite high in 1990 compared to earlier values, suggesting unusual credit tightening (Chart 15).

Although the SLO series provides an indicator of movements in loan supply, we argued above that loan supply would naturally shift as the creditworthiness of borrowers or as banks' availability of funds changed, suggesting that a measure of supply shifts ex-

[28] Following John Ryding, "Housing Finance and the Transmission of Monetary Policy," Federal Reserve Bank of New York *Quarterly Review*, Summer 1990, we identify a credit crunch as a period when the spread between the Treasury bill rate and Regulation Q ceiling rates is large. He identified the following periods as crunches: 1969-III to1970-III; 1973-IV to 1975-I; 1979-IV to 1980-III; and 1981-I to 1982-II. For this regression we use the 1979-80, 1981-82, and 1990-92 periods to define our credit crunch dummy variables.

[29] Our F-statistic is 0.6, which has a marginal significance level of 62 percent. The same calculation applied to Model II in Table 8, the "all respondents" specification, gives an F-statistic of 1.4 with a lower marginal significance level around 25 percent, also consistent with the hypothesis that the episodes are the same.

Chart 14: Adjusted NFIB Credit Stringency Series



Source: Residuals from regression in Table 8.

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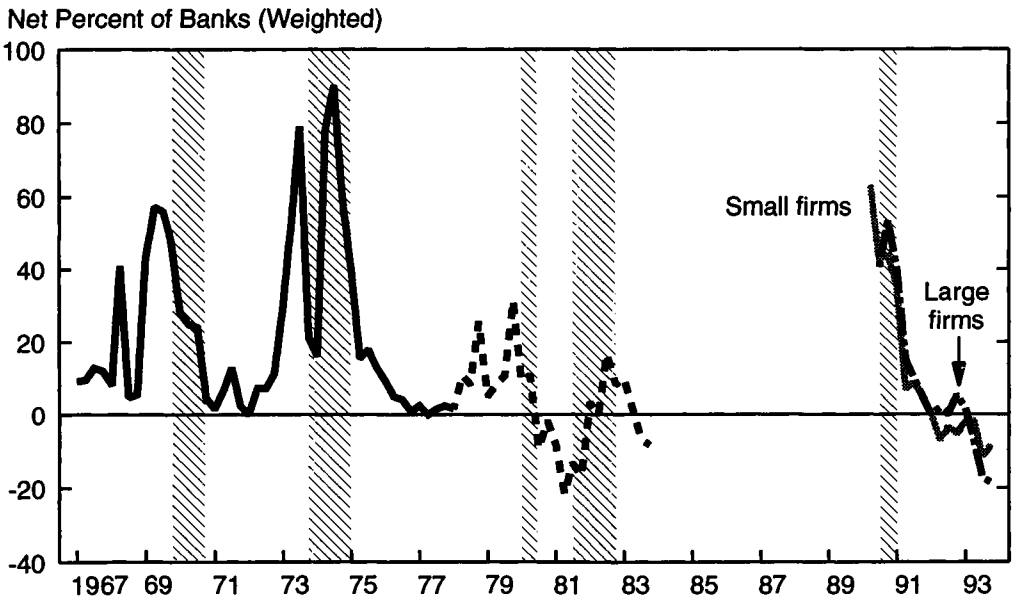
cluding these components would be preferable. We used residuals from a regression model for the survey variable, designed to capture measurable shifts in loan supply, to measure bank credit tightness beyond that induced by declining creditworthiness or by restricted deposit funds.

Our model related the credit standard variable to the current value and two lags of the growth rate of real business GDP—a proxy both for changes in the creditworthiness of business borrowers as well as a proxy for activity—and to the change in the six-month Treasury bill rate—a proxy for banks' cost and availability of funds. We allowed the slope coefficients of GDP growth to differ between recessions and other periods; this specification can detect if GDP changes have a stronger impact on creditworthiness during recessions. Because the survey question on credit standards has been modified over time, we used interactive dummy variables to permit the regression coefficients to shift in line with changes in the question.[30]

The regression model was estimated using quarterly data from 1967 through 1983. The regression coefficients, shown in Table 9, are consistent with those of a loan supply schedule; greater GDP growth leads to looser standards, as would be expected if creditworthiness improved with output growth, and an increasing Treasury-bill rate gives rise to tighter standards. GDP growth affects standards more strongly in recessions, implying greater reductions in supply than would have been obtained using the coefficients from expansions alone. Standards as measured during 1978-83, when the SLO question

[30] The SLO reported changes in standards for new loans through 1977, changes in standards for prime rate loans during 1978-83, and changes in standards for loans to different size businesses since 1989.

Chart 15: Tightening of Credit Standards
Senior Loan Officer Survey



Source: Board of Governors, Federal Reserve System.
Note: The chart reports the weighted net percent of surveyed banks who for 1967-1977 reported tightening credit standards for loans to nonfinancial businesses; for 1978 to 1983 reported tightening standards to qualify for the prime rate; and for 1990 to 1993 reported tightening standards to approve C&I loans or credit lines, according to size of firm.

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Table 9: Model of Credit Stringency
Senior Loan Officer Survey, Dependent Variable: SLO Credit Standards; 1967-I to 1983-IV

	Coefficients
Independent variables (1967-83)	
Constant	25.29 (6.20)**
Change in T-bill yield	
t	14.07 (2.50)**
t-1	5.39 (2.01)**
t-2	5.83 (2.48)**
Business GDP growth	
t	-.13 (.58)
t-1	-1.28 (.53)**
t-2	-.56 (.47)
Business GDP growth during recessions	-1.12 (1.07)
Additional variables (1978-83)	
Constant	-21.81 (8.94)**
Change in T-bill yield	
t	-11.39 (3.09)**
t-1	-4.69 (2.82)*
t-2	-7.28 (3.54)**
Business GDP growth	
t	.01 (.92)
t-1	1.07 (.86)
t-2	1.02 (.82)
Business GDP growth during recessions	-.62 (1.46)
ρ	.63 (.13)**
Adj. R^2	.65
Ljung-Box Q-statistics (17 df)	25.59

Note: Independent variables include the one-quarter change in the one-year T-bill yield; the annualized one-quarter growth rate in real business GDP; the annualized one-quarter growth rate in real business GDP during recessions and zero otherwise; and additional variables detecting the change in the coefficients for 1978-83. The dependent variable is the weighted net percent of banks reporting tighter credit standards in the Senior Loan Officer Survey. Standard errors are reported in parentheses. R^2 reported for model in ρ differences.
*Statistically different from zero at 10 percent level.
**Statistically different from zero at 5 percent level.

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measured the net fraction of banks reporting higher qualifying standards for a prime rate loan, were largely less sensitive to both activity and interest rates than the more general question on standards asked earlier.

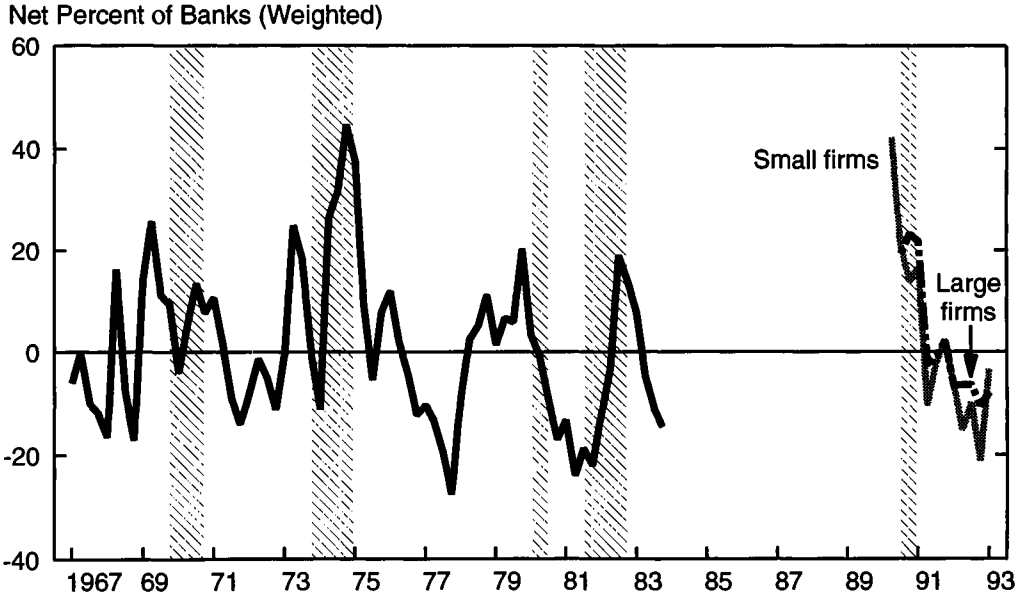
To measure the component of supply shifts not attributable to changes in borrower quality (as proxied by GDP growth) and changes in banks' cost of funds, we computed residuals from our regression by extrapolating over 1990-92. The residuals, shown in Chart 16, were derived using standards for loans to both large and small businesses. By these measures, the recent restriction in supply seems almost as severe as the 1974-75 credit crunch and somewhat more severe than observed over the 1980-82 dual recession.

Large Borrowers: Fortune CFO Surveys

In contrast to the SLO survey, which measures lender perceptions of changes in credit standards, and the NFIB survey, which measures small borrower perceptions of credit stringency, the CFO survey provides a measure of loan demand for large corporations. We used this survey to indicate whether large business loan demand was unusually low during the recent period, particularly when compared with demand in other periods of slow activity growth or perceived tight credit. In addition to providing direct information on loan demand, the analysis of the large borrower data offers some indirect evidence on the credit constraints perceived by large firms. By this measure, large and mid-sized business loan demand did not become consistently weak until midway through 1992, after the recession (see Chart 3).

To measure the extent of unusually slow loan demand in the recent period, we developed a simple model for the net percent of Fortune 1000 industrial firm CFOs that planned to increase their bank borrowing over the next six months relative to the previ-

Chart 16: Adjusted Credit Standards
Senior Loan Officer Survey



Source: Residuals from regression in Table 9.
Note: The survey asked specifically about loans to small firms as of 1990-II, and about loans to large firms as of 1990-III. Between 1967 and 1983, the survey was about loans to firms of all size.

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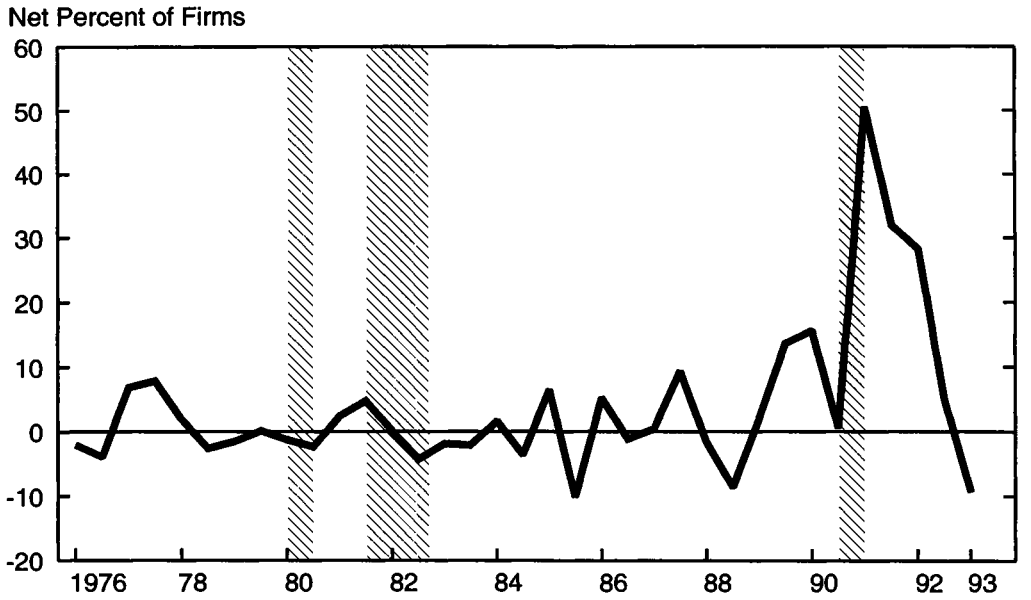
ous six months. The regression model related the survey variable to macroeconomic variables likely to influence loan demand. To measure business demand for external financing, we included the six-month real growth rates of cash flow, inventories, and capital spending in the regression. To measure the persistence in bank loan demand, we included the lagged six-month growth rate of bank loans to nonfinancial corporate businesses. Finally, we allowed the slopes of these variables to shift during recessions, permitting loan demand to respond differently to business activity during those periods.

The regression results indicate that growth in capital spending or inventories raised demand for loans while growth in cash flow reduced demand, as expected (Table 10). Lagged loan growth was also significant, suggesting relatively slow adjustment of actual loans to desired borrowing. To purge the survey series of the interest rate effects, we tried a regression specification (not reported here) that included the change in the spread of the prime rate over the Treasury rate. Our reported regression omits this variable because it was not significantly different from zero. Moreover, the estimated coefficients were positive, suggesting reverse causality.

Chart 17 plots the residuals from our regression estimated from 1976 through 1988 and then extrapolated out of sample through 1992. We found that many more firms planned to increase their lending through the recent period than would have been predicted by the observed slow activity growth. These relatively robust plans could have arisen if large firms anticipated a quicker recovery in activity than was actually observed during and after the recession. Further, these large firms apparently did not expect to face significant credit constraints over the period, since many planned to increase their future borrowing.[31]

[31] If large borrowers generally expected credit restrictions to be short-lived, this conclusion does not necessarily conflict with our earlier descriptive analysis that suggested that large borrowers perceived some credit restraint recently.

Chart 17: Adjusted CFO Plans to Increase Bank Borrowings
Goldman Sachs Survey



Source: Residuals from regression in Table 10.

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To test more formally whether demand was unusual in the recent period, we reestimated the regression over 1976 through 1992, including dummy variables for the credit crunch periods of 1980, 1982, and the 1990-92. Although the data appear to support the hypothesis that the mean survey response for this episode was the same as that in the earlier crunch periods,[32] there is strong evidence that the CFO equation shifted after 1988.[33] Thus, the relation between large business borrowing plans and activity indica-

[32] The F-statistic for the hypothesis that all three dummy coefficients are equal is 0.37 with a marginal significance level of 69 percent, a result consistent with the hypothesis of equality.

[33] When we test the hypothesis of coefficient constancy between the periods 1976-88 and 1976-92, we obtain an F(8,13) of 2.75 with a marginal significance level of five percent, allowing us to reject the hypothesis that the regression was stable after 1988 at the five percent level.

Table 10: Model of Bank Loan Demand

Goldman Sachs CFO Survey, Dependent Variable: Fortune 1000 Borrowing Plans; 1976-H1 to 1988-H2

Independent Variables	Coefficients
Constant	-4.17 (2.56)
Growth of capital	2.00 (.85)**
Growth of inventories	1.74 (.42)**
Growth of cash flow	-.28 (.15)*
Loan Growth of C&I Loans	
t-1	.37 (.20)*
t-2	.34 (.20)
Growth of capital during recessions	3.53 (1.42)**
Growth of inventories during recessions	.28 (.84)
Growth of cash flows during recessions	-.12 (.45)
Growth of C&I loans during recessions	
t-1	.84 (.48)*
t-2	.73 (.30)*
Ljung-Box Q-statistic (6 df)	2.56
Adj. R^2	.77

Note: Independent variables include the annualized two-quarter growth rates in real capital spending, real inventories, and in cash flow; the lagged annualized two-quarter growth rate of real bank loans to all nonfinancial businesses excluding farms, the annualized two-quarter growth rates in real capital spending during recessions and zero otherwise, the real inventories during recessions and zero otherwise, and in cash flow during recessions and zero otherwise, and the lagged annualized two-quarter growth rate of real bank loans to all nonfinancial businesses excluding farms, during recessions, and zero otherwise. The dependent variable is the net percent of Fortune 1000 firms expecting to increase bank borrowings in the ensuing six months. Standard errors are reported in parentheses.
*Statistically different from zero at 10 percent level.
**Statistically different from zero at 5 percent level.

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tors apparently changed after 1988. The large residuals derived from the 1976-88 model suggest that large business in recent years had more robust borrowing plans—given growth in funding needs—than would have been typical before 1989.

The results strongly point to the importance of demand factors for the 1990-92 loan growth at large corporations. Although many large and mid-sized firms planned to reduce their borrowing during 1989-92, the fraction of corporations planning to increase borrowing was larger than would have been predicted given the sustained slow activity growth over the period. Since the corporations with relatively strong borrowing plans likely did not perceive strong credit restraints, this evidence suggests that demand played a significant role in loan growth weakness at large businesses.

V. Loan Growth and Survey Evidence

Finally, we modelled growth in bank lending to businesses to determine whether the recent weakness in bank lending was primarily attributable to shifts in supply or to declining demand resulting from weak activity growth. We developed models relating loan growth to standard demand factors and to the survey variables. Since each of our survey variables gives us some information about supply conditions, our loan models allow us to determine if the recent supply shifts would have implied particularly slow loan growth, after accounting for the impact of demand factors.

Senior Loan Officer Survey

Our basic model related bank loan growth to the current and four lagged values of capital and inventory spending growth (Table 11). Shifts between bank loans and other short-term credit, induced by changes in relative price, were modelled by the spread of the prime rate over the six-month commercial paper rate. Bank loan supply was measured by the SLO credit standards series for small borrowers (plus four lags). As in our earlier analysis of the SLO survey variable, we modelled the change in the measured SLO survey question during 1978-1983 by allowing the SLO slope to shift during that period. We also included lagged loan growth to capture persistence in loan demand.

The model fit is reasonable and the estimated signs are as expected, with higher activity growth inducing greater loan growth, a higher cost of bank loans inducing substitution away from bank loans, and reductions in loan supply (as proxied by increases in credit standards) lowering loan growth.[34] The SLO survey coefficients, as a group, are significantly different from zero.[35] Hence, the SLO survey contains information in addition to the macroeconomic and interest rate variables.

This model allowed us to estimate the component of loan growth attributable to shifts in loan supply over the historical period. We compared loan growth under the condition of actual credit availability with loan growth under average availability over the period. First, we estimated the loan model over 1967-88 and then extrapolated out of sample over the 1989-92 period. The predicted values for loan growth from this regres-

[34] We interpret the survey variable as a measure of tightening or easing in bank loan supply. Since we also include the prime rate relative to a commercial paper rate, the survey coefficients could be interpreted as the impact of loan supply shifts reflected in other terms or standards of lending. However, some price effects are probably still captured by the survey variable since the prime rate is not a perfect proxy for bank lending rates.

[35] The observed F-statistic is $F(5,56)=4.51$ which would reject the null hypothesis that the SLO coefficients are jointly zero at the .001 level.

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Table 11: Loan Growth Model
Senior Loan Officer Survey 1967-I to 1988-III, Dependent Variable: C&I Loan Growth

Independent Variables	Coefficients
Constant	2.12 (4.53)
Growth of capital	
t	.43(.42)
t-1	-.14 (.37)
t-2	.25 (.36)
t-3	-.36 (.34)
t-4	.64 (.32)*
Growth of inventories	
t	.07 (.22)
t-1	.38 (.24)
t-2	.09 (.23)
t-3	.25 (.23)
t-4	.29 (.21)
Prime six-month CP rate spread	
t	-4.44 (1.83)**
t-1	.54 (1.95)
t-2	1.25 (1.92)
t-3	-2.77 (2.09)
t-4	5.82 (2.07)**
SLO survey	
t	.10 (.09)
t-1	-.22 (.11)**
t-2	.01 (.11)
t-3	-.17 (.10)*
t-4	-.06 (.08)

Note: Independent variables include annualized one-quarter growth rates in real capital spending growth and in inventory growth, the quarterly average spread of the prime over the six-month commercial rate, the weighted net percent of banks reporting tighter credit standards, the weighted net percent of banks reporting tighter credit standards for loans to qualify for the prime during 1978 through 1983 and zero otherwise, the lagged dependent variable, and the annualized one-quarter growth rate in real business GDP during recessions and zero otherwise. The dependent variable is the annualized one-quarter growth rate of bank loans to all nonfinancial businesses excluding farms. Standard errors are reported in parentheses.
*Statistically different from zero at 10 percent level.
**Statistically different from zero at 5 percent level.

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Table 11: Loan Growth Model *(Continued)*
Senior Loan Officer Survey, Dependent Variable: C&I Loan Growth; 1967-I to 1988-III

Independent Variables	
SLO survey during 1978-83	
t	-.02 (.20)
t-1	-.31 (.25)
t-2	-.24 (.25)
t-3	.25 (.25)
t-4	-.09 (.22)
Loan growth	
t-4	.43 (.10)**
Business GDP growth during recessions	1.42 (.60)**
Ljung-Box Q-statistic (22 df)	21.94
Adj. R^2	.55

Note: Independent variables include annualized one-quarter growth rates in real capital spending growth and in inventory growth, the quarterly average spread of the prime over the six-month commercial paper rate, the weighted net percent of banks reporting tighter credit standards, the weighted net percent of banks reporting tighter credit standards for loans to qualify for the prime during 1978 through 1983 and zero otherwise, the lagged dependent variable, and the annualized one-quarter growth rate in real business GDP during recessions and zero otherwise. The dependent variable is the annualized one-quarter growth rate of bank loans to all nonfinancial businesses excluding farms. Standard errors are reported in parentheses.
*Statistically different from zero at 10 percent level.
**Statistically different from zero at 5 percent level.

sion measure loan growth given actual economic activity and the actual loan supply stance of banks during the entire 1967-92 period. We also computed a second set of predictions from the loan model, using the mean of the SLO survey variable over non-crunch periods. This second set of predicted values measures loan growth under identical macroeconomic circumstances as the first set, but with our loan supply indicator, the SLO variable, set to the average non-crunch level during the subperiods.[36] Hence, the difference between the two series measures the impact of loan supply shifts on commercial and industrial loan growth.

Using the mean SLO value during either the 1970s or the 1980s as a reference, we computed two sets of comparisons. Results using either reference period suggest that business borrowers in the current period experienced a credit crunch comparable to the crunches of the 1970s and 1980s (Chart 18). If average standards of the 1970s are used as a reference for the recent period, the drop in loan growth during the 1990s was similar to crunches of the 1970s, although the recent peak effect of tightening on loan growth never reached 1970s levels. Alternatively, when we compare the current period with credit standards of the 1980s, the recent tightening in loan supply is similar to the crunch in early 1980.

[36] The periods are: 1969-III to 1970-III, 1973-IV to 1975-I, 1979-IV to 1980-III, and 1981-I to 1982-II.

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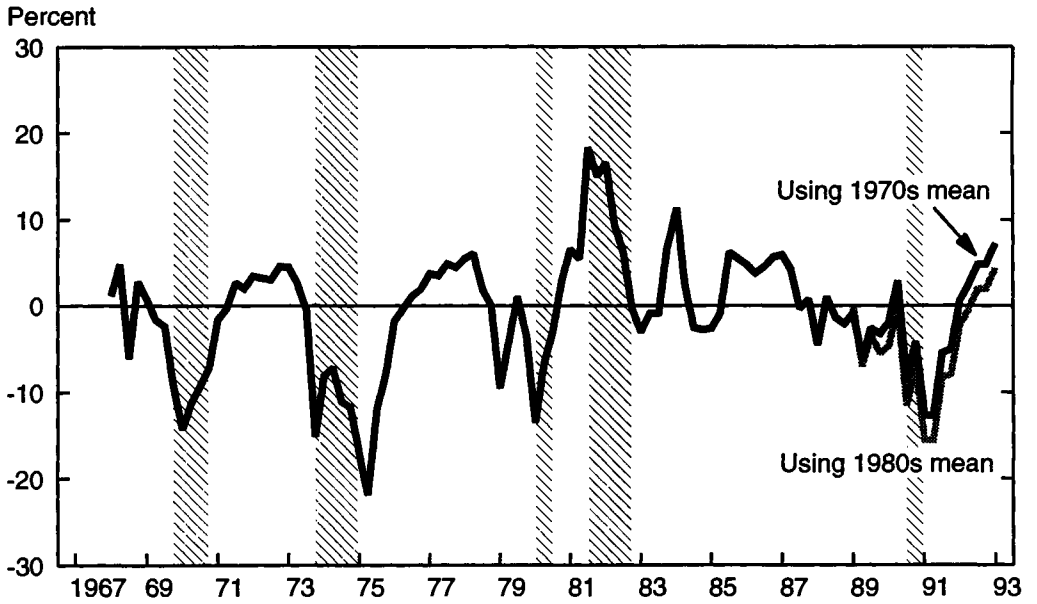
Chart 18: Effect of Credit Stringency on C&I Loan Growth
Senior Loan Officer Survey



Source: Derived from the loan growth model in Table 11.
Note: Shown are the differences between predicted loan growth using the actual survey and predicted loan growth using non-crunch means. A negative value denotes where predicted loan growth was lower due to tighter than predicted credit standards.

NFIB Survey

To create a comparison with the SLO results, we modified our basic loan model by adding the NFIB series measuring the net fraction of small business borrowers who find credit harder to get. For the loan analysis, we used the adjusted NFIB survey measure presented earlier; this adjusted measure may be a better proxy for loan supply shifts because it attempts to purge the NFIB series of reported tightening that could be associated with shifts in loan demand. The regression signs seem generally plausible and the NFIB survey appears to contain information beyond the demand determinants that can explain loan growth (Table 12).[37]

To measure the strength of loan restrictions over the 1990-92 period, we compared predicted loan growth derived using the realized NFIB values in the recent period with predictions using average survey values in earlier non-crunch periods. The difference between these two measures is a proxy for the restriction in loan growth induced by unusually tight loan supply.[38] This comparison suggests that loan supply induced unusually weak 1989-92 loan growth compared with the historical experience, including earlier credit crunches (Chart 19). Thus, the use of the adjusted NFIB series suggests a significant recent tightening in loan supply, a finding that is consistent with the SLO

[37] The F-statistic for the hypothesis that all the NFIB coefficients are zero was $F(5,61) = 2.67$ which implies that the hypothesis would be rejected using a 3 percent significance level.

[38] The chart is virtually identical whether we use means for the 1970s or the 1980s for the out-of-sample extrapolation.

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Table 12: Loan Growth Model,
NFIB Survey, Dependent Variable: C&I Loan Growth; 1973-IV to 1988-IV

Independent variables	Coefficient
Constant	-15.04 (11.51)
Growth of capital	
	1.44 (.59)**
t-1	.18 (.48)
t-2	.47 (.48)
t-3	-.87 (.51)*
t-4	-.29 (.49)
Growth of inventories	
t	.11 (.37)
t-1	.55 (.40)
t-2	-.15 (.35)
t-3	.04 (.32)
t-4	-.09 (.28)
Prime six-month CP rate spread	
t	-.51 (2.64)
t-1	2.10 (2.90)
t-2	4.72 (2.59)*
t-3	-1.35 (2.86)
t-4	3.28 (2.75)
NFIB survey residuals	
t	-.10 (.36)
t-1	.24 (.42)
t-2	-.05 (.38)
t-3	-.55 (.37)
t-4	.24 (.37)

Note: Independent variables include annualized one-quarter growth rates in real capital spending growth and in inventory growth, the quarterly average spread of the prime over the six-month commercial paper rate, the net percent of firms reporting tighter credit availability, purged of cyclical economic and interest rate behavior, the lagged dependent variable, and the annualized one-quarter growth rate in real business GDP during recessions and zero otherwise. The dependent variable is the annualized one-quarter real growth rate of bank loans to all nonfinancial businesses excluding farms. Standard errors are reported in parentheses.
* Statistically different from zero at 10 percent level.
** Statistically different from zero at 5 percent level.

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Table 12: Loan Growth Model *(Continued)*
NFIB Survey, Dependent Variable: C&I Loan Growth; 1973-IV to 1988-IV

Independent variables	Coefficient
Loan growth	
t-4	.30 (.14)**
Business GDP growth during recessions	2.95 (.81)**
Ljung-Box Q-statistic (15 df)	10.56
Adj. R^2	.38

Note: Independent variables include annualized one-quarter growth rates in real capital spending growth and in inventory growth, the quarterly average spread of the prime over the six-month commercial paper rate, the net percent of firms reporting tighter credit availability, purged of cyclical economic and interest rate behavior, the lagged dependent variable, and the annualized one-quarter growth rate in real business GDP during recessions and zero otherwise. The dependent variable is the annualized one-quarter real growth rate of bank loans to all nonfinancial businesses excluding farms. Standard errors are reported in parentheses.
* Statistically different from zero at 10 percent level.
** Statistically different from zero at 5 percent level.

survey results.[39]

Finally, we compare the effects of the SLO and NFIB surveys on loan growth (Chart 20). These surveys are complementary in that they represent different perceptions of loan supply shifts, one from the lender's perspective and the other from the borrower's perspective. The results broadly suggest that the reduction in loan supply during 1989-1990 led to a drop in lending growth similar to that observed in earlier credit crunch periods.

VI. Conclusions

Our paper analyzes survey data to discover the extent of evidence for a credit crunch in the recent period. There are two major parts to the analysis: The first is a narrative discussion of the surveys. The second is regression modelling of three survey variables and of business loan growth.

Our narrative analysis suggests that large firms were subject to some credit tighten-

[39] We also estimated a loan growth model using the actual NFIB series. When we repeated our procedure using this model, we found that the recent period did not exhibit as sharp a tightening in loan growth as did earlier credit crunches. One explanation of the difference in loan growth across the two NFIB series is that the adjusted NFIB series is a closer proxy for movements in loan supply. For example, the actual NFIB series suggests that significant shortfalls in loan growth often occur before recessions, perhaps because the survey reflects perceived tighter conditions arising from the increase in loan rates accompanying rising loan demand. In contrast, the adjusted NFIB series indicates that loan supply typically declines steadily in the early stages of recessions.

A second possible explanation for the difference between the two results is a shift in the relative importance of non-price and price rationing of loans. Our adjustment of the NFIB series may remove not only changes in demand but also the component of tightening typically attributable to price terms of credit. The results using the original NFIB series presume that the relative importance of price and non-price rationing is constant over time. The difference between specifications suggests that the non-price channel may have been used more aggressively during the current episode than in earlier periods. Possible reasons for a shift toward direct credit rationing would include deteriorating loan portfolios, which might have made default risk more important than in earlier periods, and capital constraints on banks.

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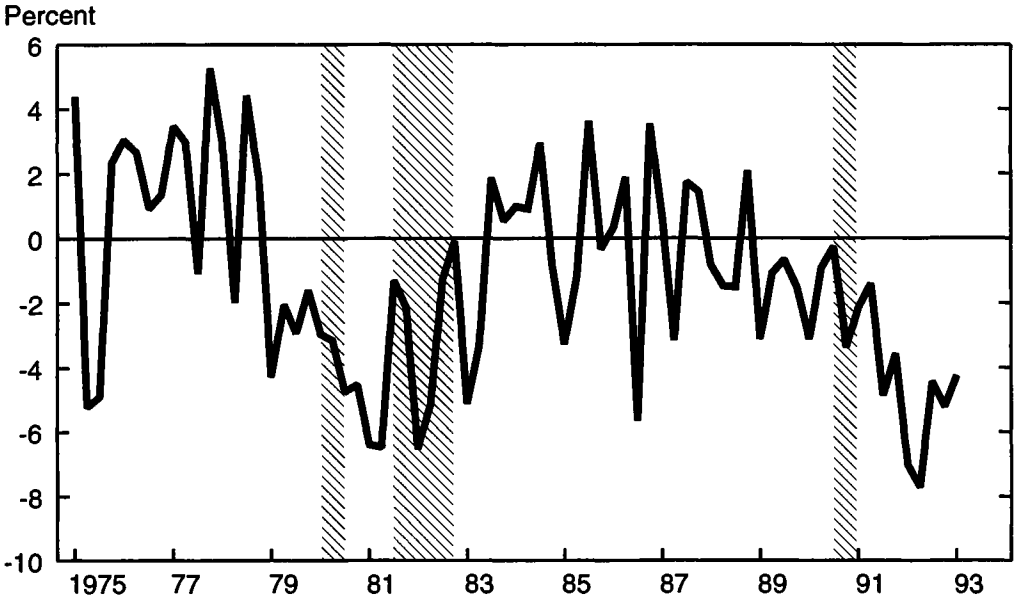
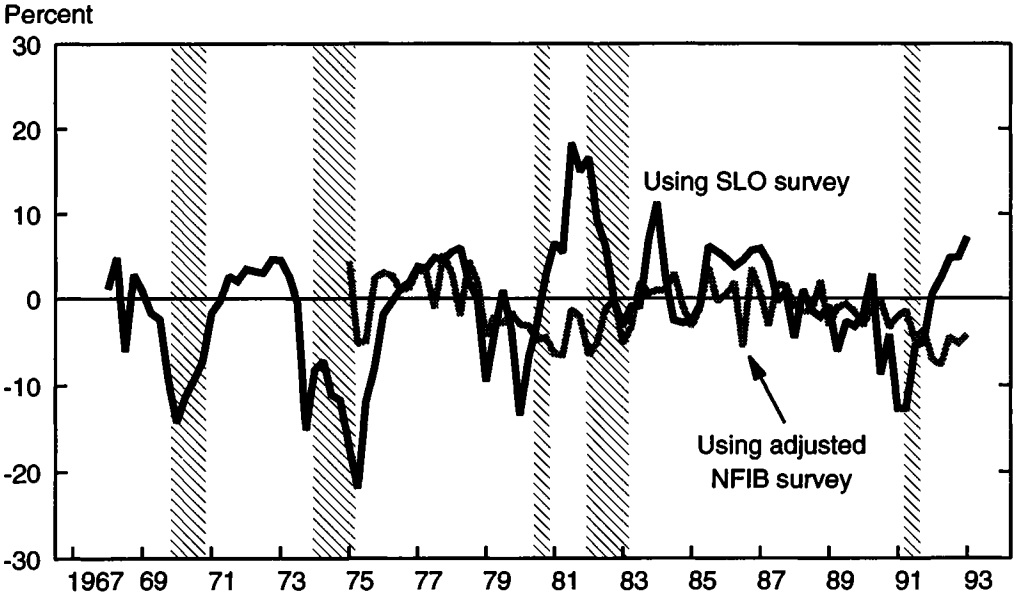
Chart 19: Effect of Credit Stringency on C&I Loan Growth
NFIB Survey



Source: Derived from the loan growth models in Table 12.
Note: Shown are the differences between predicted loan growth using the actual survey and predicted loan growth using non-crunch means. A negative value denotes where predicted loan growth was lower due to tighter than predicted credit standards.

Chart 20: Effect of Credit Stringency on C&I Loan Growth



Source: Derived from the loan growth models in Tables 11 and12.
Note: Shown are the differences between predicted loan growth using the actual survey and predicted loan growth using non-crunch means. A negative value denotes where predicted loan growth was lower due to tighter than predicted credit standards.

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ing starting in 1990 and continuing through early 1993. However, a substantial part of the weakness in large firm loan growth seems to have arisen from weak demand, a condition that has apparently continued into the present.

In contrast, small firms were subject to tightening starting in 1989. This restriction in credit continued through 1991, only easing in 1992. Although there is some evidence of a slowing in small business loan demand, the surveys suggest that weak loan demand only became an important factor in 1992. Further, small business loan demand appears to have recovered by 1993.

Our regression models attempted to purge the survey data of both demand movements and cyclical movements in loan supply, yielding proxies for the noncyclical movements in supply. The adjusted NFIB series implies that credit tightening began sometime in 1988, became extremely severe by 1991, and has only recently seemed to slacken. The adjusted SLO series suggests that large firms perceived the most severe increase in credit tightening during 1990 and that the atypical tightening largely began to reverse in 1991. The adjusted CFO series suggests that expected future loan demand at large firms was consistently and surprisingly strong in 1991 given the observed weakness in actual demand for funds reported by the surveyed firms.

Finally, models of loan growth were developed using both the SLO and the NFIB survey measures. Both models imply that tight loan supply led to significantly slower loan growth in recent years. The model using the SLO series indicates that loan growth was severely restrained in 1990 and 1991. This result suggests that supply influenced large firm loan growth most strongly in 1990-91. In contrast, the model using the NFIB series implies that restraint on loan growth began in 1989 and worsened in 1991-92. The supply restraint on small firm lending during the recent period seems to have been longer lasting than the restraint on large firms.

Overall, the survey evidence suggests that the supply of bank credit to business was tight over 1989-92. The constriction of credit supply to small business was particularly severe, lasting relatively longer than the restraint on large business.

Appendix

I. The Federal Reserve Senior Loan Officer Opinion Survey

The Federal Reserve System began conducting the Senior Loan Officer Survey on a quarterly basis in 1964. Since the earliest surveys were considered experimental, summary statistics are available only starting in 1967.[40] The information in the survey is primarily qualitative and reflects the judgement of a senior loan officer at each participating bank regarding that bank's policies governing loans. When policies are changed, the respondent is asked to indicate the nature and degree of change. For example, the officer indicates whether lending policy has become "moderately" or "much" firmer or easier.

From 1967 through 1977, the survey contained a consistent set of twenty-two ques-

[40] The purpose of the survey was to determine whether non-price lending policies of banks became more restrictive, more lenient, or remained essentially unchanged relative to three months earlier. This focus reflected the thinking that banks often initially react to changes in the cost and availability of loanable funds by making marginal changes in their non-price terms and conditions of lending. Hence, such information on a timely basis could "throw additional light on bank responses to changes in monetary policy and thus be helpful in the formulation of monetary policy."

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tions, including one on banks' credit standards for business loans. The questions were posed to a sample of 121 banks chosen from the panel of banks already participating in the Federal Reserve's *Survey of Terms of Bank Lending*. As such, they were among the largest banks operating in the national market for business loans, accounting for about 60 percent of outstanding loans.

Since 1977, the survey's format has been revised several times. In February 1978, some questions, including the credit standards question, were modified to capture bank interest rate policies and the willingness to make loans at different maturities. In May 1981, the panel was reduced to 60 banks, typically the largest banks in each Federal Reserve District. At that time, the common set of questions was reduced from twenty-two to six. In 1984, the survey became less consistent. The credit standards question, among others, was dropped, and the number and types of questions differed from survey to survey. Even the number of surveys varied from four to six per year. Only the question on the willingness to make consumer installment loans was asked consistently.

The format of the survey has been more consistent since 1990, when questions regarding banks' credit standards for loans to businesses were reintroduced. On a quarterly basis, banks have been asked about changes in their standards for loans to small, middle market, and large firms, with separate answers elicited for each group.[41] Banks have also consistently reported the reasons for changing standards and the terms that have changed. Some of the recent surveys have also contained questions on banks' perceptions of loan demand. In our analysis, we present the weighted net percent of banks responding to each question. For example, our SLO series on tighter standards is computed by summing the responses after converting to a numerical scale that assigns a weight of 2 to banks reporting "much firmer" standards, 1 for "somewhat firmer" standards, -1 for "somewhat easier" standards, and -2 for "much easier" standards.

In its current formulation, the question on banks' credit standards differs from the questions posed in earlier periods. Since 1990 banks have been asked about "standards to approve commercial and industrial loans or credit lines" to firms according to size. By contrast, from 1978 to 1983, banks were asked about "standards to qualify for the prime rate," and between 1967 and 1977, about "standards for loans to nonfinancial businesses." Since the question asked between 1978 and 1983 was considerably more narrow than the earlier, more general standards question, an adjustment in the SLO survey regression models for 1978 to 1983 may be required. We control for the change in question format between 1978 and 1983 with interactive dummy variables for all the variables in the regressions. Our survey model, presented in Table 9, supports the need for a correction since the interactive variables are jointly significant with a marginal significance level of .43 percent.

Furthermore, to interpolate the series for 1984 to 1989, the period during which the credit standards question was not posed, we used a simple regression model.[42] We regress the available SLO series on the change in the one-year Treasury bill yield (plus two lags), the real business GDP growth rate (plus two lags), the SLO series on the willingness to make consumer installment loans (available consistently from 1967 to the present) and dummies for all the variables plus the constant term for the 1978-83 period

[41] Middle market firms are those with annual sales of between $50 million and $250 million, or as defined by the institution.

[42] This model differs from our SLO model presented in Table 10. Since the consumer installment question is the only series available throughout the history of the survey, we use it as a proxy for banks' overall willingness to make loans during the period. However, because this series does not *explain* commercial and industrial loan stringency, we omit it from our base model.

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(Table A1). We use the predicted values from this regression to fill in the original series for the 1984-89 period. The regression coefficients all have reasonable values with the signs predicted by theory. The adjusted R-squared for the interpolation model is 0.59.

Survey of Fortune Chief Financial Officers

Goldman, Sachs & Co. has been surveying chief financial officers from the Fortune 1000 industrial companies semiannually since April 1976. In 1985, 350 Fortune service companies were added to the potential pool of respondents.

This survey is intended to measure the financial officers' expectations, not firm facts or plans, regarding their own corporation's bank credit financing trends in the upcoming half-year relative to the previous half-year. (This approach, Goldman Sachs claims, avoids problems of seasonality.) The format of the survey is multiple choice to ensure a high response rate. In the last several years, questionnaires have been mailed to 600 to 850 chief financial officers; responses received within twelve business days of the mailing are included in the published results. The response rate is about 30 percent, though it has ranged from 26 to 56 percent.

A question on expected borrowing needs has been asked since the inception of the survey. Goldman Sachs analysts claim that the net percent of firms planning to increase bank borrowings, computed as the difference between the percentage of firms planning to increase borrowings and the percentage of firms planning to decrease borrowings, is a good predictor of the direction of the next half-year's bank business loan growth: twenty-eight of the thirty-two surveys provided correct predictions, even though one of the misses was in the current episode.[43] Consistent with our interpretation of the other survey data, however, we use this series as an indicator of current bank borrowing demand rather than as a predictor of future loan demand. As Chart A1 shows, the series is more closely related to current loan growth than future loan growth.

We construct a second indicator of current loan demand from several CFO survey series (Table A2). Beginning in 1983, the survey queried respondents about their projected inventory growth and capital spending growth. In 1985 a question about internal cash flow projections was added. We compute a proxy for the net demand for external financing by subtracting internal cash flow growth from projected inventory and capital spending growth. Whereas the question regarding intended bank borrowings directly asks firms about their bank borrowing plans, our proxy provides an indication of firms' need for external funds. If respondents are consistent in their responses, this measure of net demand for external funding should be positively correlated with the net percent expecting to increase bank borrowing, as evident in Chart 3.[44]

From October 1990 through October 1992, the survey also included questions about credit availability (Table 5). The questions varied in detail between surveys, and were omitted altogether after the October 1992 survey.

[43] "The four major directional discrepancies were in 1980, following the imposition of credit controls; in 1984, when merger and acquisition financing overtook the cyclical features of borrowing needs; in late 1989, when the Highly-Leveraged Transactions (HLT) business came to an abrupt halt; and Spring of 1991, when stronger intentions evaporated in the face of a continuing credit squeeze." p. 5, April 1992 Survey.

[44] Since the mid-1980s, the borrowing plans measure and the net demand proxy gave contradictory signals about future loan growth in exactly the two half-years when borrowing plans failed to predict the direction of actual commercial and industrial loan growth. This result indicates that the net demand for external financing contains additional information useful in explaining bank loan growth.

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Table A1: Model to Interpolate Credit Stringency
Senior Loan Officer Survey, Dependent Variable: SLO Credit Standards; 1967-I to 1992-IV

Independent Variables (1967-92)	Coefficients
Constant	31.51(3.09)**
Change in T-bill yield	
t	9.52 (2.95)**
t-1	4.77(2.73)*
t-2	2.53(2.55)
Business GDP growth	
t	-0.17(0.66)
t-1	-1.24(0.56)**
t-2	-0.36(0.55)
Business GDP growth during recessions	-2.57(1.30)*
Willingness to make consumer installment loans	0.47(0.17)**
Additional independent variables (1978-83)	
Constant	-26.91(5.03)**
Change in T-bill yield	
t	-16.05(4.80)**
t-1	-12.43(4.54)**
t-2	-8.30(4.12)**
Business GDP growth	
t	.64(1.16)
t-1	2.26(.97)**
t-2	1.35(.96)
Business GDP growth during recessions	-5.22 (2.30)**
Willingness to make consumer installment loans	0.16 (.32)
Ljung-Box Q-statistic (26 df)	31.04
Adj. R^2	.59

Note: Independent variables include the one-quarter change in the one-year T-bill yield; the annualized one-quarter growth rate in real business GDP; the annualized one-quarter growth rate in real GDP during recessions and zero otherwise; the weighted net percent of banks reporting a decreased willingness to make consumer installment loans in the Senior Loan Officer Survey; and additional variables detecting the change in the coefficients 1978-83. The dependent variable is the weighted net percent of banks reporting tighter credit standards in the Senior Loan Officer Survey. Standard errors are reported in parentheses.
*Statistically different from zero at 10 percent level.
**Statistically different from zero at 5 percent level.

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II. The National Federation of Independent Business Survey

The National Federation of Independent Business is a small-business organization with more than half a million members. This segment of the business community employs about half of the private, non-farm workforce and produces about half of the nation's gross private product. By the organization's statistics, about one in every eight employers in the United States is an NFIB member.[45]

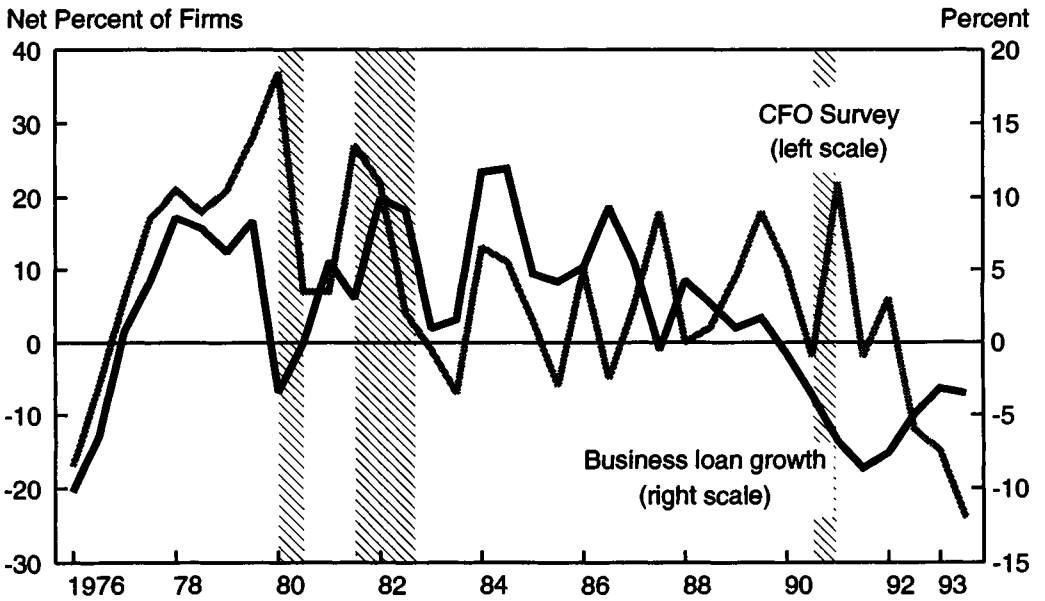
Since 1973, NFIB has surveyed its members on current and anticipated credit and business conditions. These surveys enable us to gauge small firms' loan demand and perceptions of credit stringency. For the last several years, NFIB has received about 2,000 to 2,200 responses from the 7,000 questionnaires mailed out to a randomly selected group of members—a response rate of around 30 percent.

Business condition variables reported by NFIB include the net percent of firms reporting higher sales, undertaking capital expenditures, and adding to inventories. These variables may be indicative of small business loan demand since stronger current or anticipated business conditions encourage businesses to add to inventories and undertake capital expenditures. Even if earnings were growing, this spending would probably be financed, at least in part, with credit.

NFIB also reports several credit condition variables: the percent of firms currently paying higher interest rates than three months earlier, the average interest rate paid by the reporting sample, the net percent of firms reporting loans currently harder to obtain

[45] William C. Dunkleberg, "The Credit Crunch - Myth or Mistaken Monetary Policy?" NFIB, Oct. 1991, pg. 2.

Chart A1: Goldman Sachs Survey of Fortune Chief Financial Officers and Business Loan Growth



Source: Goldman, Sachs and Co., Flow of Funds, Bureau of Economic Analysis.
Note: Shown are the net percent of firms planning to increase bank borrowings in the six months following the period shown, and the one-year growth rate of bank loans to nonfinancial businesses. The correlation between the survey and current loan growth is .39, and between the survey and forecasted loan growth is .25.

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than three months earlier,[46] the net percent of firms expecting loans to be harder to obtain over the next three months than currently, the percent of firms reporting interest rates and financing as their single most important problem, and the percent of firms borrowing at least once each quarter--the "regular borrowers". These credit condition variables

[46] It is difficult to interpret this series. The question that is asked is, "Are these loans easier or harder to get than they were three months ago?" If the same firms repeatedly responded "harder," then the interpretation is that credit stringency was increasing cumulatively. However, if different firms answer "harder" in different periods, then the availability is worsening in the sense that more firms are being affected, but not in the sense that the same loans are getting harder and harder to obtain. Because the sample is not consistent, we tend toward the latter interpretation.

Table A2: Loan Demand Proxy for Large and Middle Market Firms
Goldman Sachs CFO Survey Projected Growth

Survey Date	Inventory Growth	Capital Spending Growth	Internal Cash Flow Growth	Net Demand[a]
1985				
H1	1.3	2.6	7.4	(3.5)
H2	0.6	1.0	8.3	(6.7)
1986				
H1	1.1	1.2	8.0	(5.7)
H2	0.7	0.7	8.3	(6.9)
1987				
H1	1.7	3.1	8.5	(3.7)
H2	1.9	2.3	6.4	(2.2)
1988				
H1	1.8	3.9	8.5	(2.8)
H2	1.1	3.3	7.1	(2.7)
1989				
H1	2.2	5.6	8.7	(0.9)
H2	1.4	4.0	6.4	(1.0)
1990				
H1	1.7	3.5	7.2	(2.0)
H2	0.2	1.0	5.1	(3.9)
1991				
H1	(0.1)	0.1	5.1	(5.1)
H2	1.4	3.5	9.5	(4.6)
1992				
H1	0.3	2.6	8.5	(5.6)
H2	1.0	3.2	8.8	(4.6)
1993				
H1	(0.2)	3.4	9.9	(6.7)
H2	0.7	3.6	9.5	(5.2)

Source: Goldman, Sachs, & Co.
Note: Survey is conducted semiannually to project growth for the six months following the period shown.

a. Capital spending plus inventory growth minus internal cash flow growth, all projected over the next six months.

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provide several views of borrowers' perceptions of loan supply conditions. Since small businesses generally rely heavily on bank credit, their perceptions of credit conditions most likely reflect bank loan availability. However, perceptions of credit stringency are likely to be influenced by both higher rates as well as decreased credit availability. Such perceptions of stringency may lead to expectations that future loans will be harder to obtain as well as reports that financing is an important problem for firms.

Our analysis of small business perceptions of credit availability in the text uses survey responses to the NFIB question whether loans are harder to obtain. Our measures are derived from the responses to two questions. NFIB first asks respondents:

"If you borrow money regularly (at least once a quarter) as part of your business activity, how does the rate of interest payable on your most recent loan compare with that paid three months ago?"

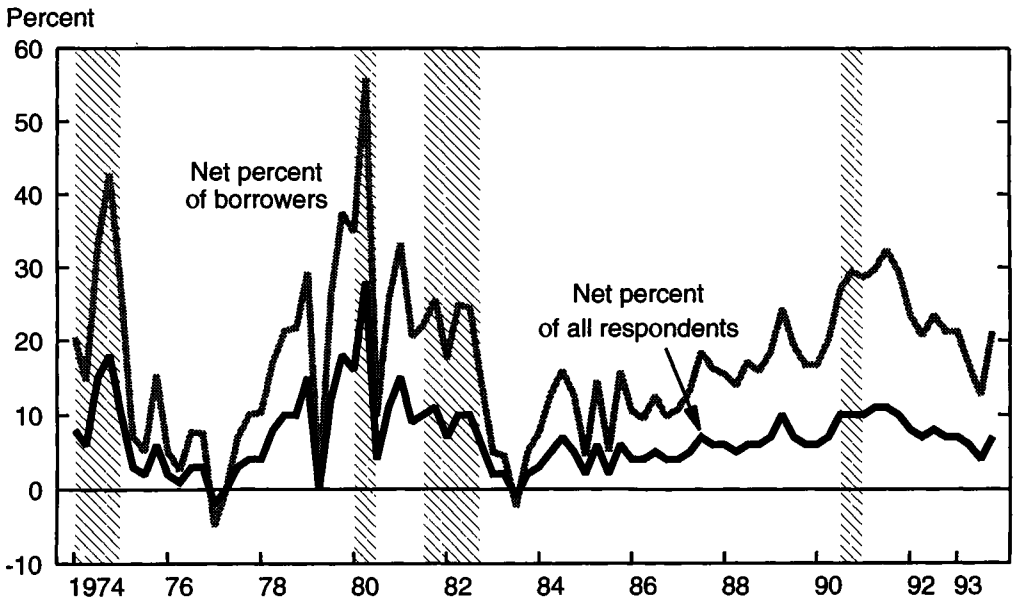
Then, as a followup to the above question, NFIB asks:

"Are these loans easier or harder to get than they were three months ago?"

The net number of firms reporting credit harder to obtain, calculated as the number of firms reporting credit harder to obtain minus the number of firms reporting credit easier to obtain, can be normalized by two measures of the number of survey respondents.[47] One measure, the dashed-line series in Chart A2, is the net number of firms reporting that credit is harder to obtain as a percent of all respondents for that survey. The other series, the solid-line series, is the net number of firms reporting credit harder to obtain

[47] In our narrative analysis, we present a series from which survey participants who report credit stringency but are not regular borrowers are dropped. Our regression analysis, however, uses a series on which such an adjustment is not made because, until recently, only unfiltered data were available as a consistent time series. Although the percent of regular borrowers has declined significantly over the life of the survey, the difference between the unfiltered and filtered series is consistent and very small. Thus, our use of the unfiltered series creates, at worst, only a small bias.

Chart A2: Credit Stringency to Small Firms
NFIB Survey



Source: National Federation of Independent Business

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as a percent of the regular borrowers - those firms answering both questions. The two series differ because the percent of NFIB respondents borrowing regularly has been declining since 1980 (Chart A3). Arguably, declining borrowing activity could be either a demand- or a supply-induced phenomenon. For example, in examining the "all respondents" series, Dunkelberg finds no evidence of a credit crunch, arguing that declining borrowing participation is a demand induced phenomenon.

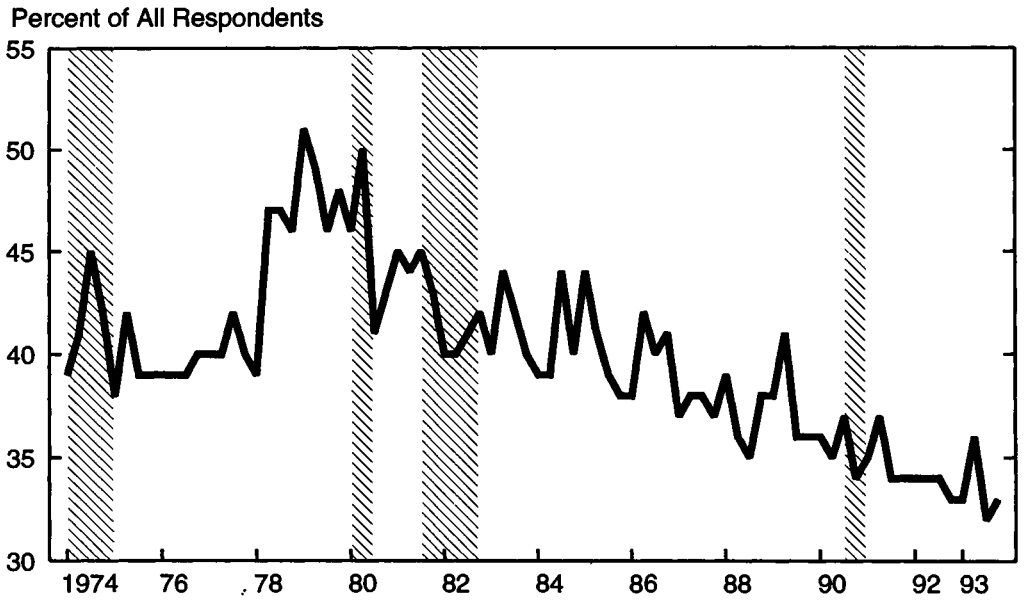
The "regular borrowers" series may be a more appropriate measure for a definitional reason that is independent of the demand-supply controversy. Using regular borrowers in the denominator may be more accurate because they are regular participants in the loan market, and are thus better able to determine whether conditions have changed.

III. NAM Small Manufacturers Operating Survey

The National Association of Manufacturers (NAM) is a national business association with more than 12,500 member companies and subsidiaries. The firms vary in size, ranging from very large companies to 9,000 smaller manufacturing firms, with fewer than 500 employees. According to the association, NAM member companies employ 85 percent of all workers in manufacturing and produce more than 80 percent of the nation's manufactured goods. Typically, about 2,300 to 2,500 questionnaires are mailed in March of each year, and the response rate is about 26 percent.

NAM surveys its small manufacturer members once a year in the spring. Respondents are asked about current business conditions and their expectations for the upcoming year. Respondents are also asked whether financing and credit are easier to obtain than they were twelve months earlier, and how their ratio of debt-to-cash flow has changed in the past year.

Chart A3: Regular Borrowers
NFIB Survey



Source: National Federation of Independent Business
Note: Respondents borrowing at least once every three moths.

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Because the questions are posed in the first quarter of each year, it difficult to apply the results to any particular calendar year. We follow the convention that the survey data reflect economic conditions during the prior calendar year. For example, the 1988 survey mainly reflects credit conditions during 1987.

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Influence of the Credit Crunch on Aggregate Demand and Implications for Monetary Policy

by Patricia C. Mosser[1]

This paper investigates the impact of credit restraint on real activity in the 1990-91 economic downturn. In addition, it examines whether financial system fragility, combined with institutional changes over the 1980s, made it more difficult for monetary policy to ease credit conditions and stimulate real activity. These two issues are related because many of the changes in financial structure and regulation that differentiate this credit crunch from previous episodes have also altered the transmission mechanisms of monetary policy.

More specifically, this investigation examines whether credit restraint, measured in several different ways, preceded or caused the 1990-91 recession and the slow-growth recovery that followed. The paper also documents long-run changes in financial structure and nonmonetary factors that made the cycle unique and contributed to slow growth. Finally, the paper asks whether traditional relationships between real activity and economic fundamentals (including monetary policy) accurately predicted the slow economic growth from 1989 to 1992, or whether proxies for credit restraint are necessary to explain the weakness in activity.

Many of the issues dealt with in this paper relate to whether monetary policy affects real activity more through a "money" channel or through a "credit" channel.[2] Roughly speaking, monetary policy affects the real economy via the money channel if policy works exclusively by changing the relative price of money, the interest rate. The credit channel view suggests that monetary policy also affects the real economy by changing the quantity and composition of credit, for example by changing the supply of intermediated credit relative to market credit. Because this paper looks at the effects on aggregate demand of both interest rates and shifts in credit supply and demand, the results described below should help clarify whether monetary policy channels via interest rates

[1] My thanks to Charles Steindel, M.A. Akhtar, Cara Lown and Ethan Harris for comments on earlier drafts of this paper. Thanks also to Cynthia Silverio and Joshua Gleason for excellent research assistance.

[2] See Bernanke (1993) for a discussion of the money and credit channels of monetary policy.

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or credit behaved in normal ways during the late 1980s and early 1990s. The main conclusions of the study are as follows:

- While credit supply problems probably had detrimental effects on the real economy after 1989, other factors appear to have contributed to overall slow growth as well. These include balance sheet restructuring by both firms and consumers, relatively tight fiscal policy, and extreme pessimism, particularly on the part of consumers.
- Despite worries that a fragile financial system blocked the effects of easier monetary policy to the real economy, policy was successful in stimulating some sectors of the economy. With the exception of large-scale real estate, sectors most sensitive to policy did slightly better, relative to cyclical norms, than the rest of the economy. Nonetheless, monetary policy did not have the same widespread stimulative effect on the economy that it had had in the past.
- Both informal observations and econometric estimates suggest a general malaise in economic activity, particularly in the household sector, that was more widespread than the credit slowdown and that was not well described by economic fundamentals, including the stance of monetary policy.

The first section of the paper examines patterns in aggregate demand and relates them to credit and monetary policy, comparing behavior across business cycles. In addition it discusses several proxies for credit restraint in the early 1990s episode and looks at the timing of changes in credit and demand. Section II discusses several other possible explanations for the economy's sluggish response to easing monetary policy in 1991 and 1992. Section III presents econometric evidence on aggregate demand and policy during the early 1990s and relates this evidence to several proxies measuring the severity of the credit slowdown.

I. Aggregate Demand and Credit

From an aggregate demand perspective, the early 1990s "credit crunch" was quite different from historical episodes. The aggregate demand boom preceded the recession by more than two years, and the slowdown in credit led rather than lagged the slowdown in activity. Tight monetary policy and disintermediation at depository institutions, which typified previous credit crunches, were almost completely absent. Instead, the 1989-92 credit slowdown was characterized by subpar growth (interrupted by a short recession), easing monetary policy and falling interest rates, and financial distress at many intermediaries. Only in the last of these features did it resemble previous crunches.

Many of the factors that made the credit slowdown unique were direct or indirect consequences of the 1980s "bubble" in debt formation relative to economic activity (Chart 1). In particular, high leverage contributed to the precarious financial health of both borrowers and lenders in the late 1980s, which in turn, appears to have been a major factor in both the slowdown in credit and in aggregate demand.

A number of studies have examined the credit slowdown. For example, see Bernanke and Lown (1991), Johnson (1991), Peek and Rosengren (1991), Hancock and Wilcox (1992) and in this volume, studies by Cantor and Rodrigues, Lown and Wenninger, Mosser and Steindel. The general conclusion of these studies is that credit demand factors, in particular aggregate demand components and interest rates, could not, by themselves, explain a significant portion of the 1989-92 credit slowdown.

This section of the paper uses results of these studies to look at the flip side of the

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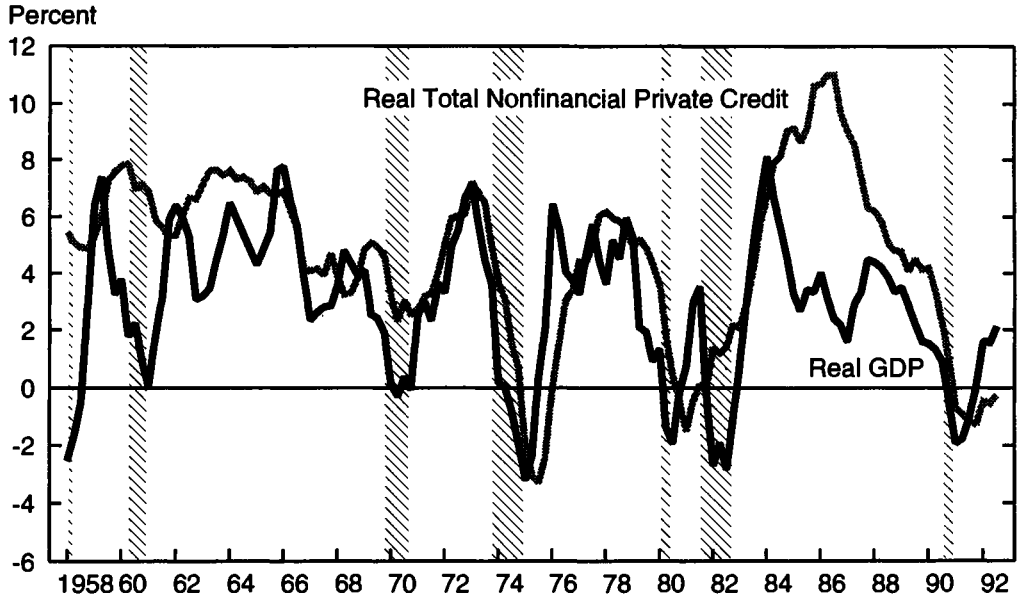
coin: the implications of credit restraint for economic activity. It begins by describing the behavior of activity and debt from 1989 to 1992. In addition, because aggregate output and aggregate credit are simultaneously determined, this paper (like those listed above) attempts to separate credit supply and demand shocks in several imperfect, but hopefully plausible ways. Below, aggregate demand weakness is related to several proxies that measure the degree of credit supply restraint, including proxies derived from studies elsewhere in this volume. In addition, the issue of "causality" or timing of credit relative to aggregate demand is investigated using reduced form relationships between credit aggregates, proxies, and real activity.

A. Cyclical Comparison of Aggregate Demand

The 1990-91 recession was a short, slightly worse-than-average downturn. Chart 2 shows that the economy was quite weak going into the recession, however, and it was well below par coming out. The entire path of the cycle was a slow roll, up and down and up again, rather than the typical boom—bust—boom pattern.

One explanation for this atypical cyclical behavior (discussed in detail below) is that the slowdown in credit growth, in particular restrictions on credit supply by intermediaries, inhibited economic activity and blocked the effects of easing monetary policy. Under such a scenario, the sluggishness in the economy would presumably have been concentrated in those sectors that are most sensitive to monetary policy and most closely connected with credit formation: consumer durables, housing, business investment, and perhaps net exports. Chart 3 presents these components of real output indexed to business cycle peaks and troughs. Somewhat surprisingly, the recession in these sectors looked quite average, certainly less severe than the 1981-82 cycle, when monetary policy was substantially tighter. In contrast, growth before the recession was weak, and the

Chart 1: Real GDP and Real Total Nonfinancial Private Credit
Four-Quarter Growth Rate



Note: Shaded areas represent recessions.

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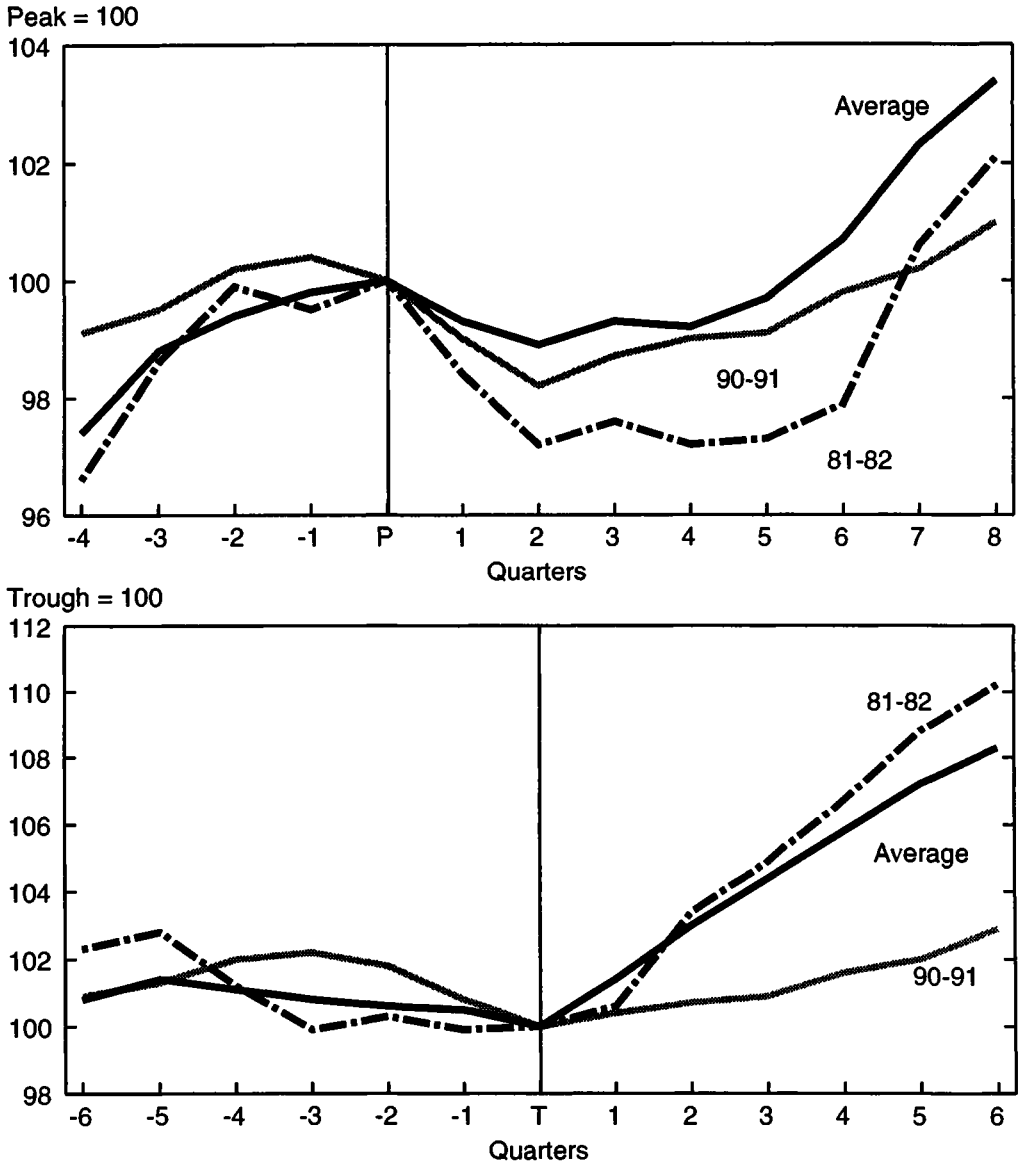
recovery was well below par in spite of steady easing of monetary policy and falling interest rates.

For comparison, sectors less directly sensitive to monetary policy (and generally less closely connected to credit) are shown in Chart 4. Here both the 1990-91 recession and the recovery look exceptionally weak. The peak comparison shows slow growth before the recession and a worse-than-average downturn during the recession—on a par with the severe 1981-82 recession. Further, these sectors had almost no recovery in 1991 and 1992.

The widespread weakness in activity can also be seen in aggregate demand components. For example, all categories of consumer spending were weak from 1989 to 1992 (Chart 5). Consumer spending on durables, which is more sensitive to credit and mon-

Chart 2: Real GDP



Note: AVG includes 1960-61, 1969-70, 1973-75, 1981-82 recessions.

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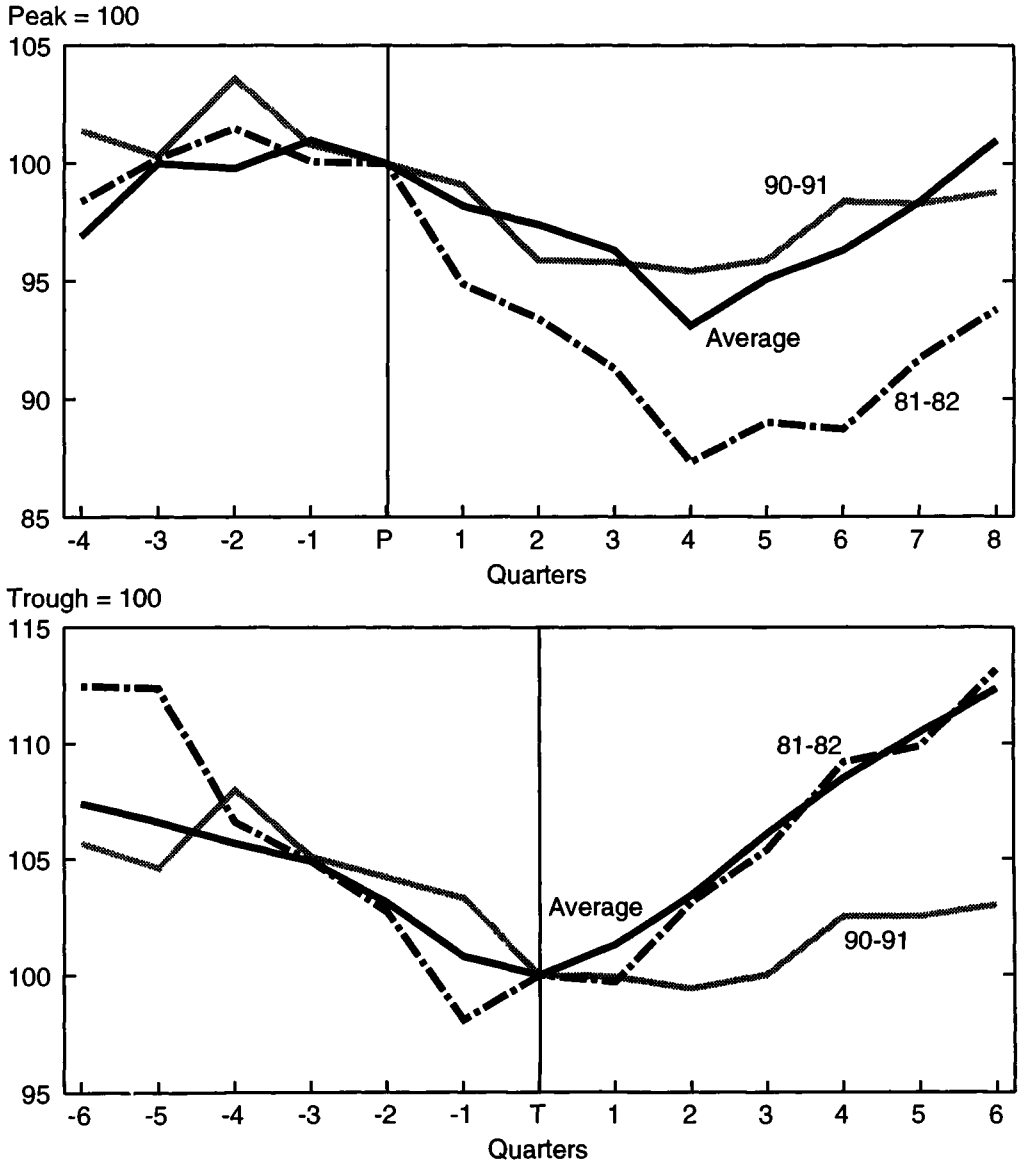
etary policy, suffered a fairly typical decline during the recession but had a weak recovery thereafter in spite of falling interest rates. Expenditures on nondurables and services were even weaker in comparison with historical norms. They were a drag on the economy before the recession, and they actually declined in 1990. Their recovery was only 2.2 percent by the end of 1992, compared with more typical 6 percent increases.[3]

Cyclical comparisons for the investment components are shown in Charts 6 and 7. Real equipment investment (Chart 6A) was well above previous norms during both the

[3] Also see Blanchard (1993), Leeper (1992), Steindel (1992) and Throop (1991) for further discussion of the unusual weakness in consumer spending both during and after the 1990-91 recession.

Chart 3: Credit and Policy Sensitive Components of Real GDP



Note: Includes consumer durables expenditure, residential investment, nonresidential investment, and net exports.
AVG includes 1960-61, 1969-70, 1973-75, 1981-82 recessions.

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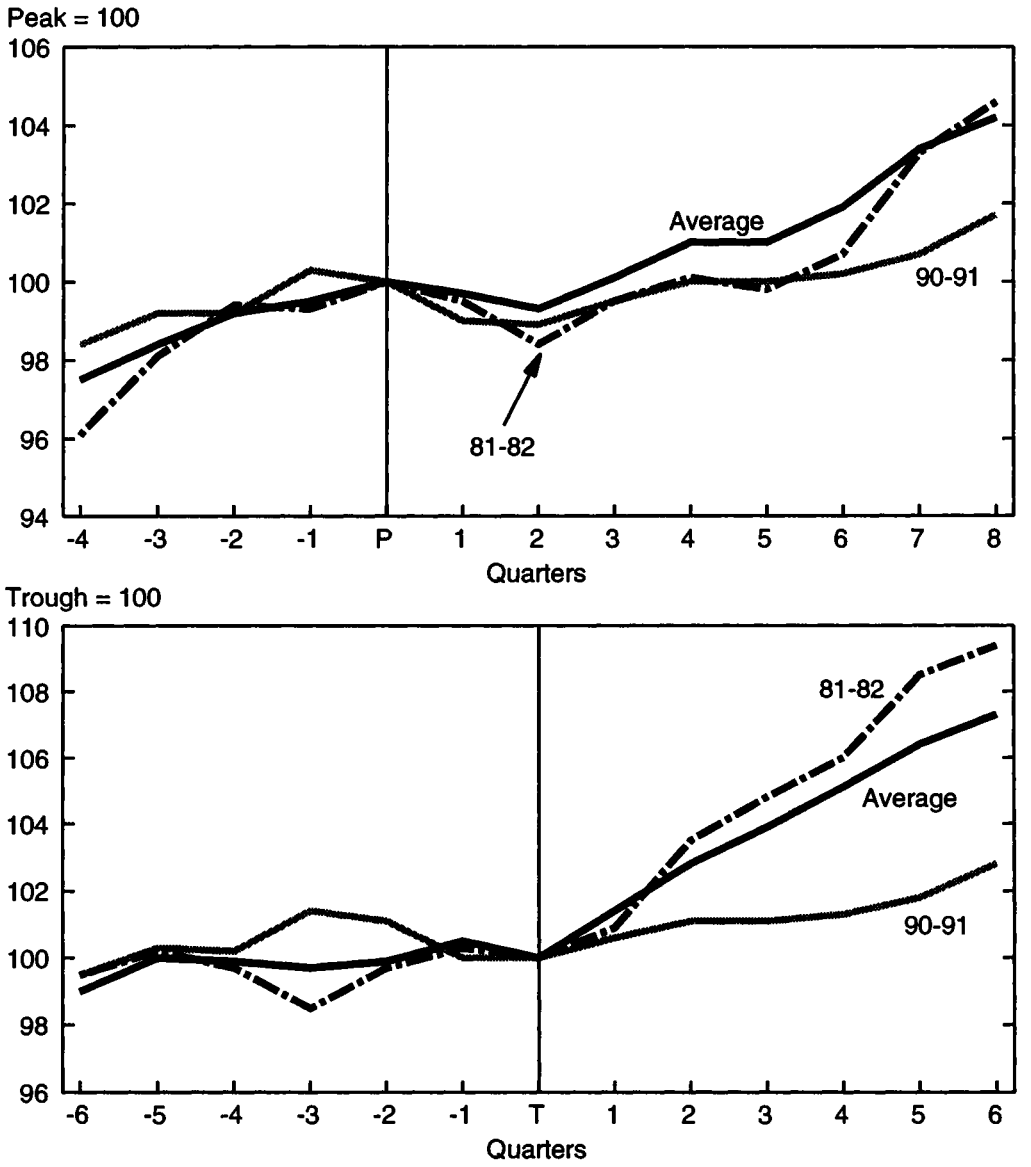
recession and the recovery because of large relative price declines for computers. The inventory cycle before and during this recession was quite small by historical standards (Chart 6B), largely because of improved inventory management techniques adopted over the 1980s. Nonresidential construction, pictured in Chart 7A, was incredibly weak during the latest cycle. Here the low level of activity appears to have been the result of massive overbuilding in the mid 1980s and perhaps credit constraints as well. Whatever the cause of this weakness, easier monetary policy and falling interest rates had little or no short-run effect on activity during the recovery. Housing (Chart 7B) had a fairly typical decline during 1990 but recovered more slowly and did not seem to respond quite as much to monetary easing as it had in the past. However, long-run changes in financial

Chart 4: Components of Real GDP Less Sensitive to Credit and Monetary Policy



Note: Includes nondurables and services consumption, and government purchases.
AVG includes 1960-61, 1969-70, 1973-75, 1981-82 recessions.

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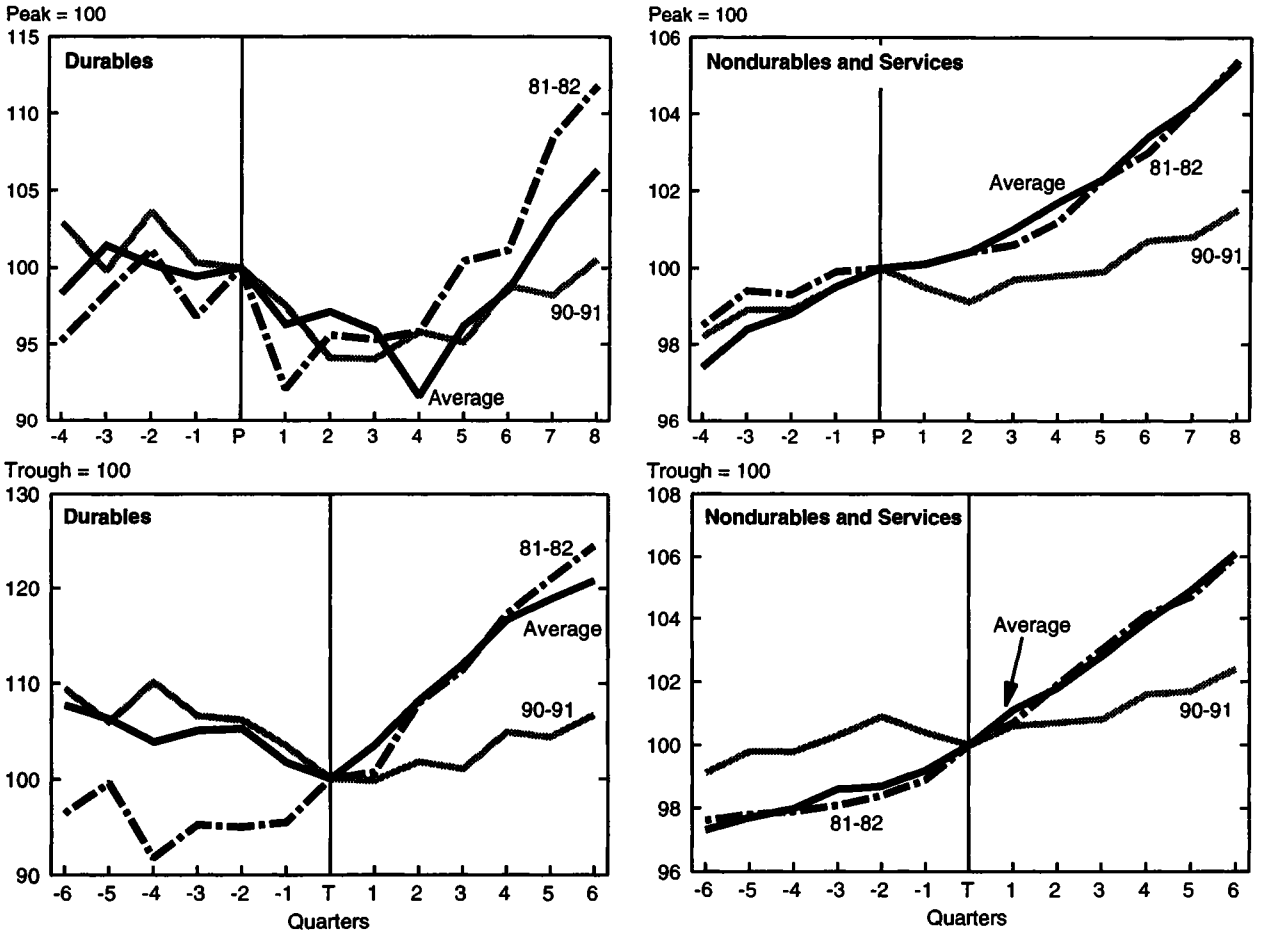
structure (discussed below), particularly the end of Regulation Q, make historical comparisons for this sector difficult to interpret.

Chart 8 shows that both federal and state and local government purchases had a depressing effect on the economy that were largely independent of credit conditions and monetary policy. Here large federal budget deficits and deteriorating revenues at the state and local level kept these sectors from making their normal contributions to economic activity.

Finally, Chart 9 gives peak and trough comparisons for the trade sector. Peak comparisons show that exports were exceptionally strong, probably a lagged effect of easier monetary policy and a falling dollar during the late 1980s. Slower export growth in 1991-92 was probably more a reflection of weak economic performance abroad than of any credit constraints or U.S. monetary policy effects. In fact, monetary policy easing during 1991 and 1992 probably made U.S. goods even more competitive in international markets, but slow growth abroad muted this effect.

In sum, a casual look at the aggregate evidence shows extraordinarily weak economic growth, particularly during the so-called economic recovery. The weakness in aggregate demand seems to be fairly evenly distributed among sectors that are sensitive to credit and monetary policy and those that are not. There is little evidence that monetary policy was completely ineffective; relative to their normal cyclical patterns, policy-sen-

Chart 5: Real Consumer Spending



Note: AVG includes 1960-61, 1969-70, 1973-75, 1981-82 recessions.

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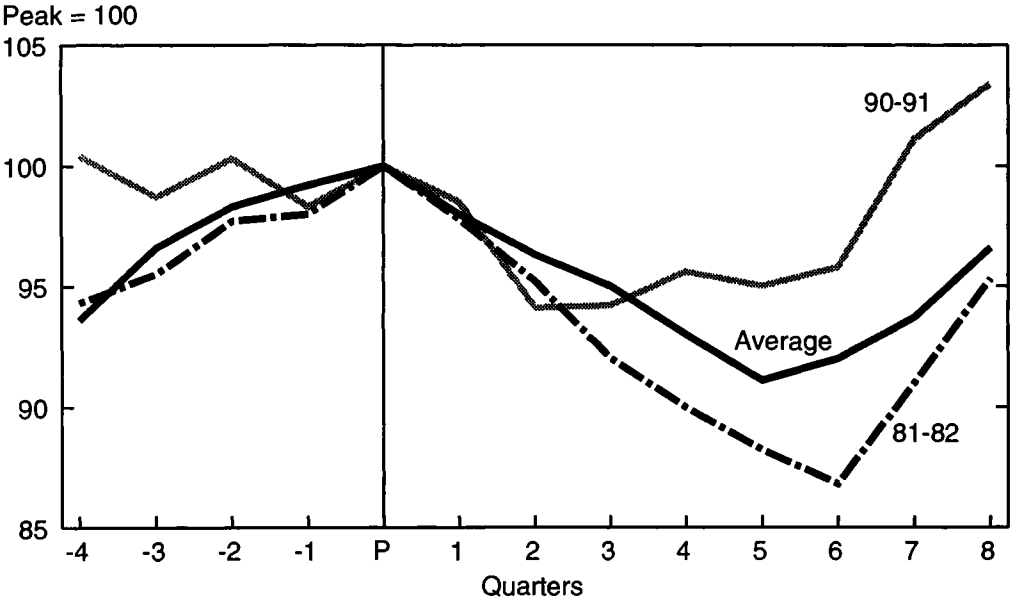
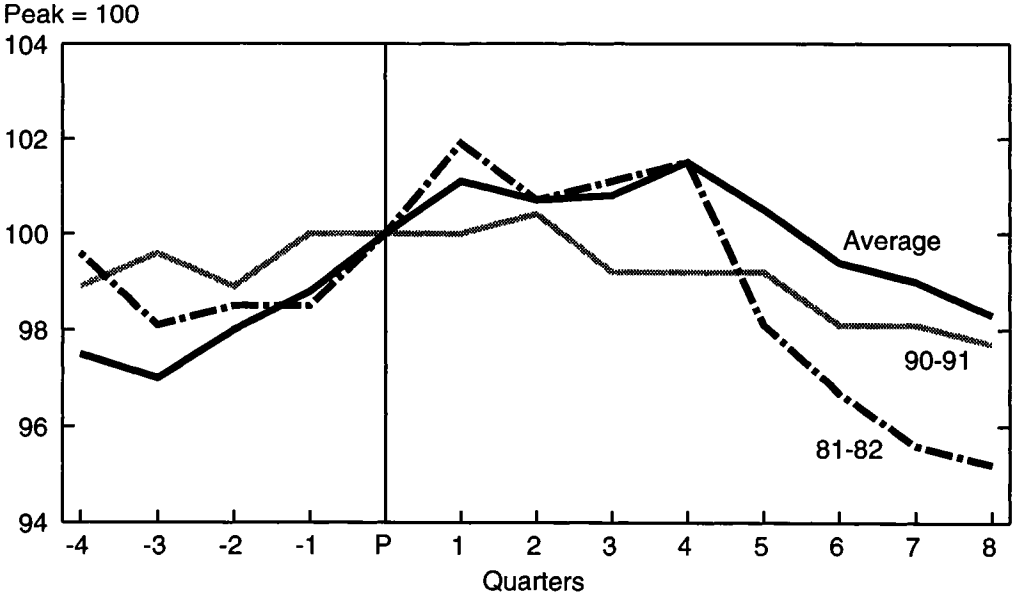
Chart 6A: Producers' Durable Equipment Investment



Note: AVG includes 1960-61, 1969-70,1973-75, 1981-82 recessions.

Chart 6B: Nonfarm Inventory to Final Sales Ratio



Note: AVG includes 1960-61, 1969-70,1973-75, 1981-82 recessions.

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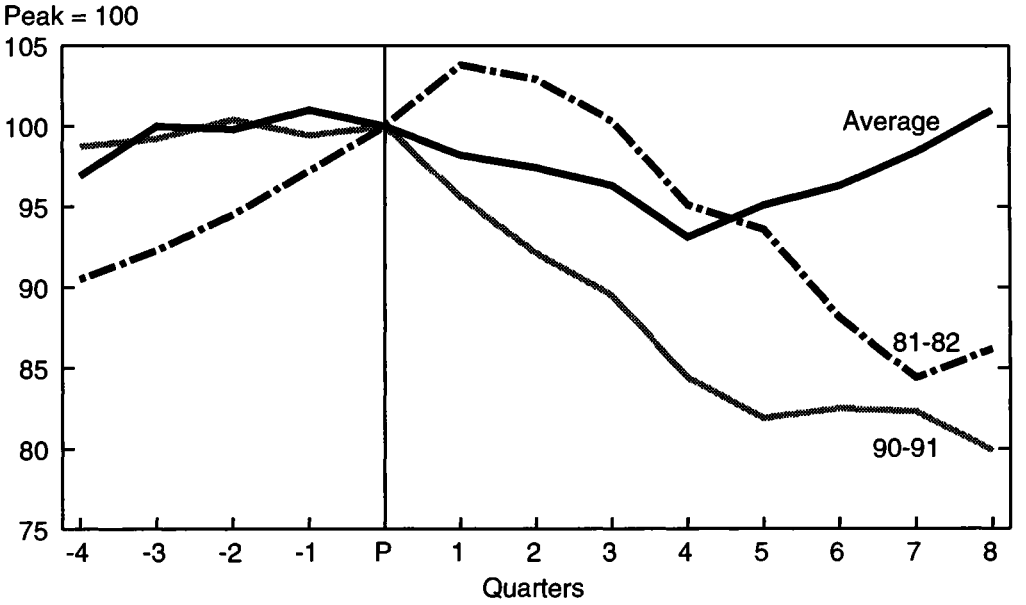
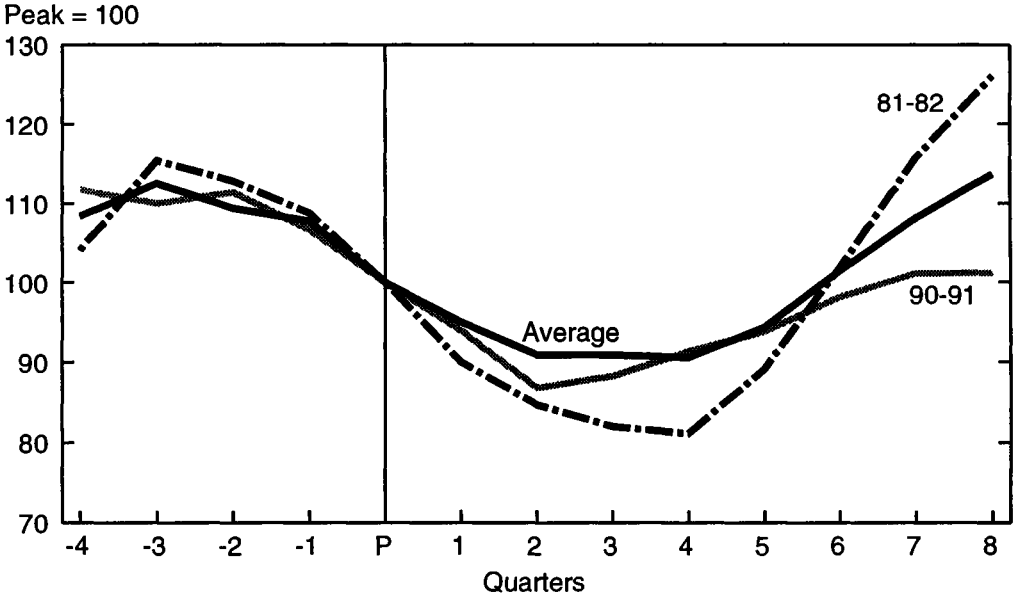
Chart 7A: Nonresidential Construction Investment



Note: AVG includes 1960-61, 1969-70,1973-75, 1981-82 recessions.

Chart 7B: Residential Construction Investment



Note: AVG includes 1960-61, 1969-70,1973-75, 1981-82 recessions.

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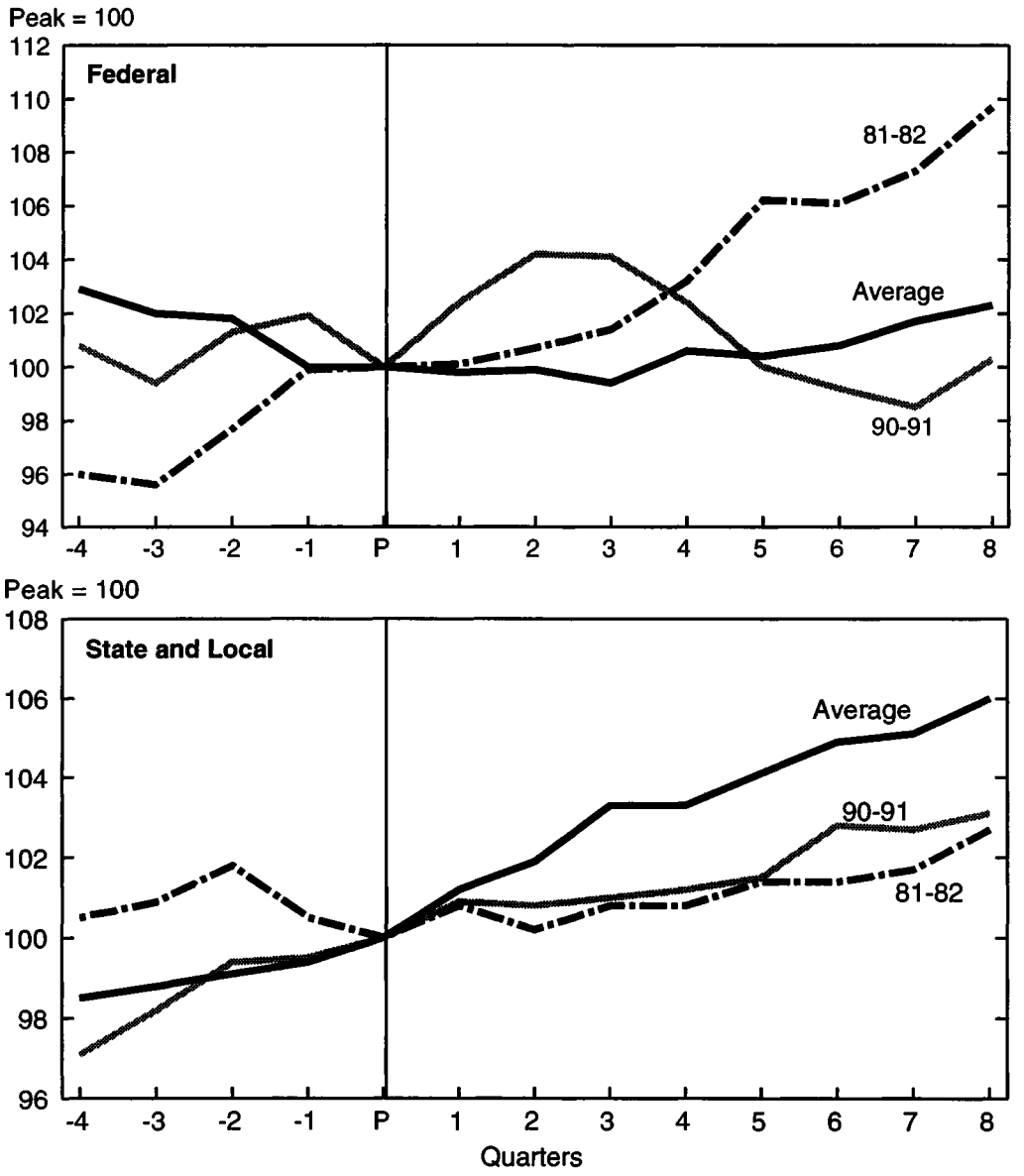
sitive sectors (with the notable exception of large-scale real estate) may have done a bit better than the rest of the economy. Nonetheless, subpar economic growth in a world of easing monetary policy and falling interest rates suggests that policy probably did not affect the real economy as it had in the past. The next section of the paper begins the discussion of what role the unprecedented slowdown in credit formation may have played in this process.

B. The Credit Slowdown

The basic facts about the credit slowdown from 1989 to 1992 can be seen in Table 1.

Chart 8: Real Government Purchases



Note: AVG includes 1960-61, 1969-70, 1973-75, 1981-82 recessions

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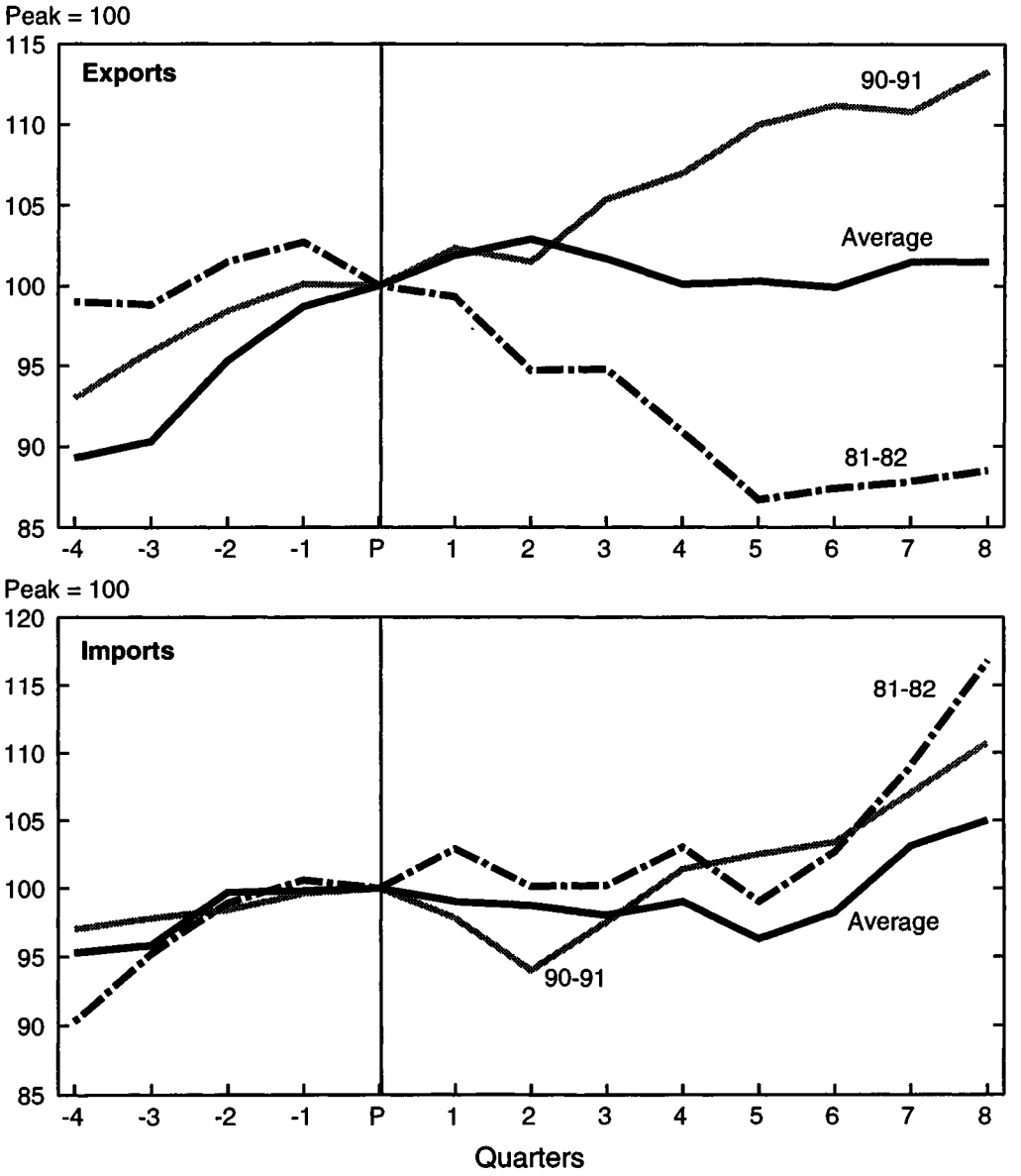
Comparing pre-recession,[4] recession, and recovery periods, growth of both real output and most credit aggregates was slower than during previous cycles. In particular, nonresidential construction and correspondingly, business mortgages were extraordinarily weak, declining through most of the 1989-92 period, in contrast to the strong growth in previous episodes. The performance of equipment and inventory spending was less dramatic, but still was reflected in low growth rates for short-term business credit. Household debt formation was also subpar, mirroring consumption growth. Only residential construction and household mortgages retained their normal cyclical patterns. General-

[4] The pre-recession periods roughly coincide with periods of tight credit. See Eckstein and Sinai (1986), Owens and Schreft (1992), Romer and Romer (1990), and Ryding (1990) for different credit crunch dates.

Chart 9: Real Exports and Real Imports



Note: AVG includes 1960-61, 1969-70, 1973-75, 1981-82 recessions

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Table 1: Growth Rates over Booms, Recessions, and Recoveries

	Booms[a]		Recessions[b]		Recoveries[c]	
	Past Episodes	1989-90	Past Episodes	1990-91	Past Episodes	1991-92
Real growth rates						
GDP	2.2	0.9	-2.9	-0.9	5.6	1.6
Debt-sensitive sectors	2.3	-1.4	-9.4	-2.1	9.4	2.5
Durables consumption	-1.3	-2.9	-6.8	-2.9	19.0	5.0
P.D.E.	4.5	-0.4	-11.7	-3.0	7.8	1.8
Nonresidential structures	8.6	1.3	-8.3	-4.0	-2.5	-10.4
Residential structures	-10.1	-10.8	-13.9	-7.0	32.8	13.4
Inventories (stock)	3.9	2.0	1.1	-0.7	1.3	-0.6
All other sectors	-0.1	2.3	6.5	1.2	-3.8	-0.9
Growth rates						
Private nonfinancial debt	11.8	6.7	10.8	0.6	8.8	2.3
Business debt	13.4	4.1	13.7	0.3	8.2	-0.6
Short-term credit	17.0	5.8	1.0	-1.2	4.7	-0.8
Loans	18.9	4.5	14.1	-0.5	4.3	-4.6
Bank loans	18.2	1.2	14.1	-0.1	1.8	-5.4
Business mortgages	12.5	1.5	12.1	-0.4	11.9	-2.6
Household debt	11.4	9.3	7.6	0.8	9.5	4.6
Mortgages	10.8	11.2	8.0	1.3	9.3	5.8
M1	5.8	4.6	8.3	1.0	7.6	10.9
M2	6.6	5.3	10.3	0.8	13.1	2.8
Differences						
Fed funds	4.28	-0.92	-5.12	-1.73	-0.72	-2.40
Prime rate	3.61	-0.66	-3.49	-0.81	-1.57	-2.69
Inflation rate	3.57	0.94	-1.31	-0.28	-2.69	-2.42
Long-term govt. bond rate	1.60	0.60	-1.28	-0.69	0.09	-0.71

a. Includes four quarters up to NBER peak dates. Past episodes are average of the booms preceding the 1969-70, 1973-75 and 1980 recessions.

b. Past episodes include average of 1969-70, 1973-75 and 1981-82 recessions.

c. Recoveries are NBER trough to four quarters later. Past episodes are average of recoveries after the 1969-70, 1973-75 and 1981-82 recessions.

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ly speaking, intermediated credit, particularly bank loans, slowed more sharply than market credit, and the broad money aggregates were correspondingly weak.

Table 1 also points out the most unusual characteristic of the "credit crunch" and the recession: they were not precipitated by a sharp tightening of monetary policy.[5]

Instead, the slowdowns (and eventual declines) in both credit and activity appear to have been more closely related to several credit demand and supply factors: (1) Debt overhang from the 1980s and the associated strain on nonfinancial balance sheets appears to have caused a fundamental downward shift in credit demand and economic activity, particularly in the consumer sector; (2) Structural changes in several areas of business investment, particularly in computers and inventories, caused an exogenous decline in credit demand unrelated to balance sheet positions; (3) Economic activity was also curtailed by credit supply problems, which were largely the result of the poor financial health and balance sheet problems of many intermediaries.

Although much attention has been paid to the third factor, credit supply constraints and their effect on monetary policy transmission, several studies have found a substantive role for balance sheet adjustments and demand shifts in the overall credit slowdown. Because credit supply problems are, in practice, difficult to distinguish from balance sheet restructuring by consumers and nonfinancial firms, the following sections discuss the three credit factors in more detail and introduce several credit proxies that attempt to measure them.

1. Balance Sheet Effects

The deleveraging/balance sheet story is a straightforward one. During the 1980s there was a huge leveraging up by households and businesses. By the late 1980s the increased leverage, combined with relatively high real interest rates, created historically high debt burdens that cut sharply into consumers' discretionary spending and firms' cash flow.

For consumers, increased leverage combined with stubbornly high consumer interest rates resulted in record high debt service burdens by the latter half of the 1980s, leaving less income for discretionary consumption. Changes in the tax treatment of interest payments combined with the generally overburdened household sector led to deleveraging late in the decade, a development that put further downward pressure on consumption. This story emphasizes the income effect of high leverage and is supported by the evidence from the composition of consumer spending in Chart 5 above: sectors that are relatively insensitive to credit, such as nondurables and services consumption, experienced growth just as anemic (relative to historical norms) as that in more credit-sensitive sectors such as consumer durables. Thus, high debt service helped to reduce spending growth in a wide variety of goods, not just those purchased with credit.[6]

Leverage effects on firms created similar problems. Both theoretical (Jensen and Meckling 1976) and empirical (Fazzari, Hubbard and Peterson 1988) studies have shown that the investment and production plans of high-leverage firms respond more strongly to bad demand shocks than do the plans of firms with lower leverage. The macroeconomic implications of these leverage effects for both investment and credit are

[5] Although policy was tightened in 1988, the tightening was short-lived, and short-term rates were falling by late 1988. Declining short-term rates and the absence of the Regulation Q ceilings mean that the credit slowdown and ensuing recession cannot be attributed to disintermediation-style credit rationing, a common feature of historical credit crunches.

[6] Further anecdotal evidence suggests that credit supply constraints may have been less important because banks and financial institutions were attempting to expand certain types of consumer lending, particularly credit cards, during this period.

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clear: as the business sector became more highly leveraged over the 1980s, investment and credit demand reacted more strongly to declines in economic activity. As with households, any attempt by firms to deleverage further depressed investment and credit demand.

2. Credit Demand Shifts

In addition to debt overhang problems, several credit- (and policy-) sensitive components of aggregate demand underwent secular changes in the 1980s that kept growth in these components and their related credit demands low relative to historical norms. The paper by Mosser and Steindel in this volume emphasizes two particular sectors, business investment in equipment and inventory investment, that underwent structural changes largely unrelated to credit market developments. As the relative price of computers fell sharply in 1980s, firms shifted expenditure away from production equipment and toward the relatively cheap computers, thus reducing nominal equipment growth and related credit demands.[7] Similarly, improved inventory management techniques, particularly by manufacturers, helped to keep the inventory cycle and associated credit demands quite small in the 1990-91 recession. Because these structural changes appear to predate the slowdown in credit in the late 1980s, it seems likely that they reduced credit demand and thus contributed to, although by no means completely explain, the slowdown in short-term business credit.[8]

3. Credit Supply Effects

Several recent studies have examined the credit slowdown, attempting to control for shifts in credit demand factors and some of the balance sheet effects noted above. In general, they conclude that credit supply restrictions, particularly from banks, were responsible for a portion of the credit slowdown. For example, Bernanke and Lown (1991) concluded that although deteriorating balance sheet positions of consumers and nonfinancial firms were responsible for most of the slowdown in activity and credit, the supply of bank credit, particularly in certain regions, was an important factor impeding the economy. In this volume, Lown and Wenninger estimate that bank loans were significantly weaker than traditional reduced form lending-activity relationships would indicate. Cantor and Rodrigues find similar results for nonbank intermediated credit. Mosser and Steindel show that the long-term relationships between credit flows and economic activity fell apart in the late 1980s, with credit flows nearly 35 percent too low given the pace of economic activity.

More microeconomic studies, such as Johnson (1991), Peek and Rosengren (1992), and Hancock and Wilcox (1992), suggest that bank capital problems, probably related to the real estate collapse, restricted credit supply in excess of what interest rates and demand factors would have predicted. In this volume, Hamdani, Rodrigues and Varvatsoulis use survey evidence to show that credit supply restrictions were particularly important for smaller firms, perhaps because of their almost exclusive reliance on intermediated credit.

Although nearly all of the studies agree that a "capital crunch" story appears to fit the

[7] In addition, deflating nominal credit by the GDP deflator (as is common practice) makes real credit growth look disproportionally weaker than investment demand.

[8] In fact, Mosser and Steindel find that fundamental demand factors explain only about 25 percent of the decline in short-term corporate borrowing from 1989 to 1991.

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general facts of the credit slowdown, estimates of the size of the credit supply restrictions vary. Most of the macroeconomic studies mentioned above measure credit supply restraints using one or more proxies, including interest rate spreads, measures of credit restrictions for small firms, and regression residuals that measure excessive credit restraint.

In their paper, Lown and Wenninger discuss several proxies for credit supply restrictions from the banking sector.[9] For example, spreads between bank borrowing rates and market rates appear to have been kept high in an attempt to discourage borrowing. One signal of the reluctance of banks to lend was a 250+ basis point gap between the prime and federal funds rates that persisted over 1991 and 1992. In contrast, during previous recessions and crunches the spread between the prime and fed funds spiked to high levels when inflation was high and monetary policy was tightened, but returned to more normal levels relatively quickly.

Lown and Wenninger also show that reduced form relationships between different components of bank lending, economic activity, and borrowing rates overpredicted lending during the crunch. Although their equations are not, strictly speaking, structural loan demand equations, they largely capture credit demand effects. Below, residuals from their estimates are used as proxies for bank credit supply constraints.[10]

Another set of credit "supply" proxies come from the paper by Mosser and Steindel in this volume. They show that long-term relationships between a number of credit aggregates (both bank and nonbank credit), interest rates, and economic activity consistently underpredicted actual credit flows in the mid 1980s and overpredicted flows in the early 1990s. While their regressions are not credit demand relationships in the formal sense, in practice they behave suspiciously like stable, long-term demand relationships. Thus their large residuals reflect either credit supply shifts or some nonlinear credit demand changes perhaps related to deleveraging.[11]

Finally, Hamdani, Rodrigues and Varvatsoulis suggest proxies for credit supply constraints that focus on small firms. Results from Gertler and Gilchrist (1992) and Oliner and Rudebusch (1992) suggest that because small firms have little or no direct access to capital markets, their activities are harder hit by credit restrictions at financial intermediaries than the activities of large firms. Using survey results from the National Federation of Independent Business, Hamdani, Rodrigues and Varvatsoulis find that even after adjusting for normal cyclical movements in output and interest rates, many small firms had significant difficulty in obtaining credit in the late 1980s. Their proxy essentially measures the amount of nonprice credit rationing faced by small firms.

[9] Lown and Wenninger offer extensive evidence in favor of this bank capital/credit supply story. They show that virtually all categories of bank lending (excepting home mortgages) were weaker than in past downturns. In addition, bank surveys, changes in lending requirements (for example, higher collateralization) and substantially weaker lending by the lowest capital banks all suggest that constraints on bank credit supply were important. Finally, their econometric estimates of relationships between bank lending, interest rates, and economic activity suggest that the weakness in bank lending (particularly consumer loans and nonresidential mortgages) in the 1990-91 recession was substantially different from that in previous economic downturns.

[10] Of course, Lown and Wenninger's residuals, like those from Mosser and Steindel below, may also reflect some nonlinear credit demand effects. For example, higher leverage may have changed the historical relationship between spending and credit demand. In other words, at high debt levels, cuts in spending may cause proportionally larger declines in credit demand as firms and households deleverage and cut spending simultaneously.

[11] More precisely, their residuals measure those balance sheets changes that are uncorrelated with economic activity.

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The studies examined here provide ample evidence that shifts in both credit demand and supply played an important role in the credit slowdown. The next question is what effect the credit slowdown, and credit supply restrictions in particular, may have had on aggregate activity. As a first step to answering that question, the next section of the paper measures the statistical relevance of credit variables, including the supply proxies discussed above, in explaining systematic movements in aggregate economic activity. Further econometric evidence is discussed in section III below.

C. Granger-Causality Tests of Credit and Aggregate Demand

This section of the paper looks at the time series relationship between credit and economic activity during the 1980s. Specifically, it reports Granger-causality tests of whether overall credit aggregates or credit supply proxies are statistically significant predictors of future economic activity. These statistical tests are based on data from 1980 to 1992, and thus are useful indicators of systematic links between credit, credit supply proxies and future activity over that period. To the extent that the 1989-92 credit slowdown was a unique episode, however, these tests may inadequately measure the impact of credit on activity. Thus these tests should be viewed as only an introduction to the linkages between credit and activity.

Following the previous literature on the relationship between credit and economic activity,[12] Tables 2 and 3 present Granger causality tests statistics from regressions of economic activity (real GDP and debt-sensitive real GDP) on lagged credit variables and lagged activity. The F-statistics test whether all the coefficients on lagged credit variables are significantly different from zero. Figures in parentheses are significance levels of the F-tests (percentiles of the F-distribution). Table 2 reports tests for regressions with eight lags of activity and credit; regressions in Table 3 also include eight lags of the federal funds rate.

Several results stand out from the tables. Aggregate credit (and money) variables were generally poor predictors of activity, although M2 was the best of a bad lot.[13] In general, the proxy variables did a better job of explaining economic activity in the 1980s than credit or money aggregates. The bivariate results show that the prime rate-federal funds rate spread, small firm borrowing constraints, and residuals from Mosser and Steindel debt regressions all Granger-cause activity. In light of the emphasis on bank behavior and the real estate sector in the credit slump, the only surprising result is that residuals from business mortgage regressions and from Lown and Wenninger's bank residuals were generally insignificant in explaining activity. In addition, all money, credit, and proxy measures were less important in explaining activity if the federal funds rate was also used as an explanatory variable.[14] Even so, the credit proxies in the three variable regressions were substantially more important in explaining economic activity than were the corresponding credit aggregates.

Overall, this formal econometric evidence using Granger causality tests is somewhat

[12] These tests are closely related to those used by Bernanke and Blinder (1992), Friedman and Kuttner (1989), Romer and Romer (1990) and Kashyap and Stein (1992), to determine if monetary policy affected real activity more through a "money" channel (interest rates) or through a "credit" channel. See footnote 2.

[13] All money and credit variables are worse predictors of activity in the 1980s than during earlier periods, probably as a result of the massive structural changes in financial market and intermediaries during the decade.

[14] This finding has been standard since Sims (1972).

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Table 2: Granger Causality Tests: Credit, Credit Proxy, and Real Activity[a]
Differences, 1980 to 1992

	Real GDP	Debt-sensitive GDP
Bivariate		
Nonmortgage debt	1.05 (0.39)	1.47 (0.23)
Short-term credit	1.65 (0.18)	2.47 (0.06)*
Loans	0.94 (0.45)	1.04 (0.49)
Consumer credit	1.45.(0.24)	2.64 (0.05)**
M1	1.11 (0.36)	1.41 (0.25)
M2[a]	2.02 (0.10)*	2.21 (0.09)*
Mosser/Steindel residuals[b]		
Nonmortgage Corp. Debt	2.96 (0.03)**	2.30 (0.08)*
Short-term	2.68 (0.04)**	5.35 (0.00)***
Loans	1.13 (0.35)	0.81 (0.52)
Business mortgages	0.99 (0.42)	1.07 (0.38)
Consumer credit	1.28 (0.29)	1.52 (0.21)
Household mortgages	1.46 (0.24)	1.93 (0.12)
Lown/Wenninger residuals[c]		
Consumer loans	0.23 (0.92)	0.49 (0.74)
C&I loans	1.51 (0.22)	2.82 (0.04)**
Business mortgages	1.20 (0.33)	0.32 (0.86)
Hamdani/Rodrigues/Varvatsoulis residuals[d]		
All firms	2.10 (0.10)*	1.85 (0.14)
Regular borrowers	2.69 (0.04)**	2.54 (0.05)**
Bank spread[e]	2.34 (0.07)*	3.64 (0.01)***

a. Debt-sensitive real GDP is consumer spending on durables, business fixed investment and inventory investment. Statistics reported in the table test the null hypothesis that all lags of credit proxies have zero coefficients in explaining real GDP. Numbers in parenthesis are percentiles of appropriate F-distributions.

b. Residuals from Mosser and Steindel regressions of the long-term relationships between debt and economic activity.

c. Residuals from Lown and Wenninger reduced-form regressions relating bank loans to economic activity and interest rates.

d. Residuals from Hamdani, Rodigues and Varatsoulis reduced-form regressions relating small business borrowing constraints (as measured by survey data from the NFIB) to economic activity and interest rates.

e. Prime rate minus federal funds rate.

* Statistically significant at 10 percent level.
** Statistically significant at 5 percent level.
*** Statistically significant at 1 percent level

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Table 3: Granger Causality Tests: Creidt, Credit Proxies, and Real Activity[a]
Differences (1980-92)

	Real GDP	Debt-sensitive GDP
Trivariate with federal funds rate		
Nonmortgage debt	0.78 (0.54)	1.00 (0.42)
Short-term credit	0.61 (0.66)	0.84 (0.51)
Loans	0.48 (0.75)	0.58 (0.68)
Consumer credit	1.11 (0.36)	2.36 (0.07)*
M1	1.16 (0.35)	0.86 (0.49)
M2[a]	0.31 (0.87)	0.45 (0.77)
Mosser/Steindel residuals[b]		
Nonmortgage Corp. Debt	2.96 (0.03)**	2.43 (0.07)*
Short-term	0.51 (0.73)	1.76 (0.16)
Loans	0.77 (0.55)	0.49 (0.74)
Business mortgages	0.17 (0.95)	1.08 (0.38)
Consumer credit	0.45 (0.77)	0.34 (0.85)
Household mortgages	0.99 (0.43)	1.89 (0.14)
Lown/Wenninger residuals[c]		
Consumer loans	0.54 (0.71)	0.03 (0.99)
C&I loans	0.49 (0.75)	1.62 (0.19)
Business mortgages	1.25 (0.31)	0.81 (0.53)
Hamdani/Rodrigues/Varvatsoulis residuals[d]		
All firms	1.92 (0.13)	1.56 (0.20)
Regular borrowers	1.86 (0.14)	1.70 (0.17)
Bank spread[e]	1.18 (0.33)	1.50 (0.22)

[a] Debt-sensitive real GDP is consumer spending on durables, business fixed investment and inventory investment. Statistics reported in the table test the null hypothesis that all lags of credit proxies have zero coefficients in explaining real GDP. Numbers in parenthesis are percentiles of appropriate F-distributions.

[b] Residuals from Mosser and Steindel regressions of the long-term relationship between debt and economic activity.

[c] Residuals from Lown and Wenninger reduced-form regressions relating bank loans to economic activity and interest rates.

[d] Residuals from Hamdani, Rodigues and Varvatsoulis reduced from regressions relating small business borrowing constraints (as measured by survey data from the NFIB) to economic activity and interest rates.

[e] Prime rate minus federal funds rate.

* Statistically significant at 10 percent level.

** Statistically significant at 5 percent level.

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disappointing. Although credit supply proxies are more important in explaining activity than credit aggregates, few of the credit variables are statistically significant, particularly when the federal funds rate is included. Taken at face value, the Granger-causality tests suggest that the quantity and composition of credit had little or no independent effect on output during the 1980s. In contrast, the informal evidence on aggregate demand presented earlier suggested a very close relationship between credit and activity.

One reason for the ambiguous econometric results may be that aggregate regressions and statistical tests mask a number of important sectoral differences in the interaction between credit formation and economic activity. Both institutional details and the large differences across the aggregate demand components in Charts 5-9 suggest that relationships between activity, credit and policy for real estate, households, and businesses should be examined individually. Section III below does this, using the credit proxies to help explain the weakness in different demand components from 1989 to 1992.

Before turning to sectoral evidence, however, a second problem associated with the statistical tests above needs to be discussed. Both the simple recession comparisons and the Granger-causality tests abstract from a number of important structural differences between the 1990-91 business cycle and its predecessors. In addition to the extraordinary conditions in credit markets, these differences include the stance of monetary policy, financial innovation and deregulation that have changed the transmission of monetary policy, fiscal policy stance, and other "exogenous" shifts in aggregate demand. Section III below looks at the role of these factors (in conjunction with the credit slowdown) in curtailing economic growth, with particular emphasis on monetary policy transmission.

II. Factors Influencing Monetary Policy Effectiveness

This section of the paper looks at the linkages between monetary policy and the real economy, giving particular attention to those factors, including the credit crunch, that may have disrupted or changed these linkages. Section A compares monetary policy stance during the 1990-91 cycle and earlier cycles. Section B reviews how financial market problems in the early 1990s, particularly the credit slowdown, may have made monetary policy less effective. Section C summarizes the long-term changes in monetary policy transmission mechanisms that may have altered the policy-credit-output linkages. Section D discusses other exogenous factors that may have offset monetary policy easing.

A. Monetary Policy Stance

Before discussing the interaction of monetary policy, activity and the credit slowdown in the early 1990s, some comparison of monetary policy stance with that in earlier cycles is necessary. Although the 1990-91 recession began with monetary policy easing rather than tightening, sluggish growth in both credit and the real economy might have occurred because monetary policy did not ease enough to stimulate activity. One reason for confusion about the "tightness" of policy is that the two traditional measures of monetary policy stance, M2 and the interest rate on federal funds, gave conflicting signals in the early 1990s.

M2 growth suggested a tight policy stance (Chart 10A). The slow growth in M2, however, was due to sharp declines in small certificates of deposit, and appears to have been a conscious choice on the part of financial institutions to reduce managed liabilities in the face of capital problems. Thus, M2 behavior reflected the capital crunch at de-

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Chart 10A: Real Money Growth

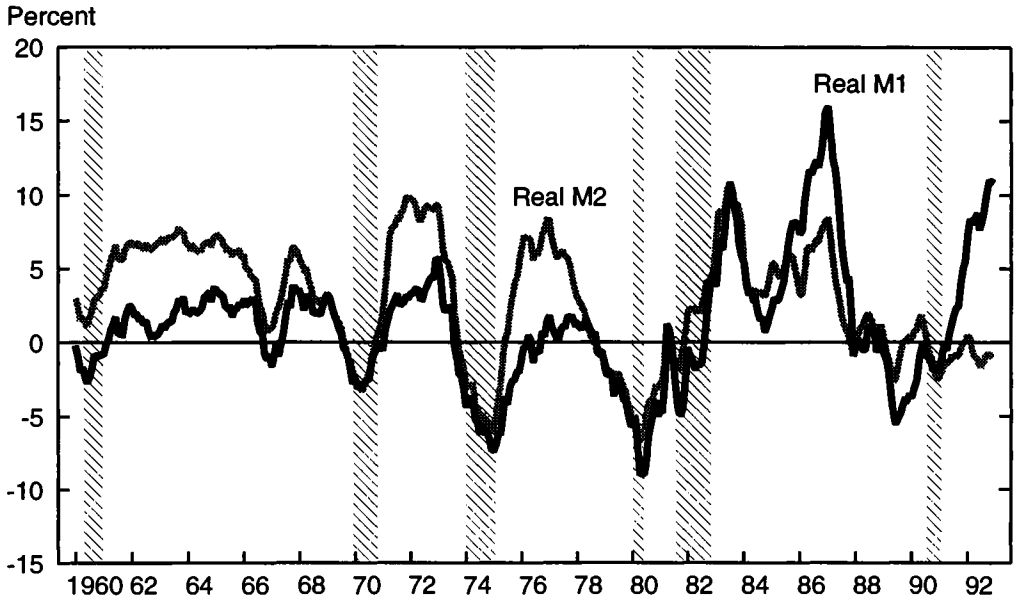
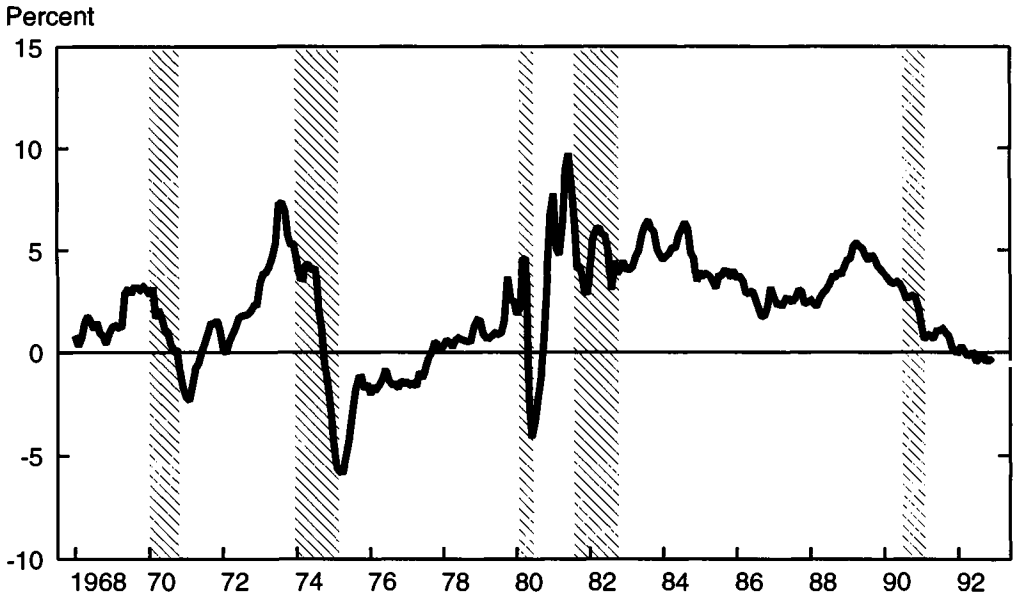


Chart 10B: Real Federal Funds Rate



Note: The real Federal funds rate is calculated as the nominal rate minus the previous twelve months inflation in the core CPI.

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pository institutions but was not a clear signal of monetary policy.

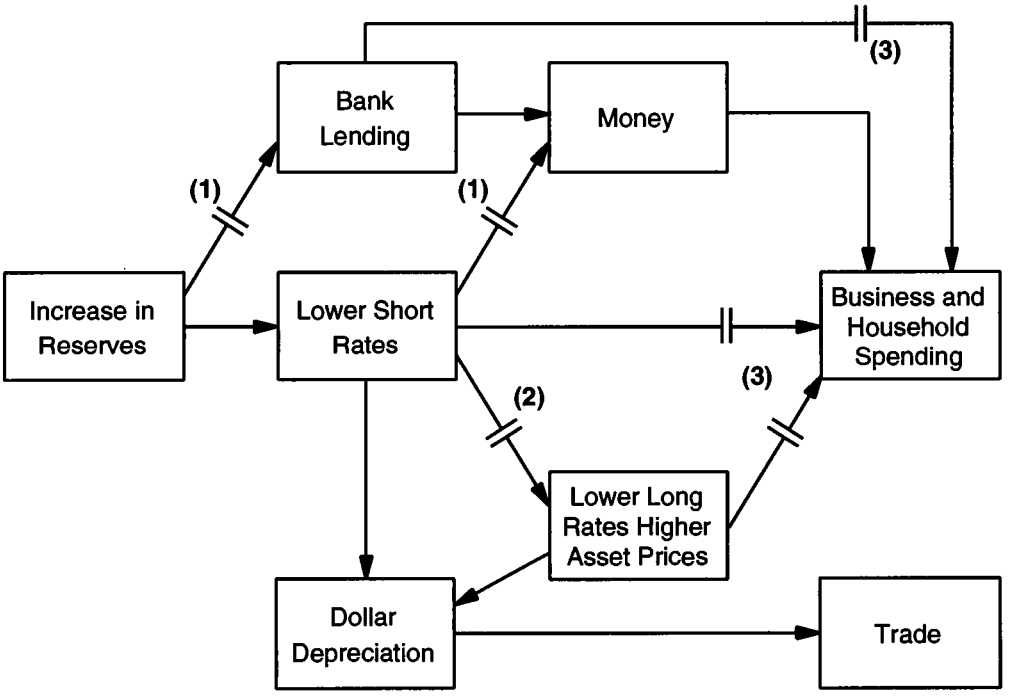
In contrast, the real, or inflation-adjusted federal funds rate (Chart 10B) fell to near zero by mid-1992, suggesting policy was looser than it had been in the 1981-82 recession, but a bit tighter than at the end of earlier recessions. Nonetheless, the real funds rate did rise more than 150 basis points in 1991 when nominal rates were flat and inflation slowed sharply. This "induced" tightness, which resulted from the Fed's policy of very gradual easing, suggests that monetary policy stimulus only slowly worked its way through the economy.

B. "Blockages" in Monetary Policy Transmission

Although monetary policy stance from 1989 to 1992 was somewhat different from past cycles, policy stance alone cannot completely explain the extraordinarily slow growth in real activity and intermediated credit. Indeed both the credit supply and demand stories outlined above suggest that during this period the transmission of policy changes via financial markets and institutions was weaker than in past episodes.

Some of the channels through which policy should affect the economy, but which may have been blocked because of financial system fragility, are shown in Figure 1. Blockage (1) suggests that the capital crunch and banking crisis did not allow reductions in short-term market interest rates to be transmitted to bank lending rates or credit

Figure 1: Channels of Monetary Policy



Possible "Blockages"
(1) Large writeoffs, new capital requirements, poor asset quality (balance sheet problems).
(2) Uncertainty, inflation concerns, long-term budget deficit.
(3) Deleveraging and balance sheet problems of firms and households.

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growth. Evidence of this shift seems quite overwhelming: credit growth, particularly at depository institutions, was well below economic fundamentals and bank lending rates relatively high.[15]

Blockage (2) suggests that the channels to long-term bonds and other assets were blocked by inflation fears or by a high level of investor uncertainty—perhaps related to credit problems or to concerns about long-term federal deficits. Certainly, long-term rates fell substantially less than short-term rates, making the term structure quite steep, but the term structure is usually steep when the economy is weak and monetary policy is loose (Chart 11). How important the credit slowdown and banking crisis were in the steep yield curve is unclear however, since the medium-term spread between three months and three years was within historical norms, but the long-term yield curve (three to ten years) was extraordinarily steep.

Blockage (3) suggests that deleveraging and debt restructuring by households and firms depressed spending and credit demand, making them less responsive to easing monetary policy. For example, lower interest rates due to easy monetary policy may have induced firms and consumers to deleverage more quickly, while keeping spending growth modest.[16] Although easing monetary policy may have "worked" by averting a deeper and more prolonged recession, this pattern is in sharp contrast to historical experience, when declining interest rates encouraged increases in economic activity. Thus the normal pattern of easing monetary policy followed by a strong rebound in economic activity appears to have been interrupted by shifts in both credit supply and credit demand.

C. Long-Term Changes in Monetary Policy Transmission

The short-run impediments to policy discussed above are only part of the reason that the relationship between monetary policy, credit, and economic activity in the early 1990s was so different from historical experience. Since the late 1970s, both financial innovation and deregulation have not only changed the behavior of financial institutions and markets, but they have also fundamentally altered the relationship between financial markets and economic activity. Even in the absence of the credit "crunch," these long-term changes in the channels of monetary policy transmission would have altered both the size and speed with which policy affected various sectors of the economy.

Tables 4 and 5 summarize by sector and by study some of the major findings on long-term changes in monetary policy transmission. Overall, these studies conclude that monetary policy today is transmitted less through Regulation Q-type quantity rationing of credit and more through interest rates and their effect on balance sheets and the ex-

[15] See the paper by Lown and Wenninger and Table 1. There is a small caveat to this story. Although bank rates remained high relative to market rates in 1991 and 1992, in fact bank lending rates (with the notable exception of consumer credit rates) did decline steadily from late 1990 to the middle of 1992. It appears that the way in which monetary policy was "working" was to allow banks sufficient liquidity to improve their balance sheet positions in a relatively short period of time. While this outcome of monetary policy did not lead directly to strong growth in real activity, tighter policy might have led to large-scale bank failures and financial distress, and certainly to a deep and prolonged recession.

[16] Tighter monetary policy and higher rates would have forced further cuts in discretionary purchases as agents attempted to lower their debt burdens. This argues that easy monetary policy prevented a short-run collapse in spending and sped up deleveraging at the same time. This process seemed to be particularly clear in the household sector. There, lower interest rates led to a record volume of mortgage refinancing, freeing up funds for both discretionary spending and for further retirement of debt. In addition, lower rates stimulated housing investment and related consumer durables spending.

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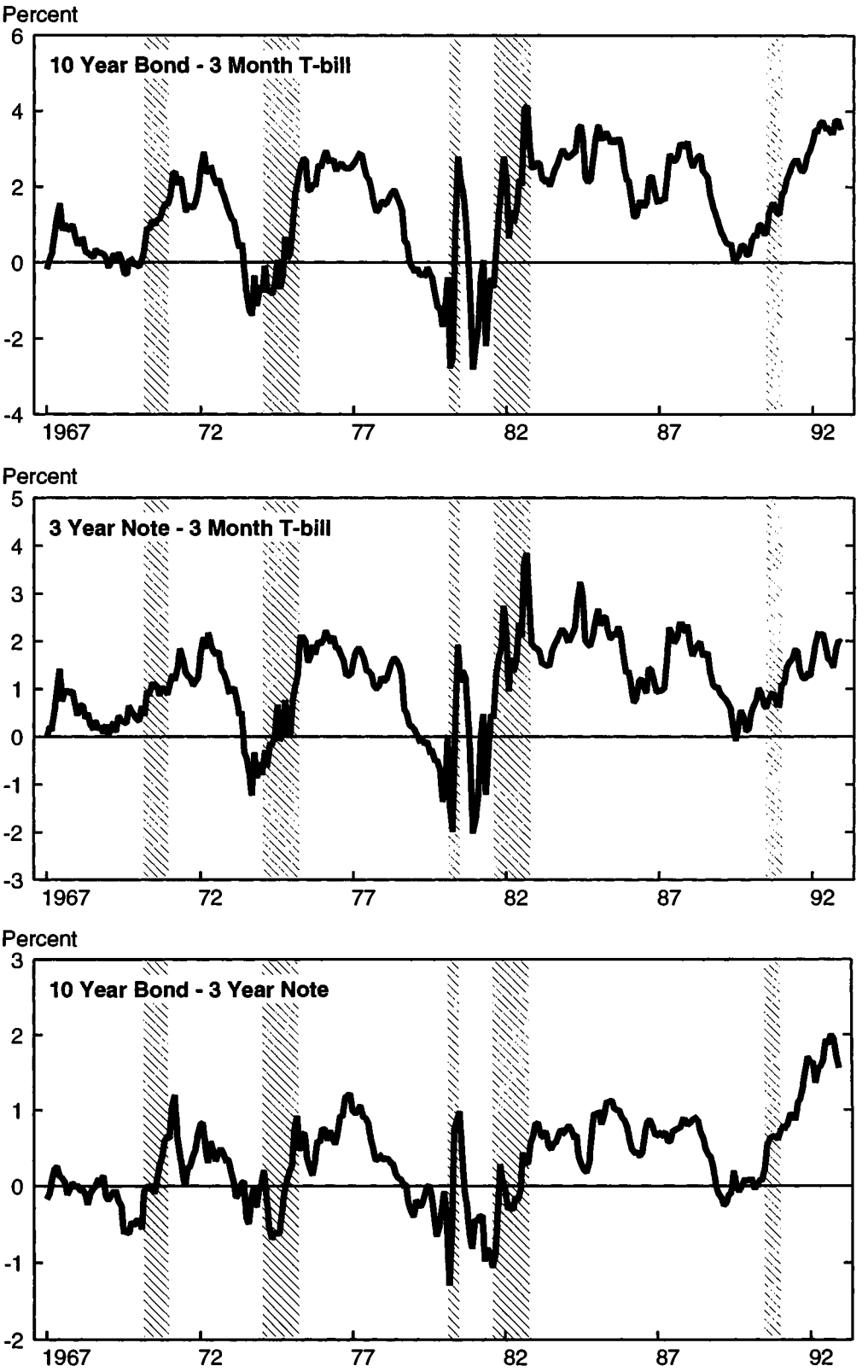
Chart 11: Treasury Spreads



Note: Shaded areas represent recessions.

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change rate.[17] Roughly speaking, the empirical evidence suggests that a smaller response of housing to monetary policy has been offset (by some measures, more than offset) by a stronger exchange rate and net export response to policy. Although the studies in Tables 4 and 5 differ in their estimates of the overall size of the change in monetary policy effectiveness, they agree that the speed with which monetary policy affects the real economy is slower, and the impact of policy in any particular month or quarter is probably more unpredictable.

From the perspective of the 1990-91 cycle, longer and more uncertain policy lags make it very difficult to distinguish between short-run blockages to policy caused by credit supply and demand shifts and the longer term changes in transmission mechanisms. For example, monetary easing in 1991 and 1992 may have weakened the dollar, eventually giving a boost to U.S. exports; however, other long-term structural changes and the recent credit crunch may have conspired to make monetary policy less effective in stimulating domestic demand. Furthermore, if policy is now transmitted via interest rates and their impact on balance sheets, then balance sheet restructuring by consumers and firms could short-circuit monetary policy easing. In addition, credit supply shifts caused by bank capital problems could still keep easier monetary policy from affecting those sectors most dependent on intermediated credit despite wider capital market access for many firms and households. Large-scale real estate appears to be one such sector.

D. Other Factors Offsetting Monetary Policy

While changes in transmission mechanisms and short-term credit problems may have muted monetary policy effectiveness in the latest cycle, economic growth was also re-

[17] This conclusion does not mean that credit rationing by intermediaries would not affect the transmission of monetary policy, only that Regulation Q-type interest rate ceilings, which induced systematic credit rationing under very tight monetary policy, are no longer important.

Table 4: Summary of Empirical Studies
Changes in the Transmission of Monetary Policy

Final Demand Components	Innovation/Deregulation	Monetary Policy Influence
Housing	Remove Reg. Q Mortgage securitization Variable rate mortgages	Less for large shocks; maybe more for small changes
Business investment	Increased leverage Greater access to commercial paper and loan commitments	Likely larger, but few studies using aggregate data
Inventory investment	Greater access to commercial paper and loan commitments	Possibly larger, but few studies
Consumption	Increased leverage Greater credit access/info. Wider menu of saving instruments	No discernible change
Trade	Reduced capital controls Swaps and futures "Internationalization" of capital markets	Larger impact of interest rate differentials on the dollar

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strained by "headwinds"—negative factors largely unrelated to monetary policy stance. These headwinds include relatively tight fiscal policy or rather lack of any significant fiscal stimulus, and low confidence or "animal spirits", particularly by households[18]

Chart 12A makes clear that discretionary fiscal policy, measured by the full employment budget deficit, eased much less than in previous recessions. There was about a quarter of the discretionary fiscal pump priming done in previous recoveries and only one-sixth of the discretionary stimulus done in 1981-82. This lack of fiscal stimulus is unique: the U.S. did not have a single sustained economic recovery in the preceding

[18] In addition, the two previous recessionary periods, 1973-75 and 1980-82, were preceded by extremely large (negative) supply shocks (mainly large energy price increases). The subsequent easing of these supply shocks was a factor in the economic recoveries that followed. In the latest episode, the energy price shock was small and brief, playing a modest role in recession and recovery.

Table 5: Empirical Studies of Monetary Policy Transmission

Study	Sector	Major Conclusions
Akhtar & Harris: FRBNY	Aggregate	Interest sensitivity of private spending has risen, credit rationing less and exchange rate effects are greater
Bernanke & Campbell: Brookings	BFI	Serious risk to real economy (investment) from leveraging up in 1980s
Bosworth: Brookings	Housing ;consumption; trade	Housing less sensitive; others perhaps more, but policy lags are longer
Cantor: FRBNY	BFI	Investment of highly leveraged firms more closely tied to sales and cash flow
Fazzari et. al.: Brookings	BFI	Financial structure of firms very important in short-run investment decisions
Friedman: FRBKC	Aggregate	Less housing sensitivity; greater BFI sensitivity; little change in consumption
Hirtle: FRBNY	Aggregate	Change in relationship between GNP and interest rates that can be related to loan commitments
Kahn: FRBKC	Aggregate	GNP slightly less sensitive to Fed funds rate; longer and uncertain policy lag
Mauskopf: FRB	Aggregate	MPS model reestimation confirms less sensitive housing, more sensitive trade sector, but little overall change in policy sensitivity
Mosser: FRBNY	Aggregate	Large macroeconometric models are more sensitive to policy than in the 1970s; policy lags are longer; housing slightly less sensitive, trade much more
Ryding: FRBNY	Housing	Less sensitivity to policy due to decline in disintermediation
Throop: FRBSF	Housing	Less sensitive to policy, but size of the effects are small

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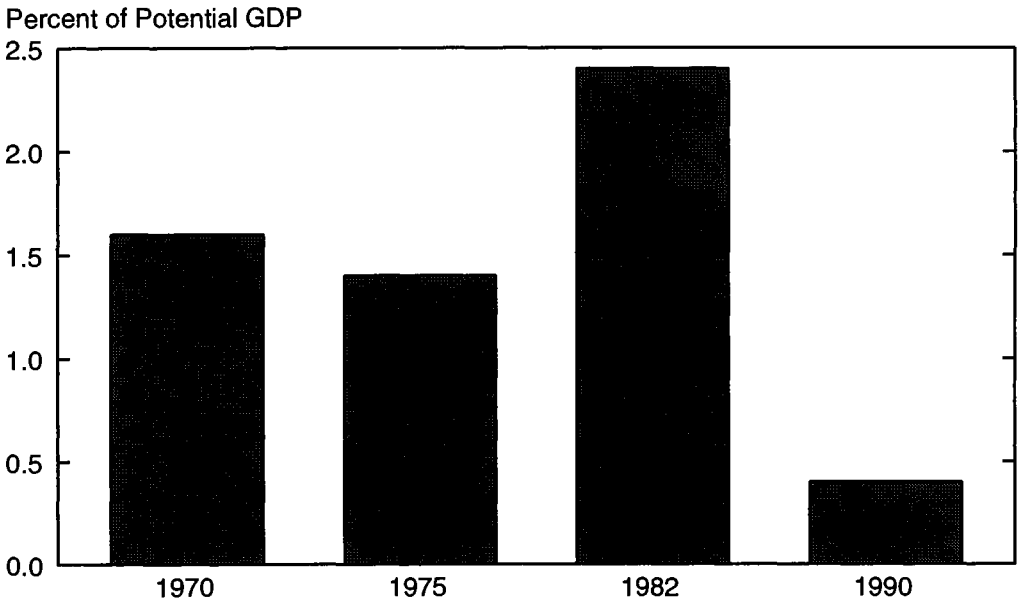
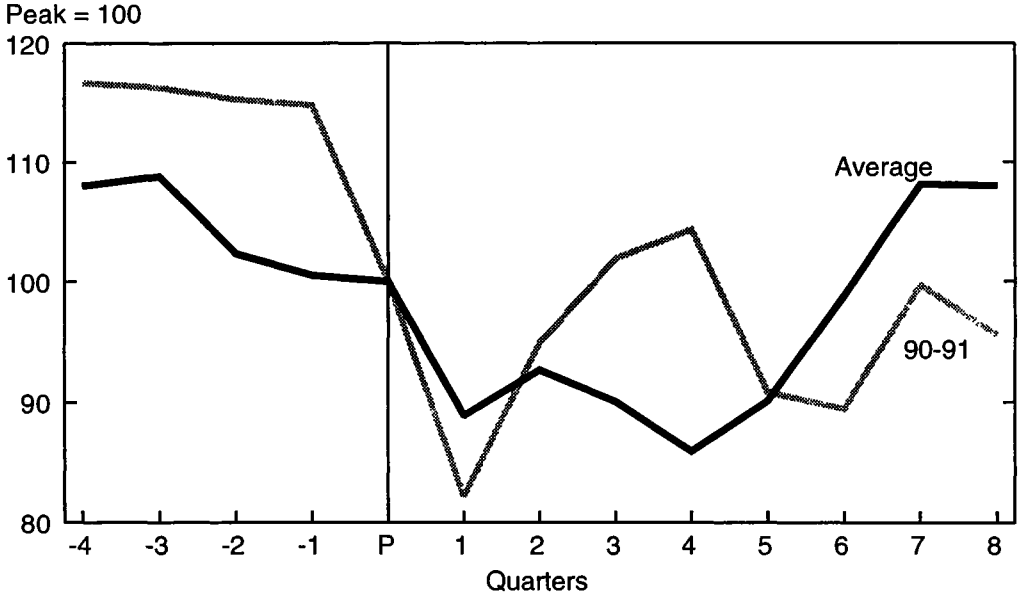
Chart 12A: Change in the Full Employment Budget Deficit
Business Cycle Peak to Eight Quarters Later



Source: Federal Reserve Board.

Chart 12B: Consumer Sentiment
Michigan Survey



Note: AVG includes 1969-70, 1973-75,and 1981-82 recessions.

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thirty years without significant fiscal stimulus. Indeed, a fiscal stimulus package comparable to that implemented in the early 1980s might have added a full percentage point to GDP growth in 1991 and 1992.[19]

Economic activity also appears to have been hurt by low consumer sentiment. Chart 12B shows that consumers were very pessimistic in late 1991 and 1992, more so than in previous economic recoveries. The low confidence readings may have been partly related to the credit slowdown, however, pessimistic confidence readings also stemmed from long-run changes in consumer prospects. In particular, corporate restructuring and downsizing have made future permanent income (and benefits) more uncertain, and a decade of relatively slow income growth and increasing income inequality (with no end in sight) probably contributed to the gloomy outlook.

Low confidence and the lack of any fiscal stimulus make the slow-growth recovery discussed in section I more understandable, regardless of the role of the credit slowdown and any long-term changes in monetary policy effectiveness. Because monetary policy, for the first time, was "going it alone" in trying to stimulate the economy, the simple historical comparisons with previous cycles presented above may be misleading indicators of whether the economy was "on track" in the late 1980s and early 1990s. To evaluate monetary policy efficacy and the role of credit in the downturn more rigorously, the next section presents evidence from several econometric models of aggregate activity.

III. Econometric Evidence on Monetary Policy Effectiveness and the Role of Credit Restraint

One way to pull together many of the factors affecting economic growth is to ask whether final demand equations, which relate spending to economic fundamentals such as income, wealth, interest rates and relative prices, adequately captured the weakness in the real economy from 1989 to 1992. On the one hand, if the slow economy was largely due to excessively high long-term interest rates or to relatively tight fiscal policy, or if balance sheet effects on aggregate demand are reflected largely through interest rates, these equations should predict economic activity fairly well. On the other hand, if factors left out of the models—for example, credit supply problems or an exogenous shift in demand for both goods and credit (such as a desire to deleverage)—were responsible for the weakness, then these equations will perform badly and consistently overpredict real activity.

This section looks at the performance of a number of different final demand models during the credit slowdown. In general, both reduced-form estimates and structural equations from large econometric models overpredicted real spending from 1989 to 1992. Adding the credit supply proxies from section I helps to explain some, but not all, of the overpredictions in policy-sensitive sectors. In addition, the overpredictions are not restricted to those sectors most sensitive to policy.

Chart 13 shows that aggregate reduced-form equations generally overpredicted output from 1989 to 1992.[20] While policy-sensitive sectors underperformed relative to model predictions, so did the sectors less directly sensitive to monetary policy. These models suggest a general malaise in aggregate demand, policy-sensitive or not, which

[19] This calculation assumes a fiscal multiplier of 1.

[20] Separate prediction models for policy-sensitive and insensitive sectors of real GDP were estimated by regressing each on four lags of the long-term government bond rate, inflation, monetary policy (federal funds rate and M2) and a measure of discretionary fiscal policy (the full-employment budget deficit) from 1967 to 1992-II. Prediction errors are static: actual expenditure less that predicted by the model equation, using actual historical values for all right hand side variables.

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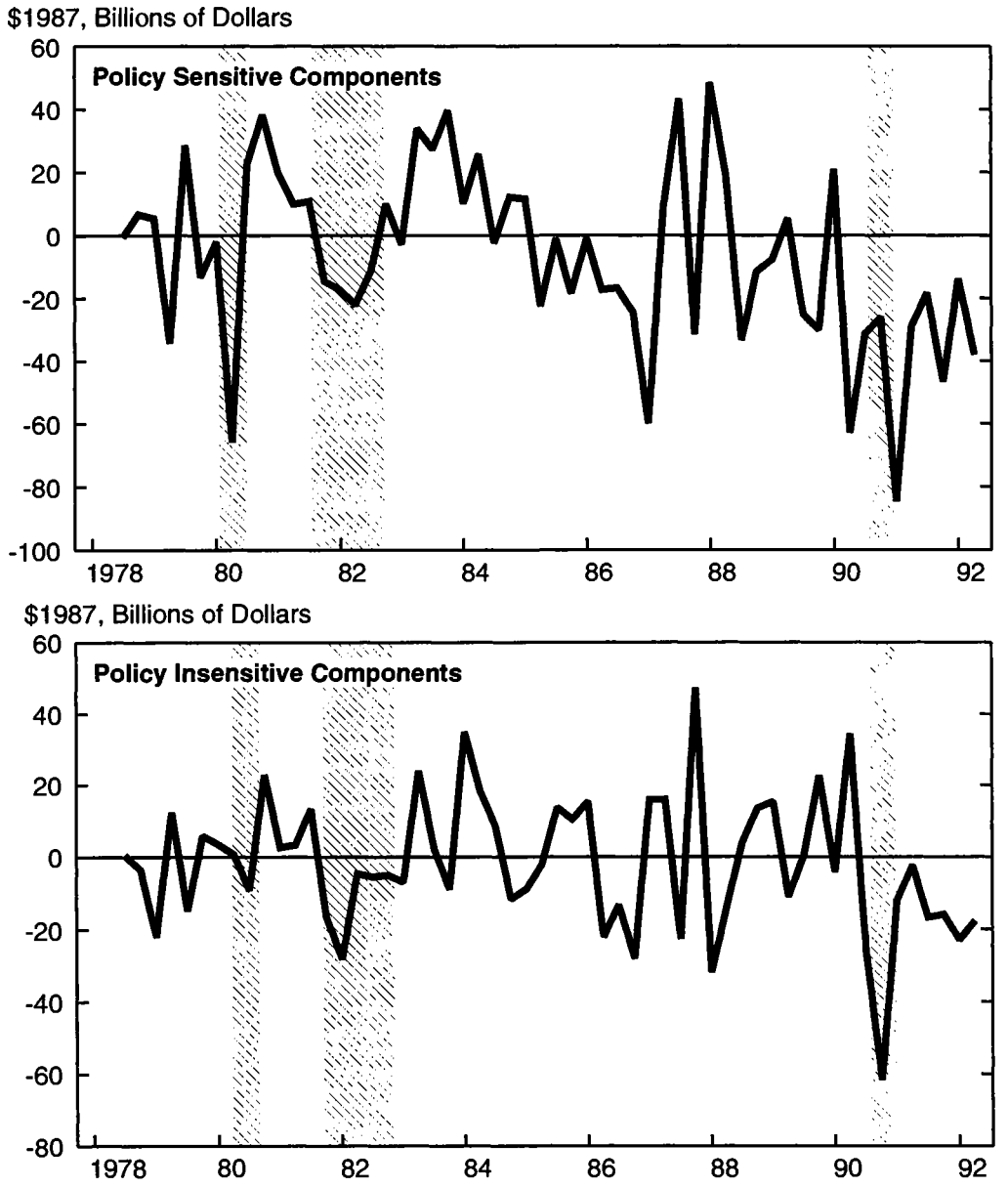
was not well described by economic fundamentals.

The general malaise in demand is particularly clear in the consumer sector. Charts 14 and 15 show prediction errors from equations for consumer spending from the DRI and MPS/Federal Reserve Board models.[21] According to the Board model, actual spending on durables and on nondurables and services was very weak in 1991 and 1992, well below what income, wealth, and interest rates would indicate. In contrast, DRI's

[21] Both DRI and the Board use income, interest rates and relative prices to predict durables spending. In addition, the Board model uses the stock of durables and the unemployment rate. For nondurables and services, the Board equation emphasizes household wealth (including the stock market) and permanent income. DRI uses recent income changes and relative prices.

Chart 13: Reduced-Form Prediction Errors



Note: Shaded areas represent recessions.

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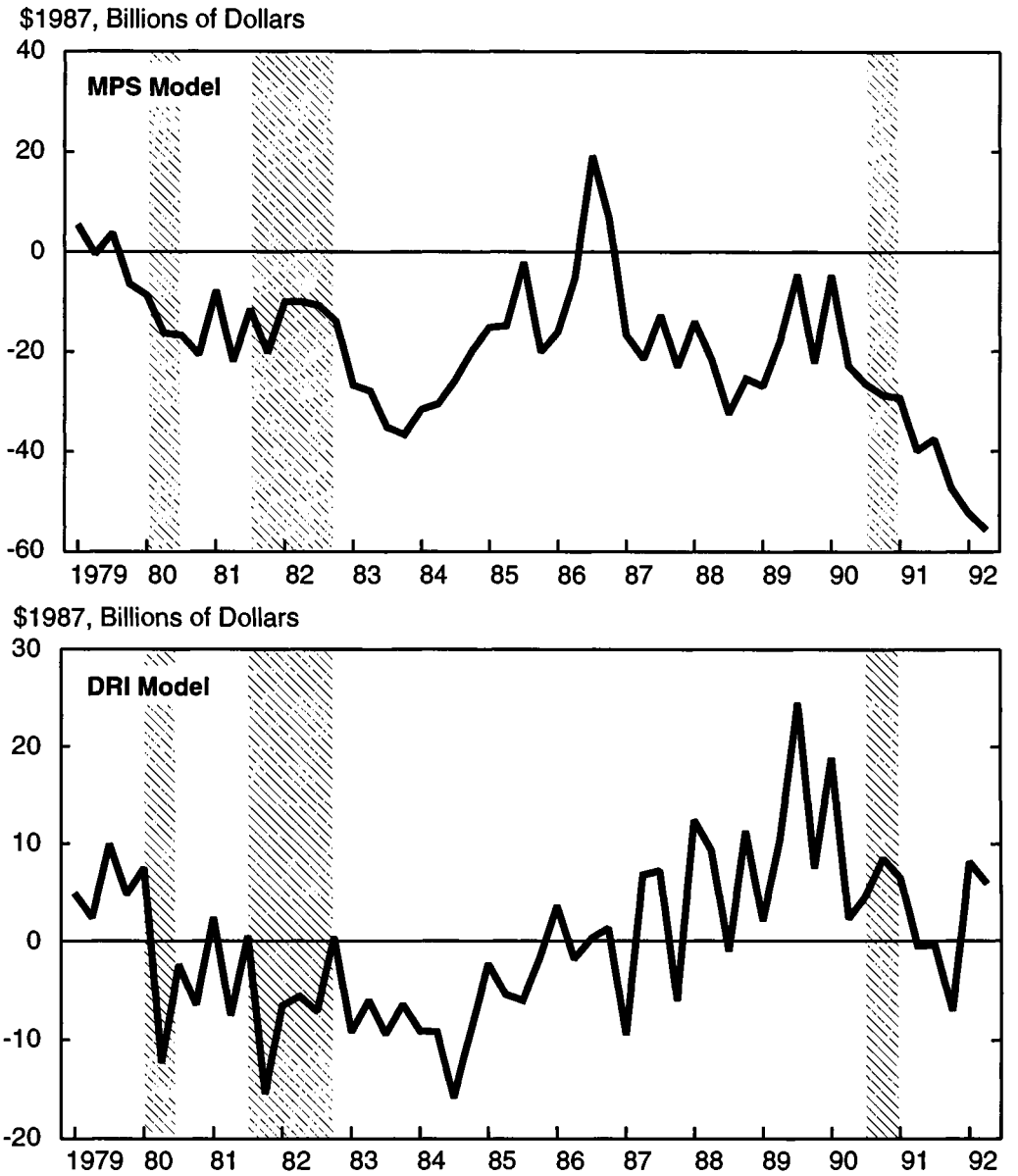
equations show consumer spending was about on track because DRI uses consumer sentiment to forecast consumption, while the Board does not. Indirectly, these charts imply that consumers were more pessimistic than their income, interest rates and wealth levels warranted.

Chart 16 shows that general reduced-form equations for consumer durables and for nondurables and services also overpredicted.[22] Notably, prediction errors for nondurables and services were, by historical standards, even larger than those for durables. The

[22] Both were predicted using disposable income, long-term interest rates, relative prices, inflation, fiscal policy, M2 and the federal funds rate. Four lags of all variables were included in the regression, which was estimated from 1967 to 1992-II.

Chart 14: Prediction Errors — Durables Consumer Spending



Note: Prediction errors are actual spending minus model prediction.

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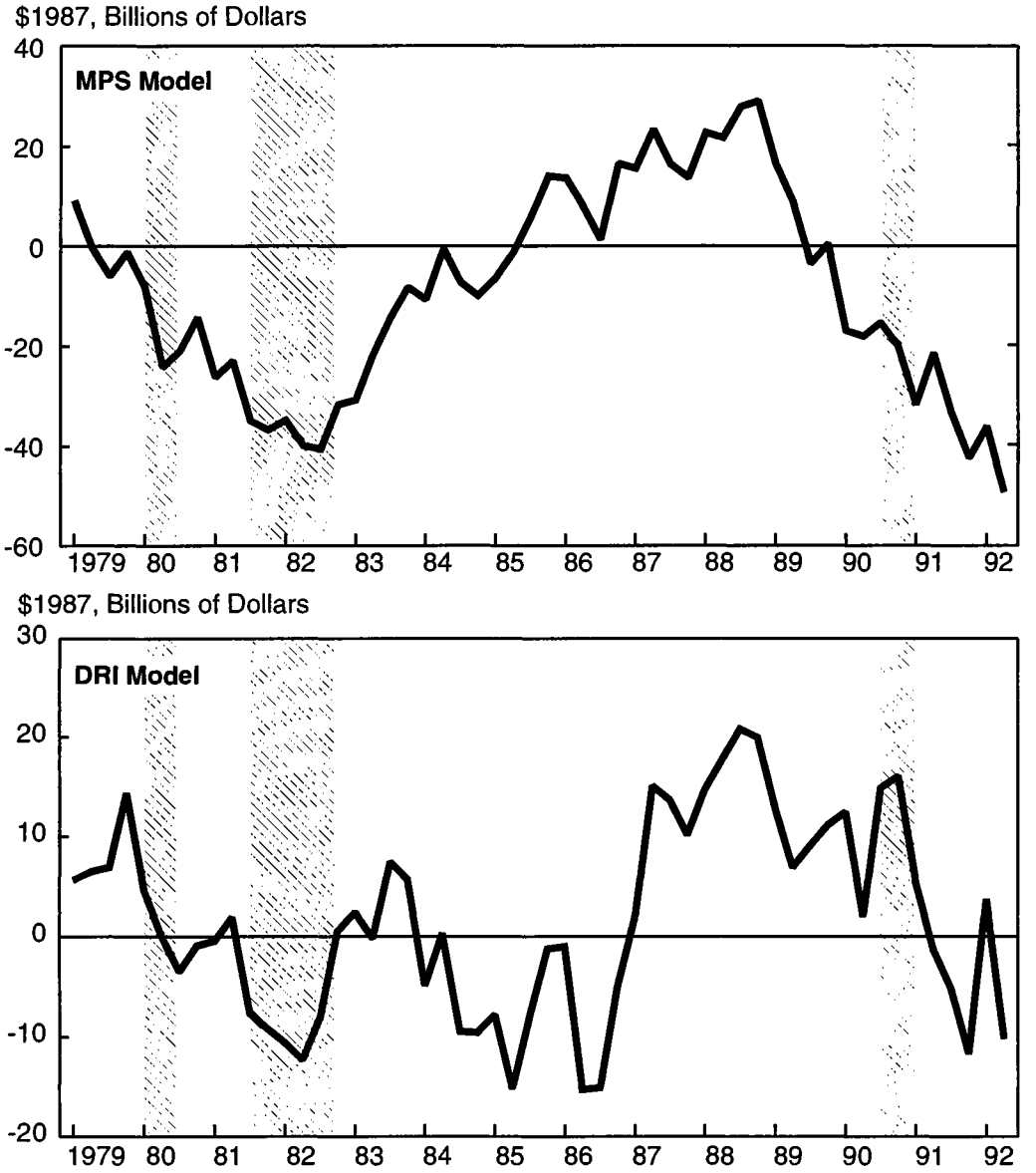
widespread weakness in consumption suggests that some exogenous factor such as high debt service burdens or depressed prospects for future income growth caused consumers to reduce expenditure across the board.

Econometric estimates for the investment sector generally support the informal evidence from Section I. For example, both a reduced-form model and DRI's flexible accelerator equation for nonresidential construction spending overestimated actual spending substantially (Chart 17). Standard housing equations, both structural and reduced form, also overpredicted slightly (Chart 18). Housing, which was one of the few areas that appeared to be having a normal recovery in 1991 and 1992, was actually weaker than what economic fundamentals (demographics, interest rates, income and

Chart 15: Prediction Errors — Nondurables and Services Consumer Spending



Note: Prediction errors are actual spending minus model prediction.

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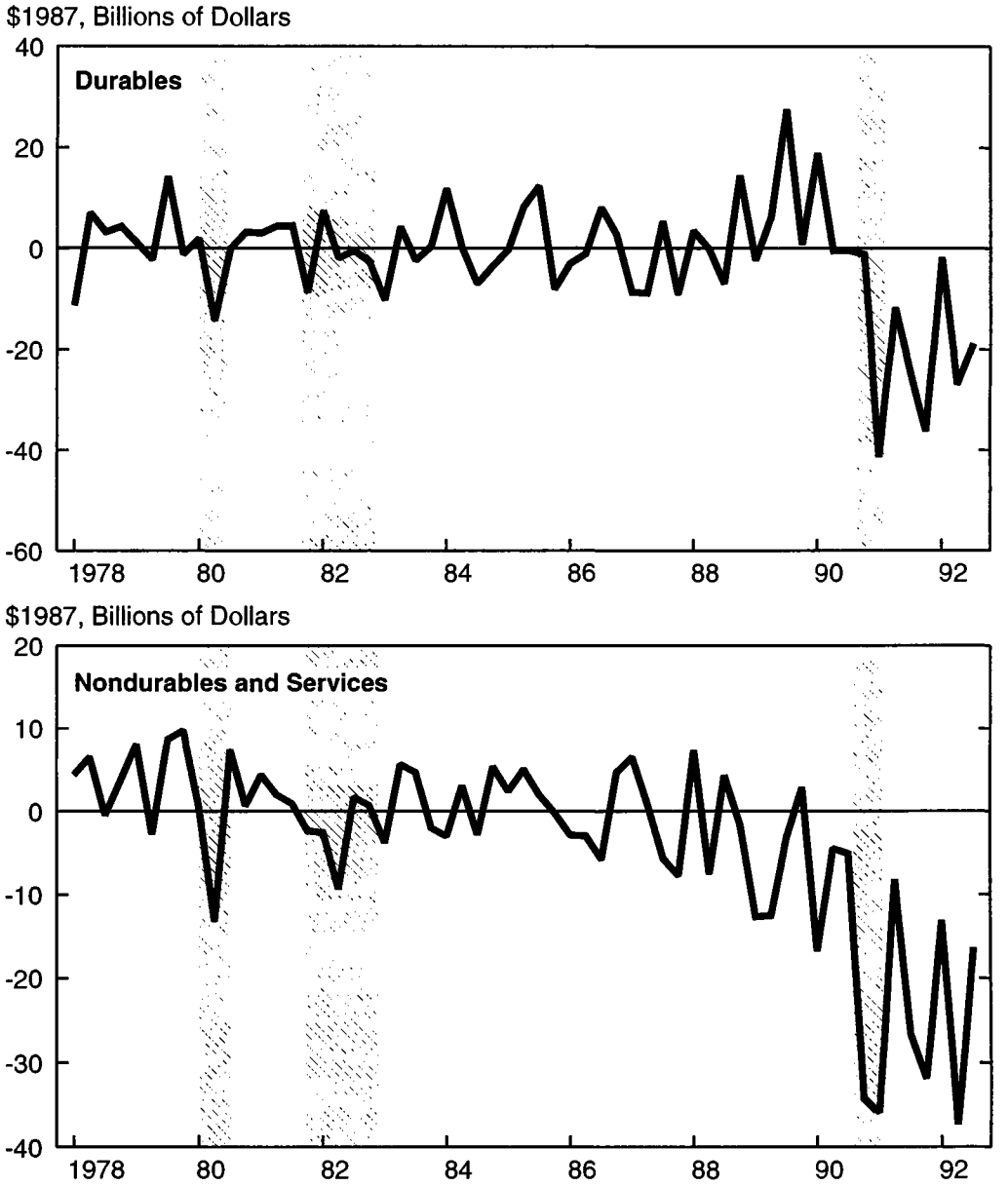
housing prices) would have indicated after mid-1990.

The evidence on producers' durable equipment is mixed. DRI's structural estimates overpredicted actual levels (Chart 19, top panel), despite the relatively strong performance of this sector in the early 1990s. However, the reduced-form prediction errors (Chart 19, bottom panel) suggest that equipment spending in 1991-92 was slightly stronger than what the fundamentals predicted.

Only for exports and imports were traditional model predictions (from DRI and FRBNY in Chart 20) either too low or on track. Taken together, the relative strength of the trade sector and the relative accuracy of trade equations are noteworthy because long-term changes in policy transmission appear to explain the strong trade perfor-

Chart 16: Prediction Errors — Reduced-Form Equations for Consumer Spending



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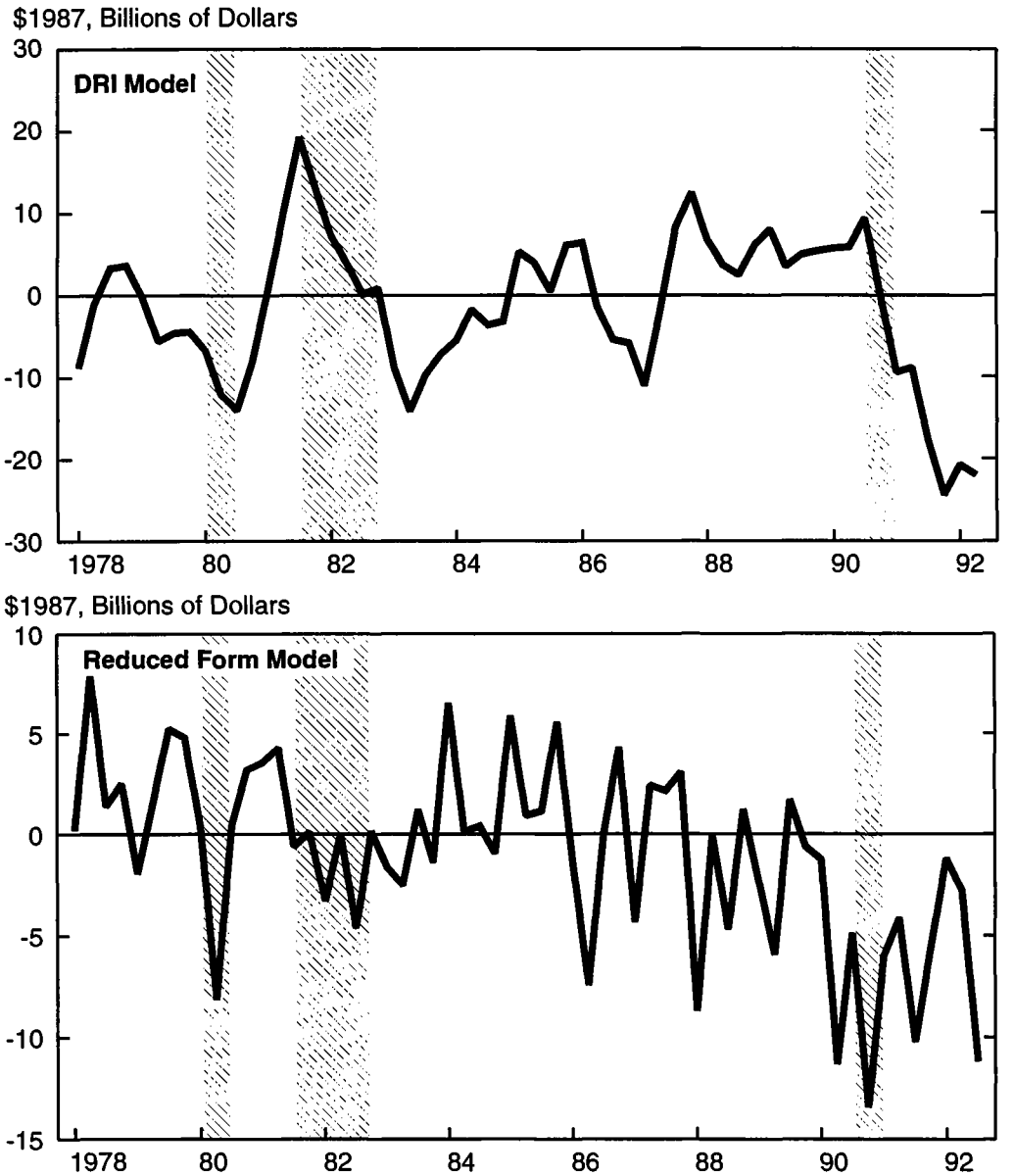
mance, while domestic credit constraints appear to have had little significant effect in this sector.

To evaluate the role of the credit slowdown in the unexplained weakness in activity, reduced-form equations for several policy-sensitive sectors were reestimated, this time including the credit supply proxies discussed in section I above. Comparisons of equations for consumer durables and several investment components, both with and without the Lown and Wenninger bank loan residuals, are shown in Chart 21. While the business mortgage residuals do improve the performance of the nonresidential structures equation (particularly in 1990), other Lown and Wenninger residuals make very little difference in the prediction errors. Both anecdotal and microeconomic studies are consistent with these results: real estate lending (and activity) were most affected by chang-

Chart 17: Prediction Errors — Nonresidential Structures



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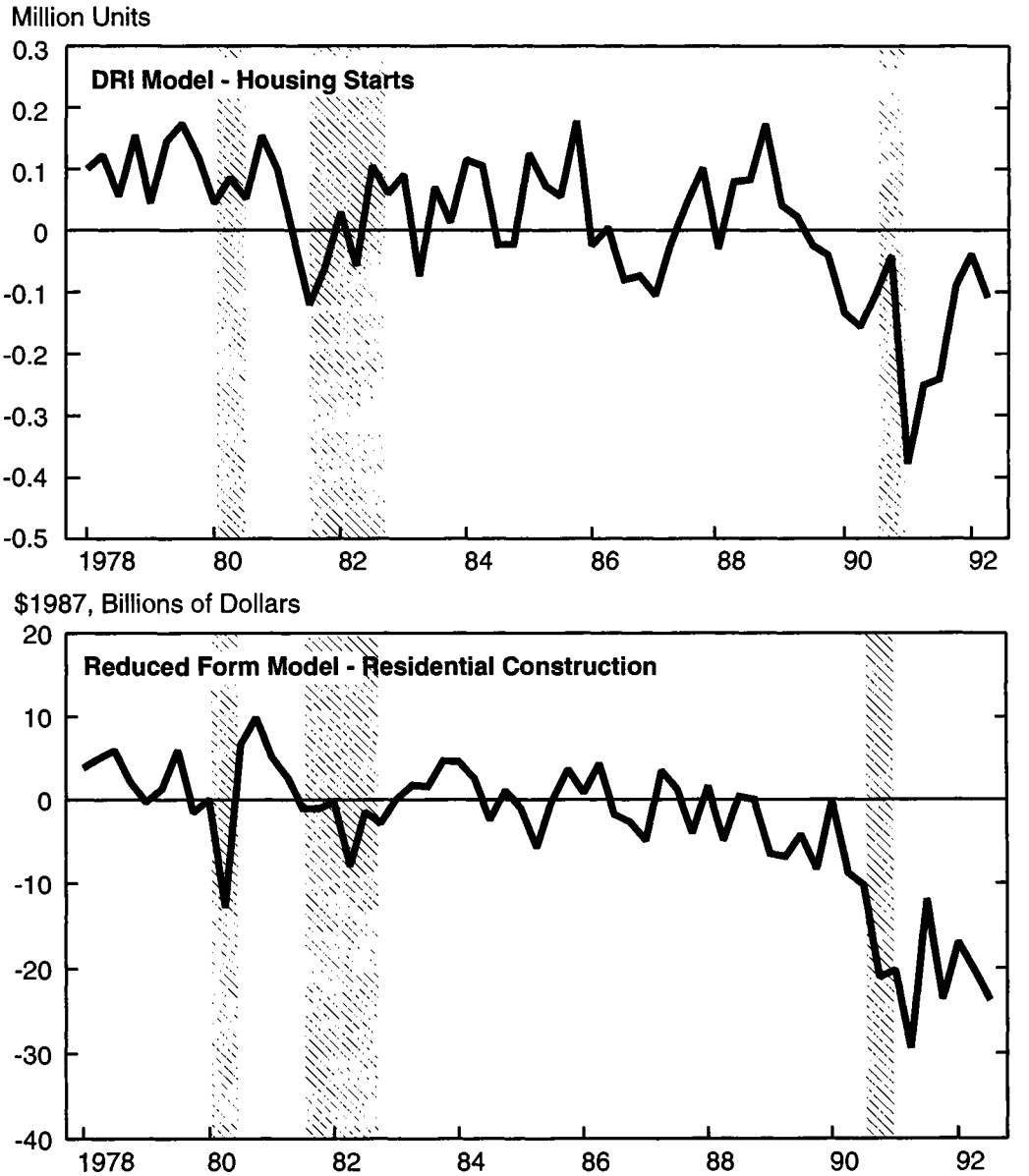
es in credit supply, while evidence of credit supply restrictions for home mortgages and consumer lending is harder to find. Furthermore, bank credit constraints may have been important for large-scale real estate spending because borrowers in this sector had few alternative sources of credit.

Similarly, business mortgage residuals from Mosser and Steindel can explain some of the overprediction in nonresidential construction (Chart 22). However, the generally positive household mortgage residuals make the overprediction of residential structures even worse. Like the bank loan residuals, consumer and short-term business credit residuals make very little difference in predicting consumer durables and equipment investment.

In contrast, the spread between the consumer loan rate and the federal funds rate

Chart 18: Prediction Errors — Housing



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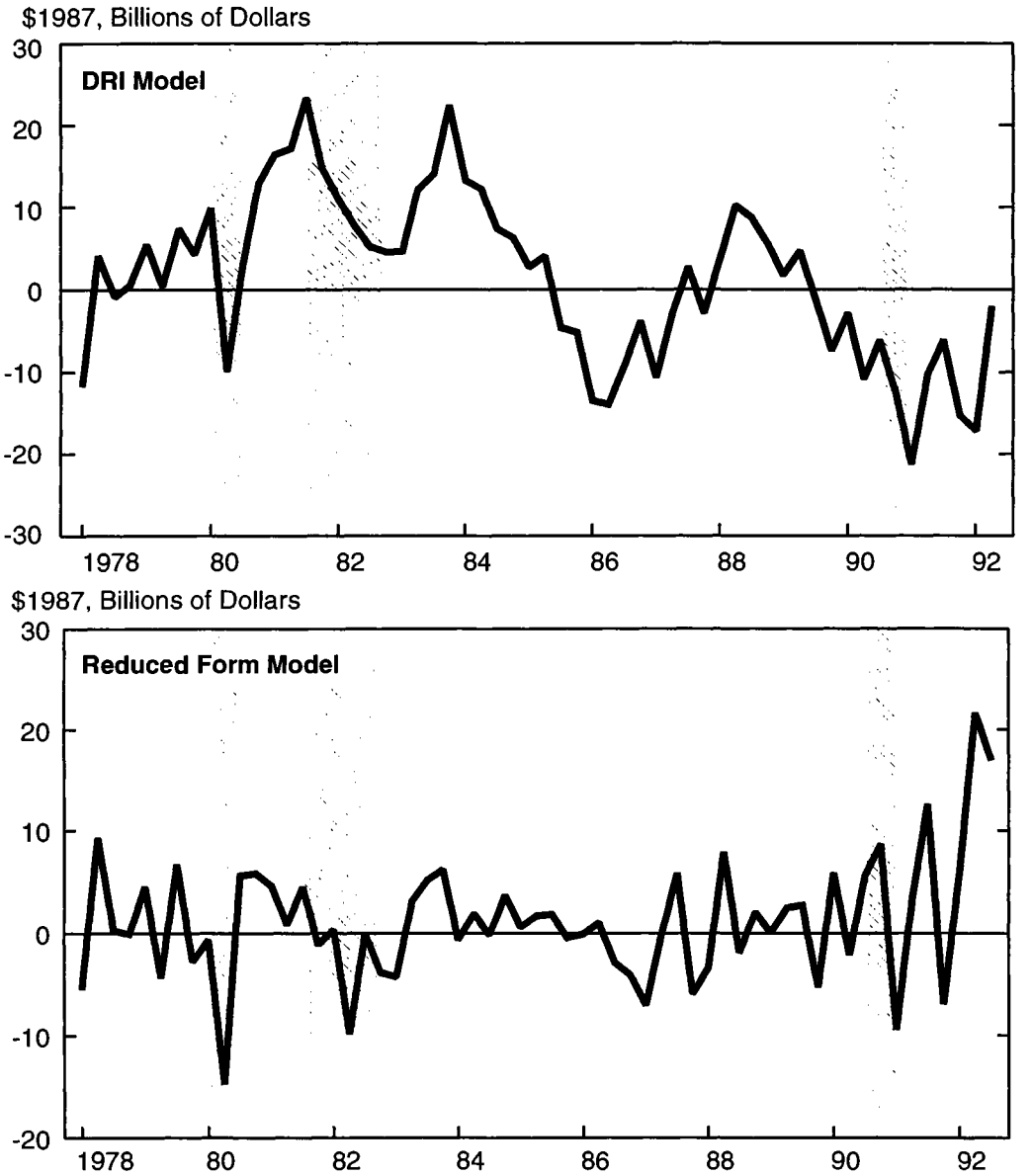
more than explains the weak consumer durables behavior from 1989 to 1992 (Chart 23). This finding is clearly the result of ever-widening and record high spreads between consumer interest rates and market rates. However, the changing risk composition and tax treatment of consumer lending (particularly credit cards) during the second half of the 1980s makes the widening of this spread difficult to interpret as a pure shift in credit supply. For example, the normal cyclical behavior of the spread between credit card rates and the federal funds rate was to increase from about 5 percent at the peak to about 10 percent at the trough. In the latest recession, the spread started at 10 percent and rose steadily to over 14 percent by the end of 1992. Chart 23 also shows that the prime rate spread over fed funds had no additional predictive power for equipment investment.

Chart 19: Prediction Errors — Producers' Durable Equipment



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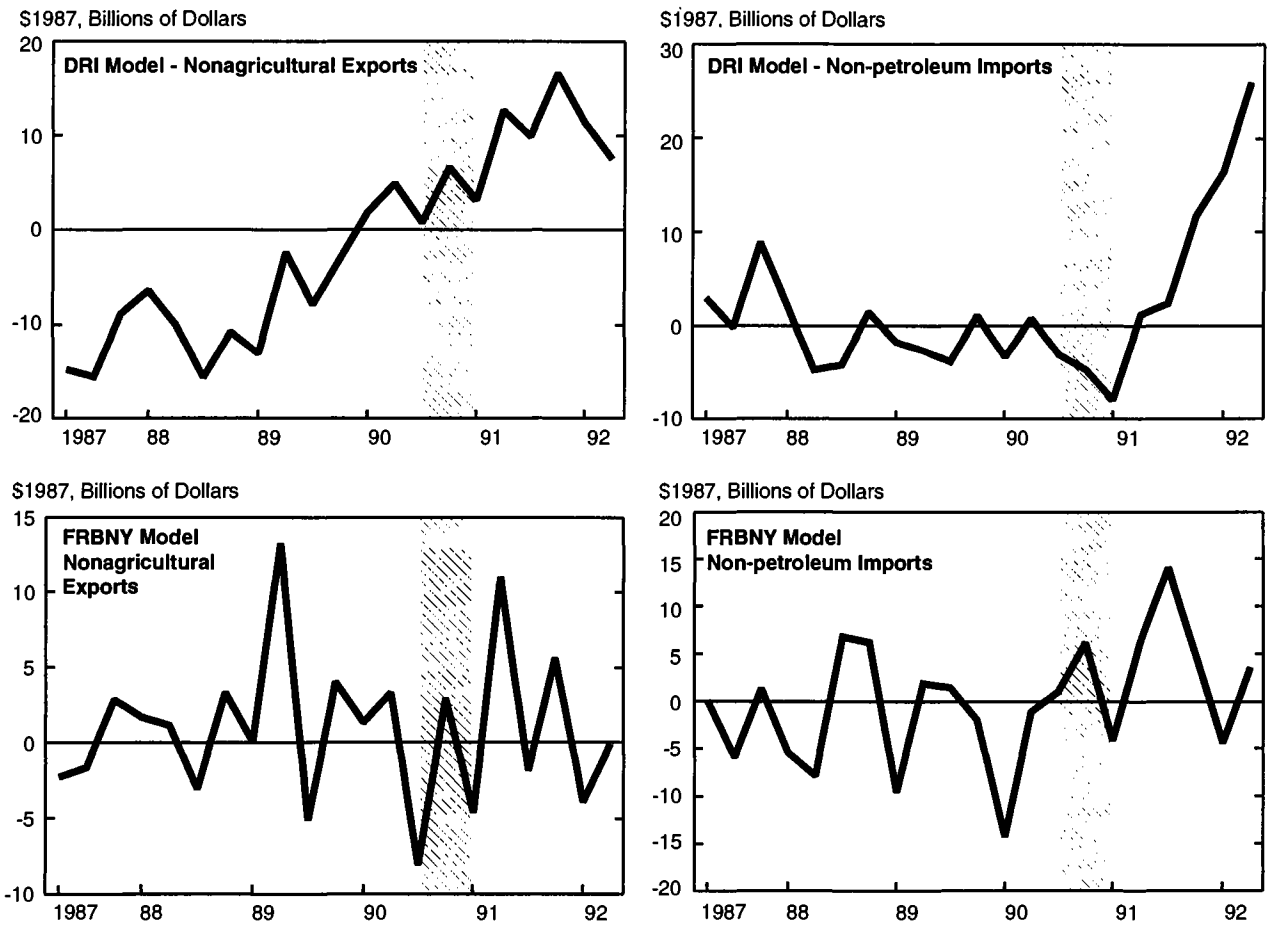
Residuals measuring small firm borrowing constraints from Hamdani, Rodrigues and Varvatsoulis have the largest impact on predictions of business investment components (Chart 23). When these small-firm effects were included in reduced-form equations, they generally lowered predictions of both nonresidential construction and producers' durable equipment. In fact, the equations for nonresidential construction switched from overprediction to underprediction when the small-firm credit supply residuals were included. These may be more powerful predictors of business spending during this period because they were constructed to measure pure (nonprice) credit rationing for small firms (as opposed to shifts in the credit supply curve).

Table 6 summarizes the usefulness of different credit supply proxies in predicting final demand components. Generally speaking, credit supply proxies appear to explain some of the weakness in investment, particularly in nonresidential construction, where the largest credit imbalances occurred and where the fewest substitution possibilities exist. However, proxies were less helpful in explaining widespread weakness in other sectors, notably consumption and housing, where the supply proxies were either unimportant or increased the prediction error (sometimes with the opposite sign).

Unfortunately, the unexplained weakness in the household sector remains a puzzle. If noncredit factors such as an increase in desired saving or lower expected future income growth are responsible, then slower growth of spending relative to fundamentals and policy may be permanent, and the final demand relationships estimated above (in-

Chart 20: Prediction Errors — Exports and Imports



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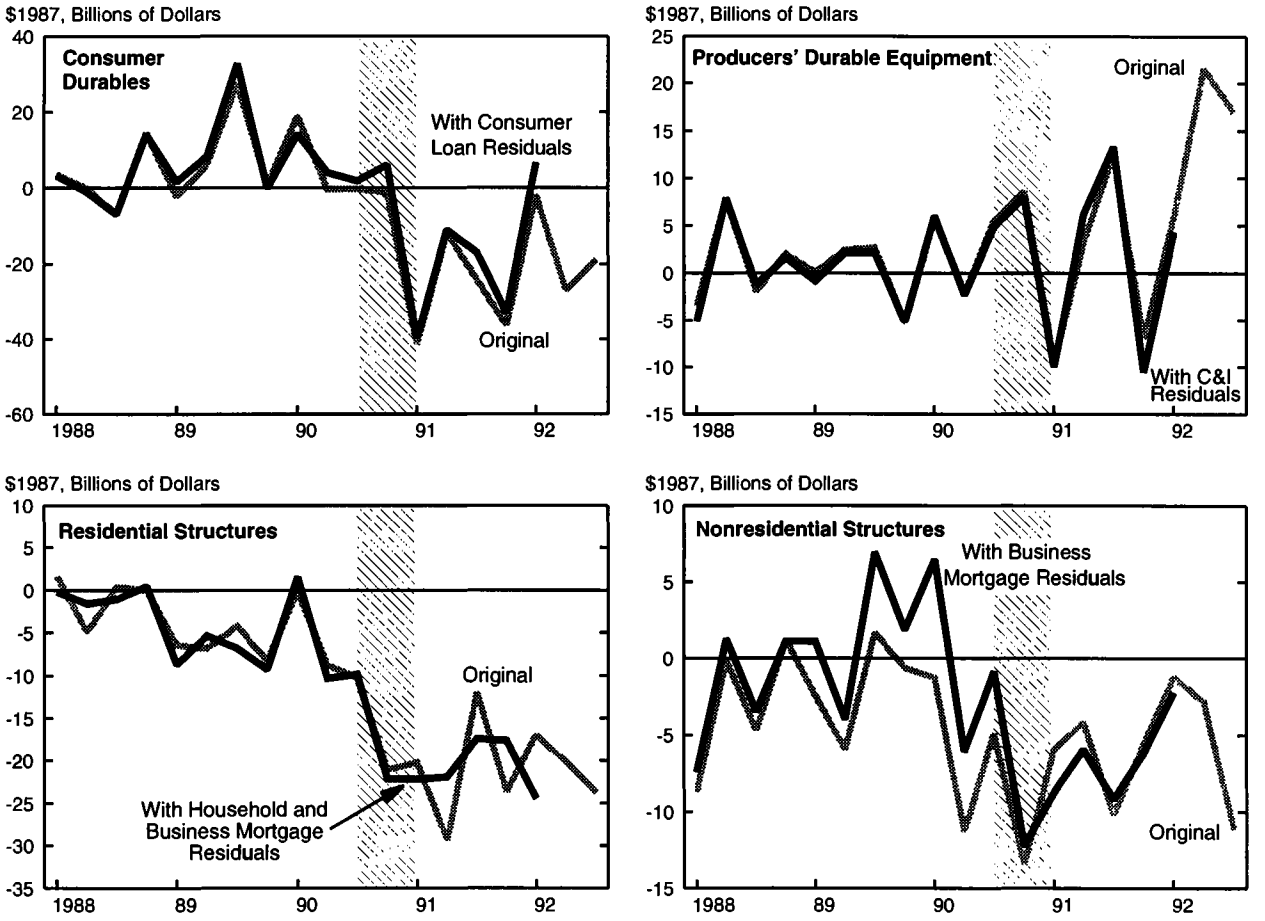
cluding links from monetary policy to the real economy) may have permanently changed. Nonetheless, the timing of the weakness in spending seems too coincidental for credit factors, particularly balance sheet restructuring, not to have played a role. If the overpredictions of consumption and housing are the result of "missing" balance sheet effects, then the shift in aggregate demand may be either permanent or temporary. For example, if monetary policy now influences activity largely through its effect on household balance sheets, and if these new balance sheet effects are a result of structural changes during the 1980s, it seems likely that the relationship between spending, monetary policy, and credit has been changed permanently. Alternatively, if balance sheet restructuring is simply a onetime adjustment to the debt "bubble" of the 1980s, the shifts in spending may be temporary. Unfortunately, it is simply too soon to tell which hypothesis is true.

IV. Conclusions

This paper has looked at the relationship between credit, economic activity and monetary policy over the 1989-92 period. Its main conclusion is that the weakness in aggregate demand was more widespread than the weakness in credit. Furthermore, the

Chart 21: Reduced-Form Prediction Errors Including Lown and Wenninger Loan Residual
Actual Less Predicted



Note: Shaded areas represent recession.

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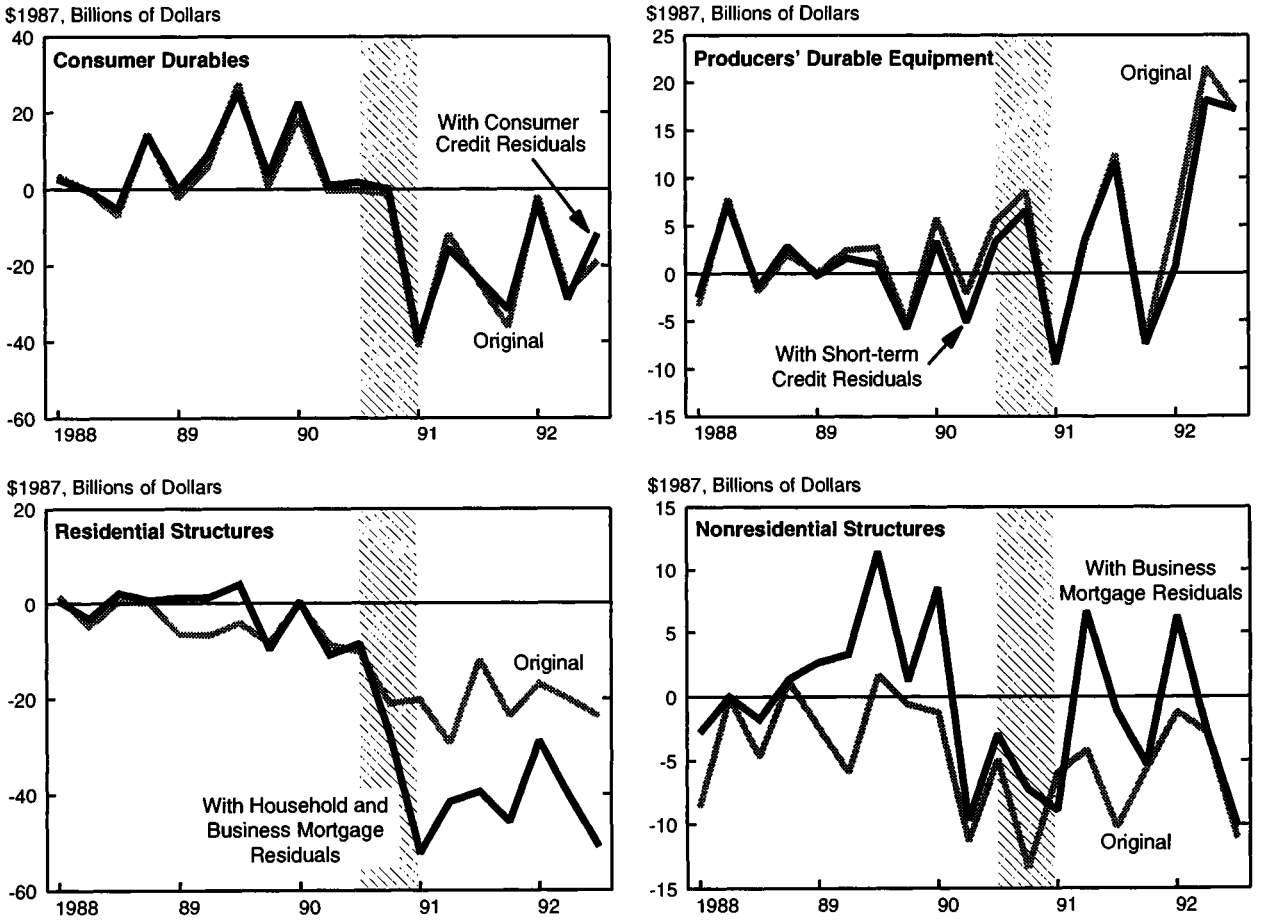
evidence suggests that moves to ease monetary policy were fairly effective in sustaining spending in some policy-sensitive sectors, such as trade, but completely ineffective in others, notably large-scale real estate, where credit supply proxies appear to be important in determining the level of activity. In other sectors, particularly consumer spending, activity was unusually weak, but credit supply restrictions appear to be less important.

Ultimately, the paper leaves an empirical puzzle: why was aggregate demand, particularly household spending, so weak overall? While lower expected future income growth could have produced this weakness, the timing of the spending slowdown suggests that credit factors, particularly balance sheet effects, played a role. Indeed, balance sheet restructuring by consumers and firms (perhaps combined with long-term changes in financial structure) may be able to account for what econometrically appears as a large nonlinear shift in the relationship between credit and activity.

Finally, structural changes over the 1980s may have made the credit-output-policy link impossible to estimate accurately. Because of the large changes in financial structure since the last crunch and recession, historical relationships between credit, activity, and other financial variables may no longer be valid. Estimating relationships over just

Chart 22: Reduced-Form Prediction Errors Including Mosser and Steindel Residuals
Actual Less Predicted



Note: Shaded areas represent recession.

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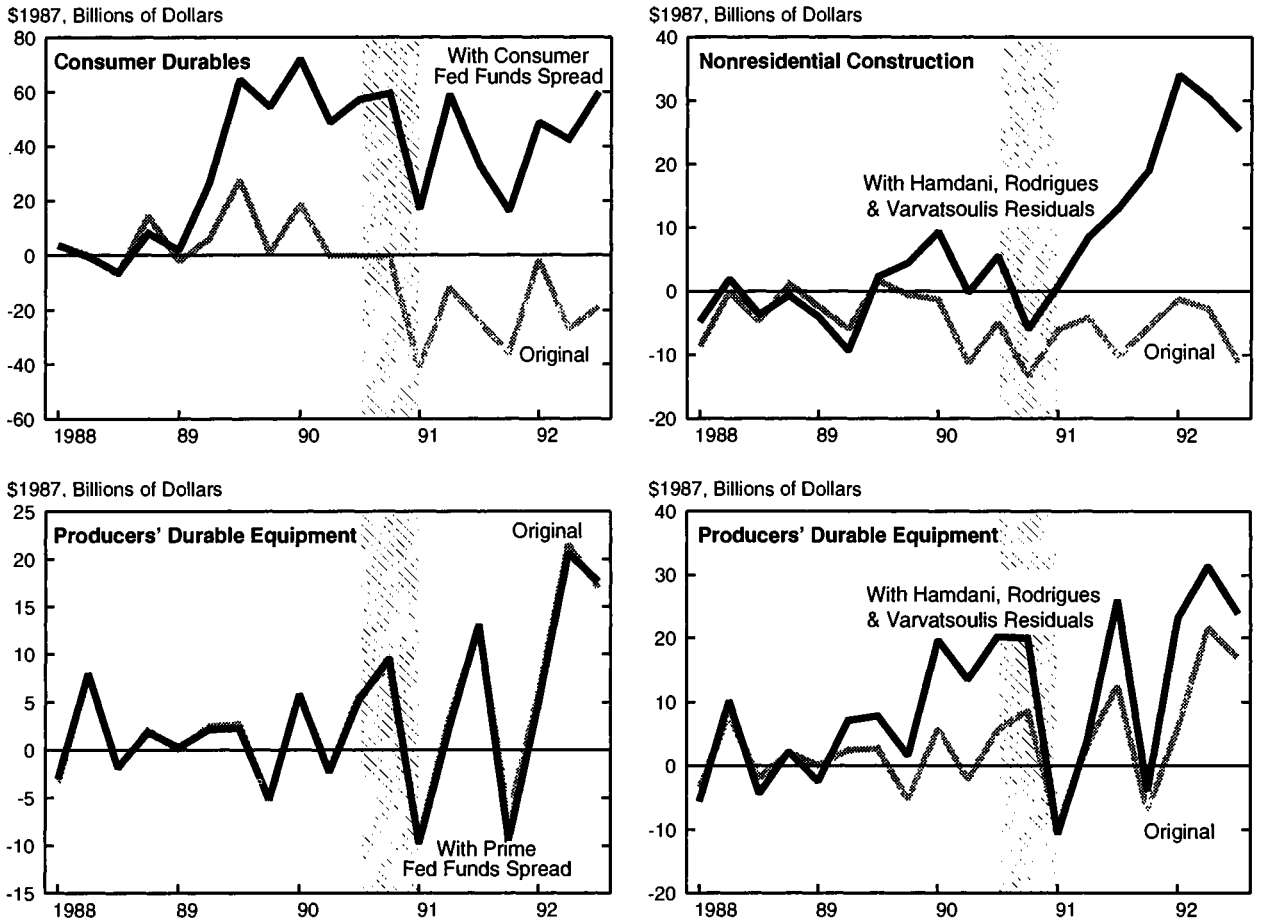
Chart 23: Reduced-Form Prediction Errors
Actual Less Predicted



Note: Shaded areas represent recession.

Table 6: Summary Prediction Errors with and without Credit Supply Proxies[a]

	Sectors			
	Consumer Durables	Residential Structures	Producers' Durable Equipment	Nonresidential Structures
Reduced form prediction errors 1990-1991	-3.0	-9.0	0.6	-4.3
Prediction errors with credit proxies from:				
Lown and Wenninger	-2.3	-8.6	0.5	-4.3
Mosser and Steindel	-4.8	-16.4	0.2	-1.5
Interest rate spreads	10.5		0.5	
Small firm proxies			0.0	0.1

a. Prediction error (actual-predicted) as a percent of actual spending.

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the 1980s may also give inaccurate readings, because much of the transition in financial structure was in progress during the decade. If this is the case, any measurement of the "new" credit-output-policy link will only be possible with more data and more time.

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The Credit Crunch and the Construction Industry

by Ethan S. Harris, Michael Boldin, and Mark D. Flaherty[1]

For a number of reasons the construction industry seems like a good place to start an investigation of the credit crunch. Real Estate was particularly vulnerable to both major elements of the crunch: the tightening of capital and lending standards, and the "credit crumble"—the chain of causation running from real estate prices to the capital position of lenders to their willingness to lend. The decline in construction pre-dated, and seemingly helped set in motion, the general economic decline: while the overall economy began to slow in the spring of 1989 and did not fall into recession until the summer of 1990, construction spending peaked in 1986 and began to decline at an accelerating rate in 1988. The contraction in real estate was also deeper than for the economy as a whole, accounting for about one-fourth of the peak-to-trough decline in GDP and a similar portion of the decline in GDP relative to potential from 1989-I to 1991-I.[2]

The direct effects of the real estate decline represent only half of the story. Equally important have been the indirect channels, including the "multiplier effect" of reduced construction spending on overall economic activity, and the "balance sheet effect" of crumbling real estate values on the ability and willingness of depositories to lend and households and businesses to borrow.

Credit crunch proponents can marshall considerable anecdotal and survey evidence to support their case. Not only are real estate horror stories featured in most articles that allege a credit crunch, but a variety of surveys have strongly supported a crunch in real estate. Not surprisingly, the loudest complaints have come from the borrowers. The business loan survey by the National Federation of Independent Businesses has shown a steady increase in the percent of those reporting that loans are "harder to get." (Chart 1) That survey also shows that construction companies consistently report more difficulties than other companies. In November 1991 the National Association of Home Builders (NAHB) reported that 70 percent of builders and developers surveyed reported

[1] We are grateful to many colleagues at the bank that provided useful comments and suggestions. Josh Gleason, Paul Ludwig, and Lara Rhame provided excellent research assistance to this project.

[2] From 1990-II to 1991-I real GDP fell $106 billion and real construction fell $25.2 billion. Assuming potential growth of the 2.5 percent (for both GDP and its components), from 1989-I to 1991-I GDP fell $264.7 billion relative to potential and construction fell $65.8 billion relative to its "potential."

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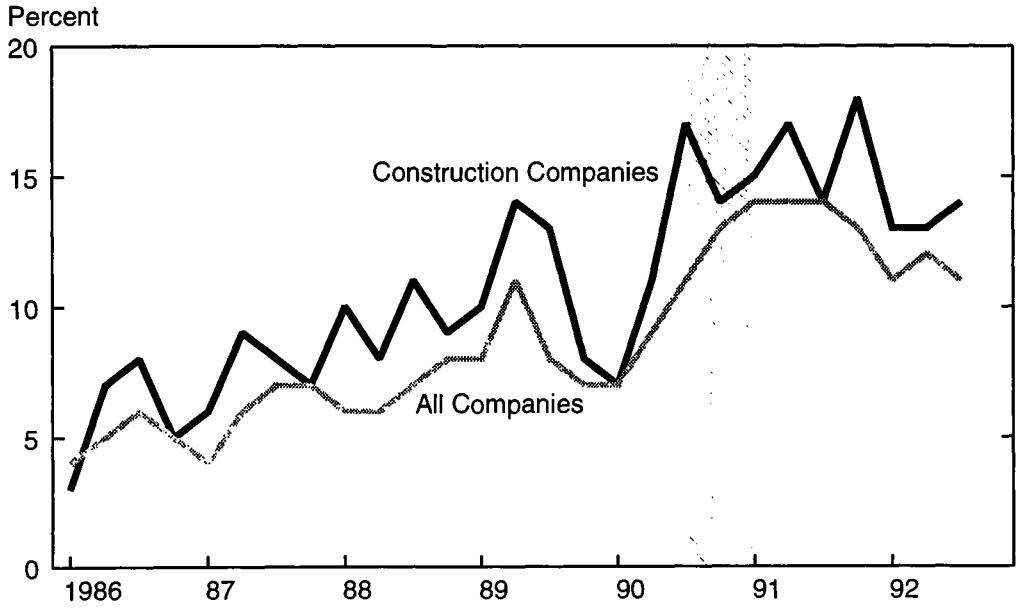
Chart 1: Survey of Business Borrowers:
Net Harder to Get



Note: The survey is by the National Federation of Independent Businesses. "Net harder to get" is the percent of respondents reporting that loans are "harder to get" minus the percent reporting "easier to get." Shaded areas on this and all subsequent charts represent NBER dated recession unless stated otherwise.

that changes in bank lending operations had caused downward revisions in their plans.[3] And in a third survey of builders in January 1992, 82 percent reported restrictions on normal lending policy.[4]

Lenders have also reported a toughening of standards. Last March a survey of commercial real estate professionals, including borrowers and lenders, found that 51 percent of respondents blamed the downturn at least in part on a significant toughening of loan underwriting rules.[5] The Federal Reserve Senior Loan Officer Survey also confirms a tightening of lending standards. Since January 1990 the survey has asked whether standards for real estate loans have tightened. At the survey's peak, in the first month this question was asked, 81 percent of respondents said standards had tightened, while only 19 percent said there had been no change. In comparison, only 32 percent reported tightening for commercial and industrial loans.

Despite this strong anecdotal and circumstantial evidence, this paper will argue that the credit crunch—defined as an "exogenous" constriction in the supply of credit—primarily affected the timing, rather than the magnitude, of the decline in construction activity. Although the single-family sector has been weaker than economic fundamentals would suggest, a wide range of tests fail to find support for the credit crunch, suggesting that other nontraditional factors such as debt retrenchment, pessimistic investor attitudes and the spill-over from the apartment glut explain much of the shortfall. Unlike

[3] Campbell and Polmar (1991).

[4] The survey was conducted by the UCLA center for Finance and Real Estate and was reported by Carlton (1992).

[5] This Arthur Anderson survey was reported by Kleege (1992).

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the classic credit crunches of the past, problems at banks and thrifts have had little impact on the flow of single-family mortgage credit, due to an active secondary market. Reduced credit flows to builders probably helped shift activity from small to large builders and may have discouraged the development of new building lots, but the impact on overall construction was not great enough to leave any tell-tale signs of a shortage in the supply of homes.

The argument for the multi-family and commercial sectors is more complicated, and strikes at the heart of how we define the credit crunch. In the 1980s a variety of factors contributed to overbuilding and "bubble" conditions in these sectors, including easy lending, loose tax policy and excessively optimistic investor expectations. The subsequent deflation of that bubble was the result of a sequence of events, including tax reform, tightening of lending standards, the recession and the concomitant change in investor expectations. With all of these shocks to the sector, and with the self-reinforcing dynamics of the bubble deflation, it is difficult to assign blame to individual factors. We will argue, however, that excess capacity was so pervasive in these sectors—covering virtually every geographic region and persisting unabated despite the collapse in construction—that it is hard to believe credit restraints played much of a role in determining the level of construction. Once the bubble started to deflate, the grim economics of excess capacity took over and, except in special cases, no new projects were started. In other words, the credit crunch may have affected the timing and perhaps the speed of the contraction, but given the pervasiveness of the excess capacity, the adverse tax environment and the weak economy, it appears that a major contraction in activity was inevitable.

One of the challenges of this paper is to find ways to isolate the credit crunch from an abundance of other explanations for the weakness in activity. For example, broad credit aggregates give us little clue because they presumably reflect the equilibrium outcome of both supply and demand forces. We address this "identification problem" by exploring whether credit restraints were powerful enough to overshadow other shocks and leave their imprint on any of a wide range of indicators. Since virtually none of the indicators shows evidence of an impact from the crunch and it seems doubtful that an important secondary factor would not show up in any of these tests, we conclude that the credit crunch probably played only a modest role in the real estate contraction.

The paper is organized as follows. Part I briefly reviews the scope of the slowdown in credit flows and construction activity, explores exactly what we mean by a "credit crunch," and then reviews our methodology for investigating the impact of the crunch. The following three sections examine the major sectors of real estate: first reviewing the changing financial conditions and then weighing the evidence of a credit crunch versus other explanations of the decline in activity. The evidence ranges from simple descriptive statistics to formal tests of econometric models.[6]

I. Real Estate and the Credit Crunch

The Real Estate Recession

Before examining the details of the credit crunch it is useful to put the real estate recession in context. If a severe restraint on real estate lending impeded new construction we would expect at least some of the following: an earlier and deeper recession for real es-

[6] In addition, a companion paper, Boldin (1993), which is not included in this volume, gives a more thorough review of the housing model simulations.

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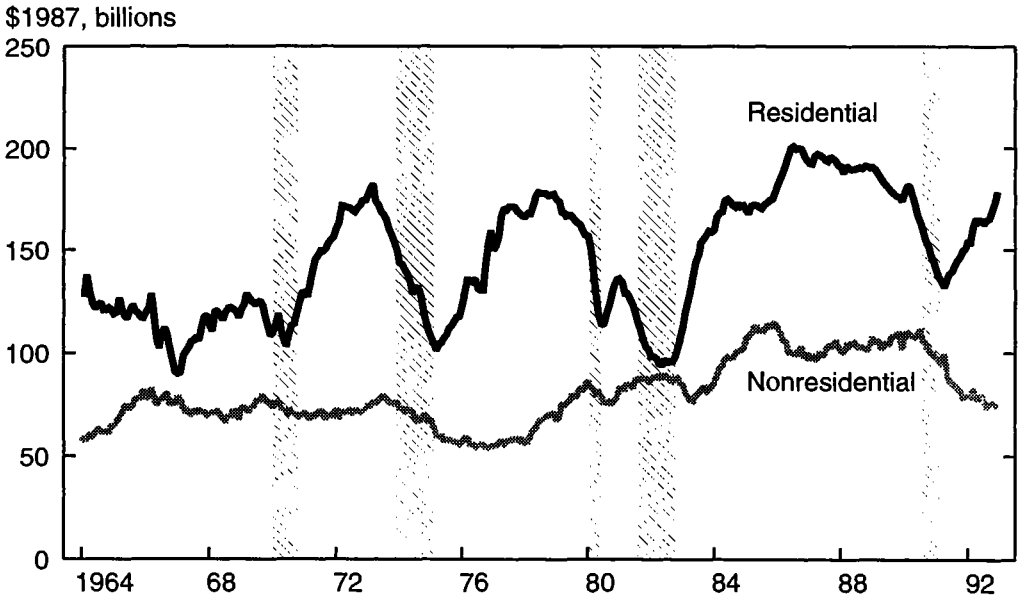
tate than the rest of the economy; a drop equal to or larger than past real-estate downcycles; an unusually low share of construction spending in GDP; and perhaps a larger decline in lending than in construction activity.

Although the national recession began in July 1990 and was proceeded by a slowdown in activity in 1989, the recession in the real estate sector started much earlier and has been considerably deeper. As Chart 2 shows, nonresidential construction peaked in late 1985, falling about 16 percent through early 1987, and then staged a modest comeback before plunging a further 17 percent during the July 1990 to March 1991 national recession. Since the end of the recession the sector has continued to fall, albeit at a more modest pace, and as of 1992-II was 39 percent below its peak. Residential construction peaked in early 1986, and then began to decline as the multi-family component began a steady slide that continues to this day. Overall residential construction began to fall more rapidly in 1989 as single family and home improvements began to decline. The sharp contraction continued during the recession, but the sector has since rebounded to its 1986-89 trend line.

Obviously, the drop in real estate activity exceeded the drop in overall economic activity, but this pattern is not unusual. Between 1986 and 1991 total private construction fell 22 percent, with residential construction declining 27 percent, and nonresidential construction dropping 16.8 percent. These drops are considerably more than the brief downturns of 1966 and 1969-70, when declines in total private construction were only 9 percent, but less than the longer drops of 1973-75 and 1978-82, which saw declines in total private construction of 31 and 23 percent, respectively.

While this decline in real estate activity also preceded the latest national recession, it is noteworthy that the lead time was considerably longer than in the past. Normally, nonresidential activity peaks several months before a recession, while residential activity leads the economy by one or two years. In the current cycle the lead time for both sectors was about five years. As we will argue later, however, this apparent long lead is

Chart 2: Construction Put-in-Place



Note: Construction put-in-place data for this and all subsequent charts are smoothed using a 7-month centered moving average.

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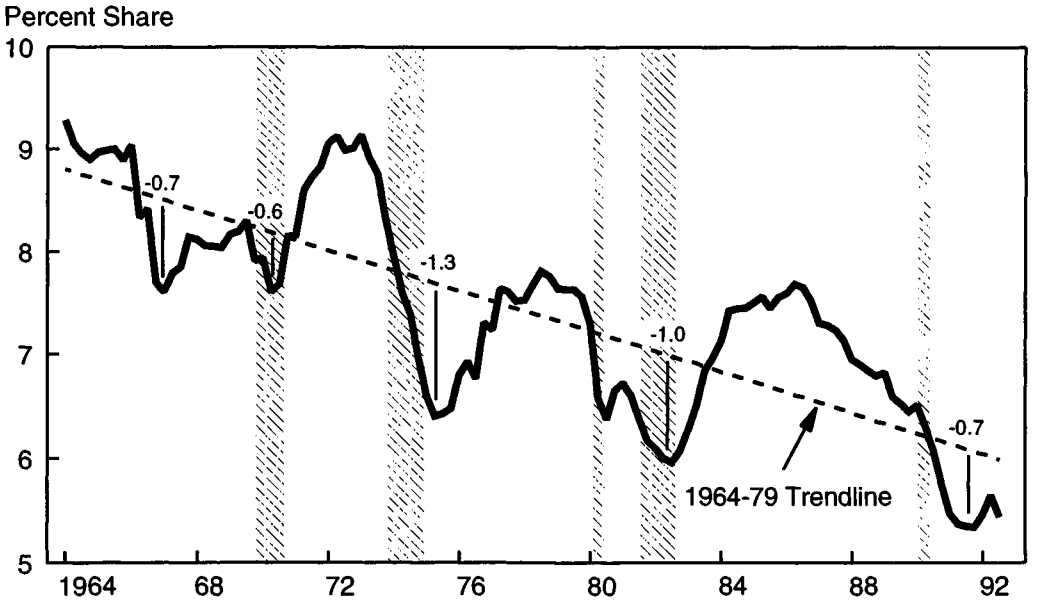
largely an artifact of the shock of the Tax Reform Act. Factoring out its effect leaves a relatively normal cyclical pattern.

Measured as a share of GDP, construction spending looks unusually low (Chart 3). In fact, in 1991-IV the construction share reached its lowest level in modern history, at just 5.3 percent of GDP. Part of this weak performance however, was due to a gradual secular downtrend in the construction share. Relative to its 1964-79 time trend, the share was 0.7 percentage point below "normal." This is well within the range of past construction cycles.

Because of the heavy dependence on loans, real estate financing normally closely shadows construction activity; in the 1980s, however, this relationship broke down. Chart 4 shows private construction put-in-place, construction loans and mortgage loans, all deflated by the construction price index. Most prominent is the fact that mortgage loans also grew faster than activity in the mid-1980s. This rapid growth primarily reflected home mortgage refinancing, especially during 1986-87 and 1989-92 when fixed rate mortgage interest rates declined sharply. The chart also shows that construction loans grew faster than activity during the early 1980s, reflecting in part higher loan-to-value ratios and a decline in the use of alternative financing. In the more recent period, the gap between loans and activity has returned to a more "normal" range, and the evidence points to a continuation of the current relationship between construction loans and activity.

With these broad measures conforming to historical norms, can we still argue that there may have been a credit crunch? The answer is clearly "yes"; there are a number of reasons to have expected real estate to hold up better in this downturn than in the past. Previous periods were marked by a number of shocks that are generally absent today: rising interest rates, deposit disintermediation (in 1966, 1970, 1973-75 and perhaps 1979-82), and a deep recession due to a severe supply shock (in 1973-75 and 1979-82.) And although it is true that tax reform played a strong role in the current cycle, the same

Chart 3: Real Construction Relative to GDP



Note: Series is defined as private construction put in place divided by GDP, all in constant 1987 dollars.

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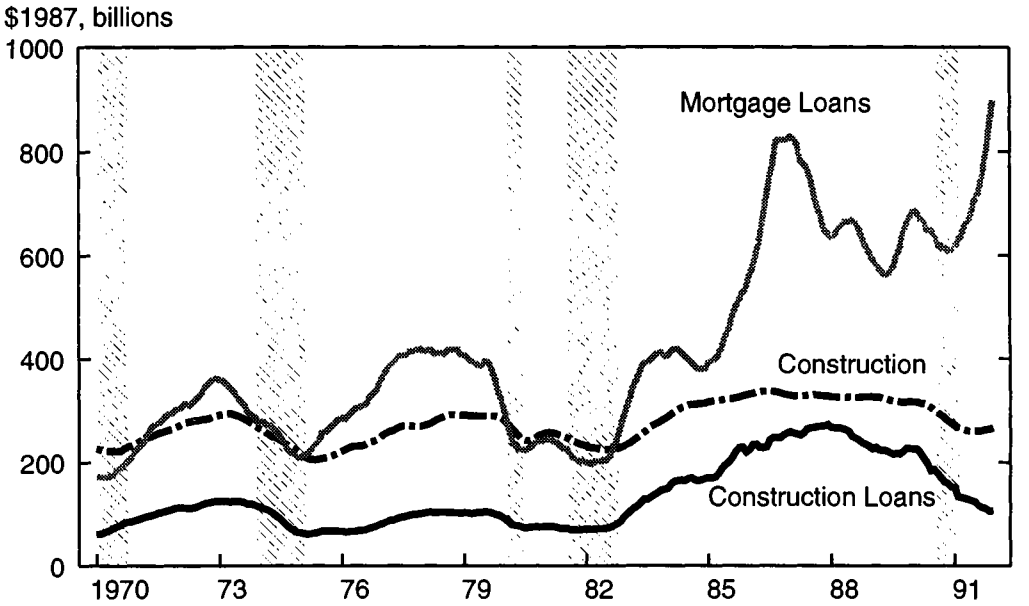
Chart 4: Real Estate Financing and Activity



Note: The loan data are from the U.S. Department of Housing and Urban Development and are deflated by the implicit price index for construction put-in-place. The loan data in this and subsequent charts are smoothed using 7-month centered moving averages.

could be said for the curtailment of Real Estate Investment Trusts (REITs) in 1973-75.

This broad overview of the "crime scene" suggests at least the possibility of something unusual in this real estate cycle. To make a convincing case, we need to look more closely at the mechanism of the credit crunch and compare it to alternative explanations for the weakness. This, in turn, requires that we be quite precise about what we are looking for; in other words, we have to define what we mean by a "credit crunch."

The Classic Crunch

In theory, a credit crunch can occur any time there is imperfect access to credit markets. Until recently, however, the term was reserved for periods of thrift deposit disintermediation in 1966, 1969-70, 1973-75 and perhaps 1979-82.[7] In the classic credit crunch, interest rates rose above regulated deposit rates at thrifts, causing an outflow of deposits. For example, in 1973 and 1974 the gap between the rate on passbook accounts and three-month treasury bills grew to 300 basis points. As a result, deposit growth slowed from 17 percent in 1972 to 6 percent in 1974.[8] Home buyers had few alternative sources of financing since thrifts comprised almost two-thirds of the mortgage market and the nearest alternative lenders, commercial banks, were under disintermediation pressure as

[7] A number of other episodes have had "credit crunch" qualities. These include: credit controls during the Korean War; the impact of the Penn Central collapse on the commercial paper market in 1970; Herstatt Bank's disruption of the Euro-dollar market and the shock of Franklin National's near failure to the CD market in 1974; the near default of NYC and the municipal bond market in 1975-6; and controls on credit card and other debt in 1980. Of these, only the 1980 credit controls had an impact comparable to the classic housing crunch.

[8] With consumer price inflation of roughly 11 percent in 1974, this implies that in real terms deposits were falling at about a 5 percent annual rate.

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well. Furthermore, because thrifts were already heavily specialized in illiquid mortgage assets they were unable to fund new mortgages by selling off existing assets.[9]

Financial deregulation and innovation in the late 1970s effectively eliminated the classic credit crunch. Ceilings on deposit rates (and lending rates) were gradually raised and then phased out by 1986. At the same time, because of deregulation and financial innovation, mortgage markets became increasingly integrated with other capital markets. In particular, portfolio restrictions and tax inducements for thrifts to specialize in mortgages were eliminated or scaled back, and two major financial innovations made mortgages a more attractive and widely available investment vehicle—Adjustable Rate Mortgages (ARMs) and Collateralized Mortgage Obligations (CMOs). ARMs reduced the risks to lenders by making it easier to match the interest return on their assets to their liabilities while at the same time giving borrowers a more flexible menu of choices. CMOs made mortgage financing attractive to a broad spectrum of investors, sharply reducing the role of deposits in funding mortgages.

As a result, in the last period of high interest rates, 1979-82, the credit crunch in housing was much less severe than in the past. Akhtar and Harris (1986-7) found that credit rationing had only two-thirds as big as the impact in the earlier periods, Ryding (1990) found only one-third the effect, and Throop (1986) argued that there was no credit rationing at all. Indeed, this effective end to credit rationing has led several economists to argue that monetary policy changes now have more gradual, less dramatic effects on the economy.[10]

A New Kind of Credit Crunch

In contrast to the relatively simple classic credit crunch, in current usage the term has become a catchall for anything that ails the loan market. Some applications of the term focus on real estate:

> "The real estate markets are in the midst of an unprecedented credit crunch, brought on by overbuilding in the 1980s."[11]

But perhaps the most common application covers anything that has caused bank lending to decline:

> "The credit crunch had been caused both by banks' reluctance to lend and by weak demand from the business community to borrow."[12]

Neither of these uses of the term "credit crunch" is very helpful. Overbuilding has certainly plagued real estate markets but its main effect has been to reduce the demand for economically justifiable real estate loans. In this sense the credit slowdown is a symptom of overbuilding and plays no direct causal role in the weakening of the econ-

[9] Hendershott (1991b) lists four factors that made housing markets vulnerable to disintermediation in the 1960s and 1970s: (1) interference with the price mechanism: deposit ceilings were imposed to cushion thrift against adverse interest rate movements; (2) poor asset-liability matching: federally chartered institutions were prohibited from originating adjustable rate mortgages (ARMs); (3) segmented markets: portfolio restrictions and tax inducements caused thrifts to supply two-thirds of the mortgage market; and (4) inflexible portfolios: regulations and artificially depressed mortgage rates prevented development of a secondary market for mortgages.

[10] For example, see the discussion in Mosser (1992).

[11] Kleege (1992).

[12] Greenhouse (1992).

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omy.[13] The second use of the term equates a decline in the growth of credit with the credit crunch. By this definition every period of weakness in the economy would be called a "credit crunch".

This paper adopts the following definition of a credit crunch:

> "A contraction in the supply of credit to a group of borrowers who are creditworthy under previous standards of prudential lending."

It is worth noting that this definition extends beyond the classic credit crunch. In the classic crunch, credit standards were temporarily tighter than "normal"; our definition also allows for a crunch when credit standards *return* to normal following a period of laxity. In the course of this paper we will argue that a large portion of the recent crunch has been of the later variety and would probably be more accurately labeled a "credit standards *correction*" rather than a "crunch."

The current crunch mechanism is more complicated than the classic crunch and is therefore harder to detect. The classic crunch involved a simple disintermediation mechanism, essentially affecting only one sector, over a distinct period of time. The current crunch operates through a multitude of direct and indirect channels. It evolved over an extended period, starting as early as the Fall of 1989 (or as late as the Spring of 1990) and ending as early as the Spring of 1991 (or continuing today), and has allegedly affected virtually every sector of the economy.

The Chronology of the Crunch

The real estate literature generally points to the passage of FIRREA, in August 1989, as the "official" beginning of the credit crunch. FIRREA adopted the capital rules of the Basle Accord and also put in place the mechanisms for resolving failed thrifts. FIRREA has several implications for real estate markets:

- Tighter capital requirements encouraged thrifts to try to shrink their assets, including real estate loans.
- The risk-weighting of assets encouraged banks and thrifts to focus their asset shrinkage on real estate loans. Acquisition, Development and Construction (AD&C) loans and multi-family and commercial mortgages all were given the highest risk rating, 100 percent, while nonguaranteed single-family loans were given a 50 percent weight and government guaranteed loans and securities were given a zero weight. FIRREA chartered the Resolution Trust Corporation (RTC), starting the process of systematically closing failed thrifts. Although, at least in theory, other lenders could fill the gap and lend to creditworthy borrowers, presumably they would not do so on the same generous terms as a failing institution and it would take time to develop relationships with the displaced borrowers.
- It limited lending to 15 percent of capital to any one borrower (down from 100 percent of capital). Presumably, this change greatly affected the nonresidential and multi-family sectors. It may have also hurt some large single-family builders as well. In addition, nonresidential loans were limited to 400 percent of capital.
- Thrifts were prohibited from taking direct equity stakes in real estate investment, a relatively common practice in the 1980s.

In 1991, the second major legislation was passed, FDICIA, which established risk-

[13] To be precise, overbuilding did play an indirect role in the credit crunch to the extent that it has caused defaults on past loans, impairing bank capital and reducing lending.

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based capital rules for banks and mandated that regulators develop stricter guidelines on real estate lending. FDICIA's main effects on real estate lending were:

- Through a variety of penalties and incentives FDICIA encouraged banks and thrifts to be "well capitalized" and maintain high risk-weighted capital ratios.
- It required the four federal regulatory agencies to establish real estate lending standards and they adopted the following loan-to-value guidelines a year later: raw land (65 percent), land development (75), multi-family and nonresidential construction (80), 1-4 family construction (85), improved property (85), and 1-4 family mortgage and home equity loans (90).
- Subsequent regulations tightened the requirements for professional appraisals.

Although many of these rules were not adopted until late 1992 and a variety of exceptions were allowed, there had been earlier proposals for even tighter requirements, discouraging some loans in the interim.

Two nonstatutory developments reinforced the impact of the new real estate lending rules. First, the collapse in real estate values, starting in the oil patch and developing later in New England and elsewhere, put further pressure on the capital position of lenders. This "capital crunch" was particularly important given that regulators were tightening rather than easing capital requirements. Second, there were significant changes in attitudes toward real estate loans on the part of borrowers, lenders and regulators. Early in 1990, in reaction to the large losses at thrifts, there was a general call for tighter standards from the public, elected officials and some regulators. At the same time, the adverse experience in some real estate markets (commercial and multi-family) and for some kind of lenders (thrifts taken over by the RTC) probably caused closer scrutiny of all kinds of real estate loans. Surveys of borrowers during this period complained of stricter collateral requirements, withdrawal of lines of credit, stricter evaluation of projects, tougher occupancy requirements, and of regulators forcing lenders to increase their loan-loss reserves. Indeed, some commentators point to regulatory pressure on the Bank of New England to increase reserves for bad real estate loans in late 1989 as an important trigger-date in the credit crunch.

As the national recession deepened, several steps were taken to ease the credit crunch. In March 1991 the major bank and thrift regulators issued a joint statement urging continued lending to sound borrowers, while assuring lenders that examiners would not value loans at depressed liquidation values. Although the statement was followed with a second clarifying statement in November 1991, these steps did not prevent the GAO from issuing a letter in March 1992 criticizing regulators for too stringent real estate lending rules. By early 1992, surveys showed the proportion of respondents reporting that loans are harder to get leveling off. More recently, in the spring of 1993 the regulators announced several modest steps to provide regulatory relief and encourage lending. The last two years have also seen a steady improvement in the capital position of lenders. With real estate prices apparently stabilizing it appears that the capital crunch is over.

Identifying the Crunch

Not only did the credit crunch gradually unfold, rather than suddenly slamming the economy, it interacted with other shocks to the economy in a more complex fashion than past crunches. Chart 5 illustrates the complex relationship between credit flows and real estate activity. The chart shows how seven kinds of shocks to the loan market (the out-

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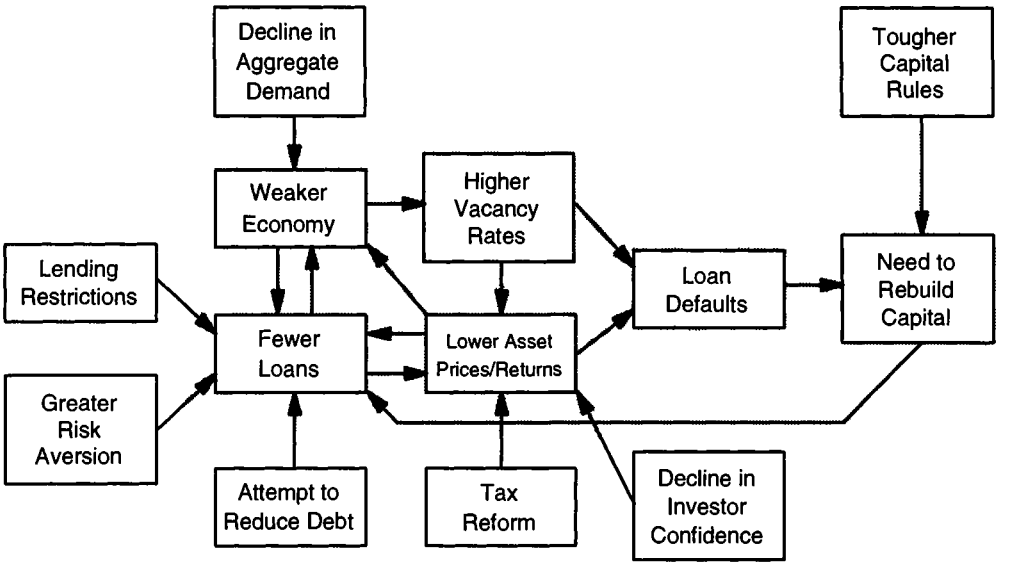
Chart 5: Credit Flows and Real Estate Activity



Demand Shocks	Both Supply and Demand	Supply Shocks
Aggregate Demand	Decline in Desired Debt/income Ratio	Tougher Regulation of Capital
- defense cuts	Decline in Investor Confidence	Tougher Regulation of Loans
- initial monetary tightening	Greater Risk Aversion	
- oil price increases		
Tax Reform		

side boxes) have directly and indirectly caused a decline in both lending and overall economic activity. Although the diagram is rather complex, it simplifies by ignoring some feedback effects. Clearly two of the shocks—tougher regulation of lending and more stringent capital requirements (eg. the "capital crunch")—are potential elements of the credit crunch. Certain other shocks, such as increased risk aversion by lenders, could be considered part of the credit crunch as well.

It is also clear that many determinants of the credit *slowdown* are not part of the credit *crunch*. The most obvious example is the slowdown in lending due to the decline in aggregate demand. Weak economic activity not only reduces demand for loans, but it makes some projects that would have been creditworthy in a strong economy uncreditworthy. Reluctance to finance new construction due to the overhang of unused space and the desire of borrowers to pare down debts should not be considered part of the crunch. Similarly, although changes in the tax treatment of real estate go a long way in explaining the weakness, they are conceptually quite different from a credit crunch, and instead should be considered a determinant of the demand for credit.[14]

All of these supply and demand factors became entangled once the real estate contraction got under way. This makes it very difficult to measure the indirect or secondary channels of the credit crunch. For example, one of the principle credit crunch mecha-

[14] The shocks to credit demand—high leverage ratios, excess real estate capacity, tax reform and the recession—all reduced the creditworthiness of borrowers. The resulting contraction in credit should be considered separate from the credit crunch regardless of whether it caused *borrowers* to stop seeking loans or if it caused *lenders* to reject requests for loans.

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nisms was the "credit crumble"—the impact of the decline in the price of existing buildings on the capital position, and willingness to lend, of real estate lenders. This fall in prices reflected all of the negative shocks to the sector, including tax reform, the weak overall economy, and credit tightening, as well as all of the forces that contributed to the prior overbuilding. Clearly only part of the "blame" for the resulting pullback in lending should be apportioned to the credit crunch.

Empirical Methodology

Past credit crunches have been relatively easy to characterize and control for in empirical analysis. Only one sector of the economy was involved, the time period was clearly delineated and simple proxy variables were available to measure the intensity of the crunch—the spread between deposit and market interest rates, and the growth in deposits at thrifts were good measures of disintermediation pressures and could be treated as more or less exogenous variables. Indeed, because each crunch had similar characteristics a simple 0/1 dummy variable could be used to capture the "average" effect across credit crunches.

Today's much more complicated crunch mechanism does not yield any useful proxy variable. For example, a 0/1 dummy variable would not be appropriate since many sectors of the economy are involved, the time frame is not clear and a dummy variable cannot distinguish between the effects of the crunch and other missing variables. Lacking a "smoking gun" we are forced to resort to examining a variety of circumstantial evidence.

We approach the problem in two steps. First, we explore whether "fundamentals" can explain the construction decline, using both formal econometric models and descriptive analysis. Presumably any "residual" drop in activity reflects nonfundamental factors such as the credit crunch. Second, we see how the credit crunch stacks up against other nonfundamental factors. If a credit crunch constrained the supply of real estate, we would expect telltale signs in a number of indicators. Did "constrained" lenders cut back more than "unconstrained" lenders? Did indicators of excess demand, such as vacancy rates, real estate prices, inventories and interest rate spreads, show signs of a shortage of credit? Individually, none of these indicators gives very compelling evidence about the importance of the credit crunch. Taken together, however, they give a useful sense of whether the credit crunch was an important secondary factor in the real estate contraction.

In addition, for the multi-family and nonresidential sectors, we explore whether problems of excess capacity overwhelmed any effect from the credit crunch. Was the path of construction in these sectors sustainable for any major market under reasonable economic assumptions? Did the actual fall in construction put the sector on a sustainable path? Was it likely that new construction projects would have generated a high enough income stream to cover construction costs? Would the path of construction spending have been materially different without an exogenous shock to lending?

As we will see, neither of these approaches can fully reject an important role for the credit crunch, but they do cast a considerable shadow of doubt on the hypothesis.

II. Single-Family Construction

In the past the single-family sector has been the main victim of credit crunches, so it is a natural place to start our investigation. In the last thirty years there have been five single-family construction cycles (Chart 6). Of course, in each cycle a lot more than a cred-

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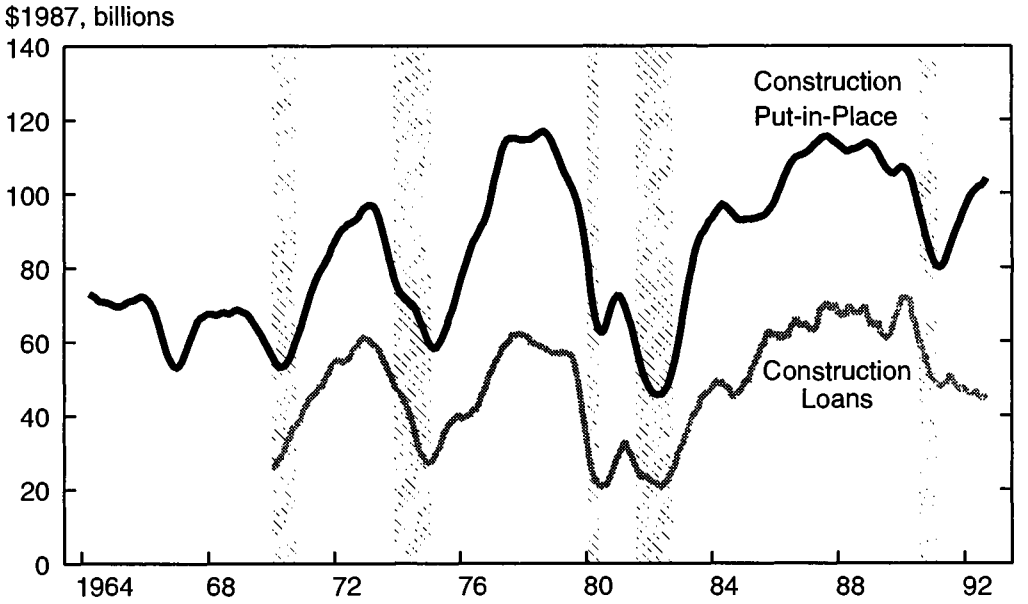
Chart 6: Single-Family Real Estate Financing and Activity



Note: Loan data are not available before 1970.

it crunch was happening. We can crudely control for the most important other factor—the overall economic cycle—by comparing the peak-to-trough movement in single-family construction over its own cycles and over the national business cycle. By either standard the current cycle does not stand out. The current cycle is about average relative to past construction cycles, and as in past recessions the sector recovered most of its initial decline within the year following the recession. Nonetheless, given the significant decline in mortgage interest rates and the concomitant improvement in home affordability, both the severity of the decline and the weakness of the recovery in single family construction have come as a surprise to housing experts.

In this section we first examine the *modus operandi* for the current versus past crunches. We then line up and investigate the various suspects that are allegedly responsible for the housing contraction: demographics, tax reform, debt retrenchment, changes in investor sentiment and the national recession as well as the credit crunch. Finally, we gather a considerable amount of circumstantial evidence—interest rate spreads, loan shares, lead-lag relationships, measures of excess demand and model forecasts—all suggesting a small role for the credit crunch in the decline in residential construction.

A More Complicated Credit Crunch

In contrast to the classic credit crunch, the current crunch has not been particularly directed at the single-family sector. The risk based capital rules do not penalize single-family lending as much as other real estate lending. The tightening of single-family lending rules has also been less dramatic, if only because the prior loosening of standards in the 1980s was less obvious. In addition, single-family mortgages have not experienced the dramatic default rates of other real estate loans, so there has been less pressure on regulators to reign in this sector. Last, and most important, this sector has benefitted most from financial innovations, with both ARMs and CMOs becoming commonplace.

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Nonetheless, the crunch could have had effects on this sector, particularly on the construction side of the market. The adverse experience in related markets (commercial and multi-family) and for some kinds of lenders (thrifts taken over by the RTC) probably caused a more cautious attitude toward single family lending by lenders and their regulators. Furthermore, most single-family construction loans have the same risk weights (100 percent) as other construction loans. Even with the diversification of mortgage lending and the rapid growth of securitization the sector remains dependent on the shrinking thrift industry.

Although today's crunch, unlike the classic crunch, does not yield a useful proxy variable, it does imply some testable hypotheses. We examine three kinds of evidence. First, we outline the potential causes of the downturn. Second, we explore whether housing "fundamentals" can explain the housing decline. And third, we investigate whether the credit crunch left its "fingerprints" on various housing indicators.

Comparisons with Other Explanations

There are seven primary suspects, or at least co-conspirators, in the housing contraction. Three of these relate to housing "fundamentals": tax reform, demographics and the recession. The other four are more subjective, special factors:

- as with consumption in general, borrowers may have initiated efforts to retrench in the face of excessive debt accumulation in the 1980s;
- the perceived riskiness of home investment, such that demand for housing is now driven more by shelter needs, may have increased;
- the demand for homes may have fallen because of the glut of new apartments; and
- credit flows may have been restricted.

Offsetting these seven negative factors has been the drop in interest rates and real home prices, and the attendant improvement in home affordability.

Model Simulations

One easy way to isolate the subjective factors from the fundamentals is through model simulations. In particular, we can estimate housing equations over the period before the housing decline and then use the results in simulations of the alleged credit crunch period. If the models tend to over-predict in the recent period, this will suggest that something unusual was depressing the housing market.

The companion to this paper, Boldin (1993), discusses the results in detail; here we highlight its findings. Boldin first looked at some existing models and then considered several variants that attempted to improve on these specifications. Although the models are constructed quite differently and have varying degrees of econometric "purity," taken as a whole they confirm that fundamentals cannot explain all of the recent weakness in housing. Overpredictions of 20 percent (over $30 billion) or more at the 1991-I trough in residential construction were common.[15]

Noting a variety of econometric problems with the existing models, especially their

[15] The models that were examined included Ryding (1990), the 1987-vintage MPS housing equation, the latest MPS housing equations, Esaki and Wachenheim (1984/5), the Eckstein's (1983) DRI model and the latest version, and DiPasquale and Wheaton (1990). Some of these models cover the whole residential sector, but further analysis shows that virtually all of the underprediction in the "crunch period" came from the single-family and "home improvements" components.

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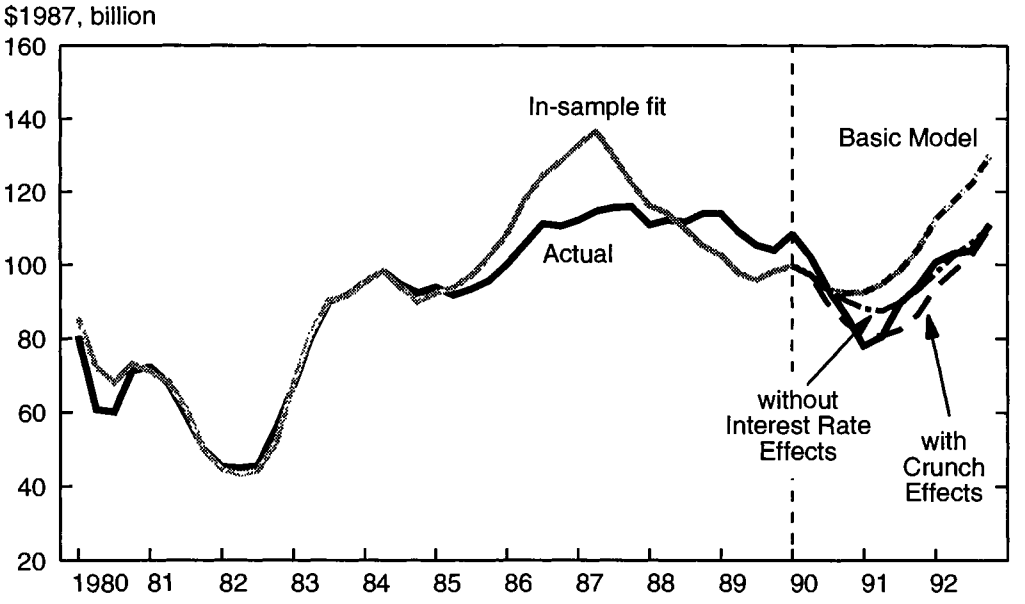
inadequate efforts to capture long run trends, Boldin developed a new specification for residential construction that uses recently developed cointegration and error-correction concepts. It allows for short-run deviations from these fundamentals, but it includes an error correction mechanism that leads to long-run trend reversion. One advantage of Boldin's approach is that it can be used to formally test the overbuilding hypothesis. He developed the new model to empirically encompass the best features of the previous specifications as well.

Boldin's housing model regresses net residential investment (as a percent of the existing stock) on a credit crunch dummy (that equals one in 1969-III to 1970-III and 1973-IV to 1975-I and zero elsewhere), changes in nominal mortgage rates, a housing affordability index (mortgage payments as percent of median household income), the new home inventory-to-sales ratio, changes in the unemployment rate, and consumption growth. The model also includes a long-run trend reversion variable, which is estimated on the assumption that the desired housing stock grows smoothly over time after adjusting for market prices and the cost-of-capital. The underlying theory behind this view is that utility maximizing homeowners try to maintain the real opportunity cost of housing as a constant share of their wealth (see Boldin [1993] for more details).

Chart 7 shows the in-sample fit (from 1968 to 1989) and the out-of-sample predictions (1990 to 1992) for Boldin's model as applied to the single-family sector. Although actual spending fell about $30 billion from 1989-IV to 1991-III, the model predicts a much smaller $5 billion decline over this period. This $25 billion unexplained drop persists into the housing recovery and is consistent with estimates from the other housing models.

What causes the overprediction? The chart shows two additional simulations that can shed light on this overprediction. In the first simulation, we hold both nominal interest rates and mortgage affordability constant after 1990-II. The chart shows that

Chart 7: Single-Family Construction:
Model Simulation Results



Note: The simulations start in 1990:Q3. For the alternative simulations either the interest rate effects are turned off or the credit crunch dummy is set to one.

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without these short-run effects the sector would have had a modest downcycle in this period. Comparing this simulation to the base case simulation shows that interest rates factors should have stimulated housing investment. This counterfactual fall in single-family construction is due to increases in unemployment and low consumption growth. Therefore, the model concludes that falling interest rates should have more than offset the impact of a weak economy. In the second simulation we allow the same 0/1 dummy variable used for past crunches to be "turned on" over the 1990-III to 1992-IV period. With this change, the model almost exactly predicts the depth of the downturn, even with lower rates. In other words, whatever is causing the unusual weakness in housing, it is having an effect that is quantitatively the same as previous credit crunches.

The simulations do not take into account new demographic trends. Since home ownership is closely tied to starting a family one would expect changes in the rate of growth in the prime new-owner age group, twenty-five to thirty-four, to affect construction. Indeed, the expected decline in this age group is the basis for Mankiw and Weil's (1989) frequently cited prediction that real home prices would slide about 50 percent over the next two decades.

After peaking at 1.3 million per year in the late 1970s, the growth in the population of twenty-five to thirty-four year-olds slowed to 0.7 million in the early 1980s. Since 1986 growth has fallen steadily and by 1992 this group was shrinking at a 0.5 million annual rate. Unfortunately, at best, demographic variables are not statistically distinguishable from other trend-like variables in housing models. At worst, they were extremely misleading in the 1980s, as shifts in the home-ownership rates within age groups dominated any effect of changes in the size of different age groups.

Thus, Boldin found that when applied to data that includes all of the 1980s, the demographic variables used by other researchers either had the wrong sign or were quite small and not significantly different from zero. The most reasonable conclusion is that supposedly important demographic effects are not very evident in national housing trends. This claim is confirmed by the fact that (at least so far) Mankiw and Weil's predicted decline in real home prices has turned out to be grossly false. Despite the 1990-91 bust in the housing market, a very slow recovery out of the recession, unfavorable demographic trends, and a small decline in home ownership, real home prices have stayed roughly stable since the mid-1980s. It is also worth noting that housing models which attempt to exploit demographic trends had similar or worse prediction problems as Boldin's preferred ECM specification.

The notion that something beyond demographics and other fundamentals is behind the housing decline is confirmed by private sector housing forecasts during the period. By the fall of 1989 the effect of adverse demographics and Tax Reform should have been fully factored into housing forecasts. A typical forecast, such as Data Resource Inc. (DRI), was assuming modest economic growth and relatively flat mortgage interest rates. In this environment, they predicted that single family housing starts would remain flat at about 1.1 million. Actual starts in 1991 were about 200,000 lower, showing about the same magnitude of overprediction as the econometric models.

Since housing fundamentals do not explain the weakness we are left with at least four "special factors": a generalized effort to reduce debt, an adverse shift in investor psychology, a spill-over from the glut of apartments, and a credit crunch.

First, home-buyers may have reacted to the debt accumulation of the 1980s and decided to reduce consumption, including consumption of housing services. As Chart 8 shows, the ratio of mortgage debt to the value of single-family homes grew about 15 percentage points in the 1980s. Despite declining mortgage rates, debt service payments as a share of personal income also rose. Both series turned down in 1991, although the

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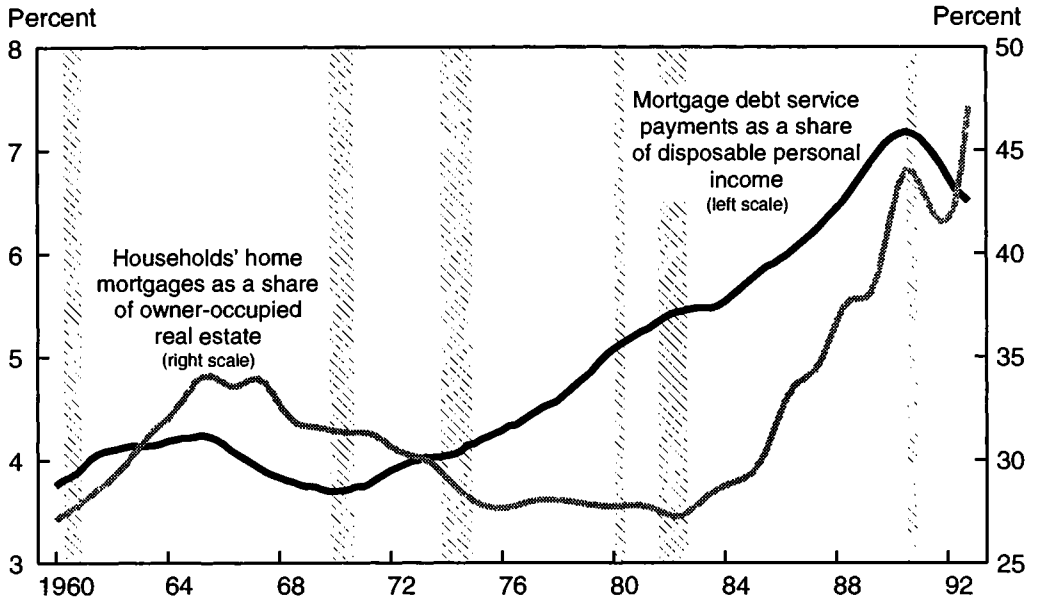
Chart 8: Household Mortgage Debt Ratios



Note: Mortgage debt service payments data estimated by the Federal Reserve Board and smoothed by the Federal Reserve Bank of New York. Home mortgages and owner-occupied real estate data obtained from the Federal Reserve Board's Flow of Funds accounts.

debt ratio has since rebounded. It is plausible to argue that at least some of this retrenchment was due to a conscious debt-reduction effort by borrowers.

Another sign of the debt-aversion of homeowners comes from the data on mortgage refinancing. With interest rates down sharply, homeowners could cut monthly payments equally sharply. Instead, many homeowners are opting for shorter term mortgages with equal or higher monthly payments. For example, according to data from the Mortgage Bankers Association, about 40 percent of those refinancers (in 1992) who had thirty-year loans opted for fifteen-year loans. This occurred despite a stable spread between thirty-year and fifteen-year interest rates and despite the prospect that higher future taxes would increase the attractiveness of mortgage interest deductions.

A second nonfundamental factor is the apparent change in attitudes toward home ownership as a form of investment. As Chart 9 shows, home prices grew at an annual rate of 2.1 percent above inflation in the 1970s. Although real home prices fell in the early 1980s it is reasonable to assume that homeowners saw this as an aberration brought on by severe economic recession and sky-high mortgage rates. The same could not be said for the more recent period, with equally poor returns despite better housing fundamentals. As a result, judging from the outpouring of news reports on the perils of home investment, attitudes appear to have changed dramatically: homes are now seen as a riskier investment.[16]

A third possible explanation, which reinforces the second, is that the apartment glut may have depressed housing demand. As we will show in Part III, overbuilding has caused apartment vacancy rates to reach record levels in the late 1980s. Although reliable data is hard to come by, the residential rent component of the Consumer Price Index

[16] Recall that housing models generally focus on home affordability—which has improved dramatically—rather than the return to home investment—which has deteriorated equally dramatically.

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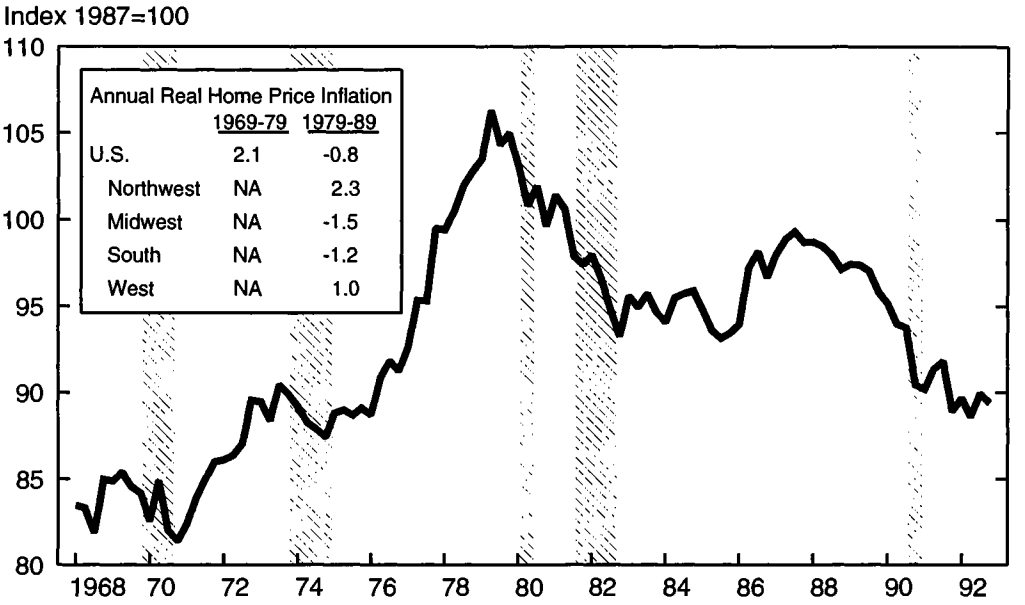
Chart 9: Real Quality-adjusted New Home Prices



Note: Data are deflated by the consumer price index, excluding food and energy. Quality adjusted prices are from the Bureau of the Census.

has fallen about 5 percent in real terms over the last five years. With apartments cheap and easy to find, home prices uncertain, and debt levels high, the obvious question is: Why invest in a new home?

Circumstantial Evidence

How do we distinguish between these three demand-side factors and the supply-side impact of the credit crunch? Unfortunately, the simple approach of looking at overall sectoral credit flows is not very useful. Since virtually no one builds or buys a house without borrowing heavily, it is difficult to distinguish a causal relationship between real activity and financing in either the Granger (lead-lag) sense or in terms of the amplitude of the series. All is not lost: we can still examine a broad range of circumstantial evidence. In particular, the credit crunch story has several testable implications; if the credit crunch played an important role in the decline in activity, we would expect to find evidence of its influence in some important housing indicators.

Hypothesis: Construction loans were more constrained than mortgage loans.

Although there may have been some disruption to mortgage markets, most descriptions of the credit crunch focus on home builders.[17] There are several reasons to believe home-builders have been particularly vulnerable to a decline in the supply of loans. First, nearly all builders are small- or medium-size companies with limited access to non-bank financing. Second, in many areas of the country their collateral has been hard hit due to falling home prices. This is particularly important because over the years an

[17] This is a theme of several articles in housing journals. For example, Polmar (1990) writes: "For the first time in our history, the producers of housing are facing a serious credit crunch and are having a great deal of trouble securing financing for land acquisition, land development and construction of new homes (AD&C loans) while credit generally has remained available to the ultimate buyers of housing."

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increasing portion of construction has been "speculative"—built before a specific buyer is lined up. Third, there may be a contagion effect from the problems in commercial and apartment building. If banks and their regulators have "redlined" these activities some of their ink may have spilled onto single-family homebuilders as well. Finally, builders have been among the loudest complainers about the credit crunch.

If building loans are being constrained more than purchase loans this should have caused a shortage of homes for sale. In all recessions weak income growth tends to reduce demand for homes, putting downward pressure on home prices. Credit restraints put additional pressure on prices: in the classic crunch lack of mortgage credit should have put further *downward* pressure on prices, but in the current crunch lack of construction credit should have exerted some reverse *upward* pressure on prices. Unfortunately, home price data are not particularly reliable; a better indicator of supply constraints is the inventory-sales ratio for homes: if the credit restraint was binding, there should have been an unusually low level of new homes for sale relative to underlying demand; that is, a low inventory-sales ratio.

Price behavior does not suggest a pervasive housing shortage. In real terms, home prices have declined steadily since 1987. The cumulative 10 percent drop almost matches the 1979-82 decline, a period of deep recession and sky-high mortgage rates (Chart 9). Judging from anecdotal evidence, until recently the market was even more stagnant than the official price data suggest, with slow turnover and many homes taken off the market due to lack of demand.

The regional data are also not consistent with a strong supply-side story. Consider conditions in the Northeast, which is allegedly the most credit constrained region in the nation. Table 1 confirms that while the Northeast suffered the largest drop in starts, this drop was accompanied by the weakest prices, largest rise in vacancies, and highest inventory-to-sales ratio among the four regions. In this region, demand factors appear to outweigh the credit supply factors. In the Midwest, starts were steady over the 1988-1991 period and rose to record levels in 1992 as fundamental trends in inventories and prices were favorable. In the South and West, despite relatively flat prices, starts also rebounded sharply in 1992 as inventories are at reasonable levels.

Because price and vacancy data are buffeted by several supply and demand forces, they do not provide very conclusive evidence on the credit crunch; the inventory data are more convincing. Chart 10 shows that new home inventories have not been unusually tight. From their April 1989 peak, home inventories have fallen less than in either the 1973-75 or the 1979-82 cycle. More important, the inventory-to-sales ratio has also fallen less than in past cycles and is well within the range of previous troughs.[18]

A more recent argument is that lack of development financing has created a shortage of building lots. For example, a poll by the National Association of Home Builders last winter found that 38 percent of the respondents saw lot shortages as one of their top twenty concerns. Lot shortages could not have had much impact on construction during the alleged peak of the crunch period, however, because in earlier periods no builders mentioned this as a top-twenty concern. Taken together, these data, as well as anecdotal evidence, suggest no evidence of a credit crunch during the 1990-91 period.

Hypothesis: The parts of the market that had access to secondary funding sources should have been less affected than parts without secondary sources.

Some of the most important financial innovations in the last fifteen years have been in the secondary market for home mortgages. As a result, even if deposit flows slow or

[18] Reinforcing this argument is the fact that in previous housing crunches the primary constraint on lending was mortgages. This should have helped prevent some of the decline in inventories.

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if lenders become leery about holding mortgages on their books the flow of funds to borrowers need not slow. Thus, housing experts such as Hendershott (1991b) argue that the deposit contraction should have little impact on the market for fixed rate mortgages (FRMs) that are a small enough ("conform") to be eligible for agency guarantees and therefore easily securitized. On the other hand, "major disruptions could occur in the ARM and jumbo FRM markets" since they are still primarily funded by deposits. "This could lead to reduced housing demand, real prices and home-ownership" (Hendershott 1991b, p. 21)[19]

If ARM or jumbo markets were credit constrained we would expect the volume and terms of these loans to be tight compared to conventional mortgages. The data suggest otherwise. If the ARM market was constrained, it was not enough to prevent a sharp drop in the ARM interest rate. As Chart 11 shows the recent twenty-year low in one-year Treasury bill rates has also pulled down the associated ARM rate to its all time low.

[19] A secondary market for jumbos and ARMs has emerged in recent years, but is significantly smaller than the conforming market in absolute size and in terms of the percent of mortgages passed through.

Table 1: Regional Housing Indicators

	1980 - 85	1986	1987	1988	1989	1990	1991	1992
Northeast								
Starts (1000's)	104.5	227	205	181	131	104	99	112
Vacancy rate (1%)	1.0	0.98	1.23	1.6	1.58	1.6	1.47	1.33
Inventory (months supply)	8.7	7.2	10.12	13.6	15.1	15.8	14.9	10.53
Price (1% change)	7.4	14.7	13.6	2.4	3.0	-2.1	-3.3	ND
Midwest								
Starts (1000's)	113.0	187	203	194	191	194	192	241
Vacancy rate (1%)	1.6	1.5	1.37	1.2	1.43	1.3	1.28	1.23
Inventory (months supply)	7.3	4.59	4.76	5.34	5.08	6.04	5.56	4.01
Price (1% change)	3.2	5.6	6.7	4.4	2.3	0.8	2.7	ND
South								
Starts (1000's)	385.3	503	485	442	410	372	353	451
Vacancy rate (1%)	1.7	2.12	2	1.93	2.25	2.12	2.2	1.77
Inventory (months supply)	6.8	6.18	6.78	6.21	6.23	6.37	5.72	4.91
Price (1% change)	4.0	3.0	3.5	2.3	2.8	0.2	1.9	ND
West								
Starts (1000's)	163.0	261	255	264	272	227	198	253
Vacancy rate (1%)	1.8	1.75	1.82	1.57	1.6	1.75	1.65	1.93
Inventory (months supply)	7.4	4.84	5.51	4.76	5.21	8.43	7.63	5.39
Price (1% change)	2.8	2.5	5.3	5.4	6.3	4.8	0.8	ND

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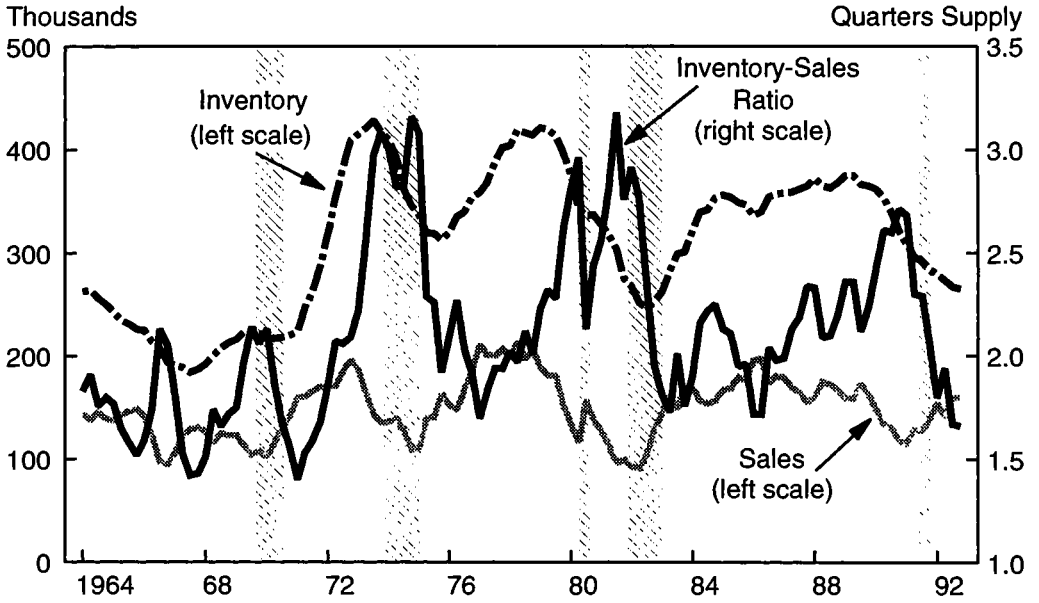
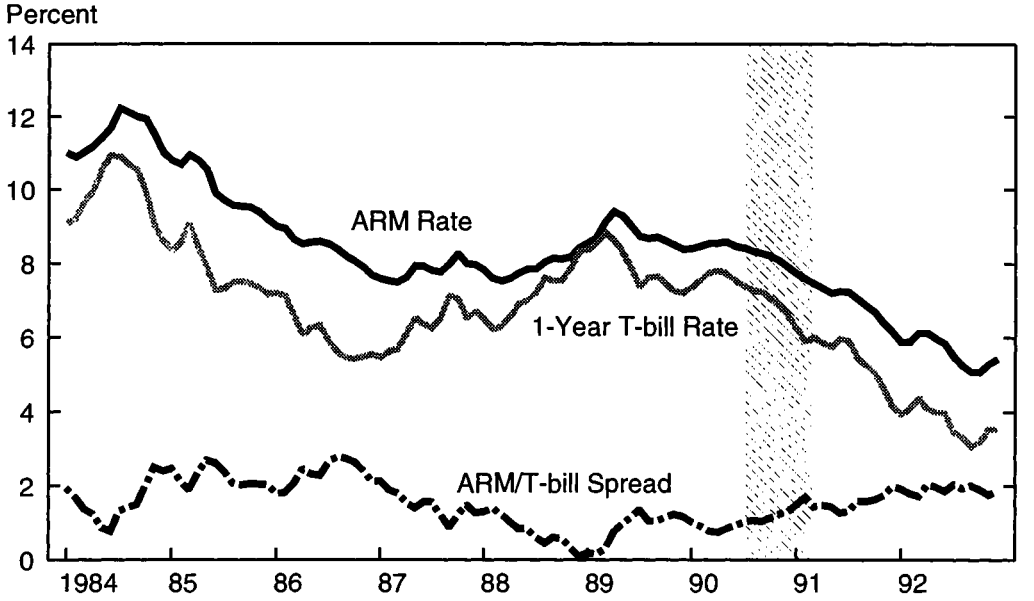
Chart 10: New Homes Sales and Inventories



Note: Sales are measured at a quarterly rate, inventories and the inventory-sales ratio are the end of quarter numbers.

Chart 11: Comparison of the ARM and One-year T-bill rates



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Although the gap between the ARM rate and the Treasury bill rate has widened, a comparison with 1986 suggests that this is a normal response to unusually low rates.

While Chart 12 shows a steep decline in the ARM share of mortgage origination in 1989, this development is not necessarily evidence of a supply restraint. The econometric model in Brueckner and Follain (1989) shows that the increase in the FRM-ARM interest rate spread should have increased the share of ARMs, but that this is more than offset by the effect of the general decline in interest rates (Chart 13). Our back of the envelope calculations show that the current ARM share of 20 percent is roughly what the Brueckner-Follain model predicts.

This leaves only the "jumbo" market as potentially constrained market. Jumbo mortgages make up less than 20 percent of the value of loans for new homes, with a heavy concentration in the high-priced northeast and western regions. Although it is possible that credit terms have tightened for jumbos, housing experts have reported only modest pressure on the spread between jumbo and conforming interest rates (1/4 to 1/2 percentage points).

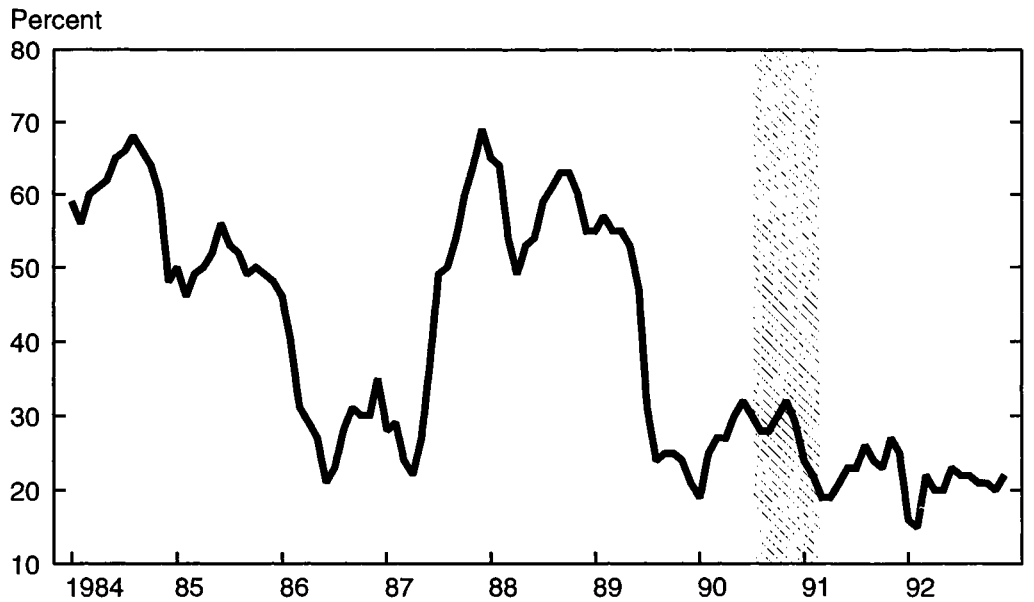
Hypothesis: Depository lenders were more constrained than nondepositories.

As we argued earlier, the patterns of aggregate home lending do not give useful clues about the credit crunch. Although the data are poor, the *composition* of lending does provide another test for the credit crunch.[20]

Differences in lending patterns between depositories and nondepositories do provide circumstantial evidence for the credit crunch story. Chart 14 shows that the share of mortgage loans by depositories declined significantly after 1989. Similarly, in the classic 1974-75 crunch mortgage loans fell much faster for depositories than nondepositories, driving down the depository share. In the current period, however, the decline in the depository share primarily reflects the explosion in refinancing through nondeposi-

[20] The detailed loan data used in this paper come from the HUD Survey of Mortgage Lending Activity. These data come from multiple sources, lack conformity in definitions and suffer from double counting. Unfortunately, they are also the only source of this kind of detailed information.

Chart 12: ARM Share of Mortgage Originations



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tories rather than a constraint on depository lending. Chart 14 shows that depositories did not lose market share in the market where we would expect crunch effects—the construction loan market. Indeed, nondepositories have been much more aggressive in curtailing construction loans, pushing up the depository share to close to 100 percent.[21]

[21] Lending from nondepositories may have been constrained by *some* of the same problems that plagued depositories. Here we are testing if there was a stronger constraint on depository lending, as the credit crunch story predicts.

Chart 13: Comparison of ARM and FRM Interest Rates

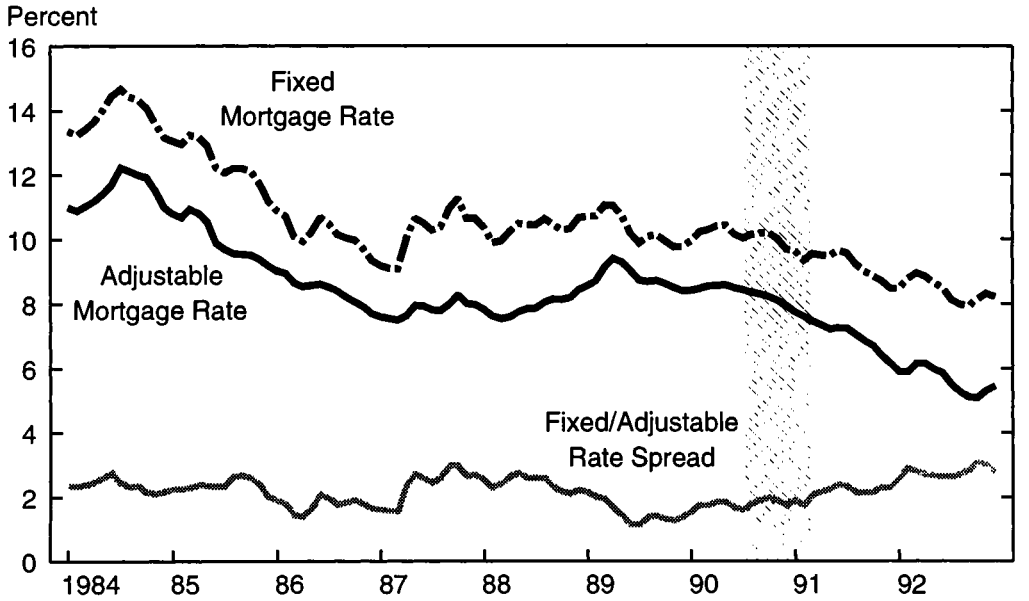
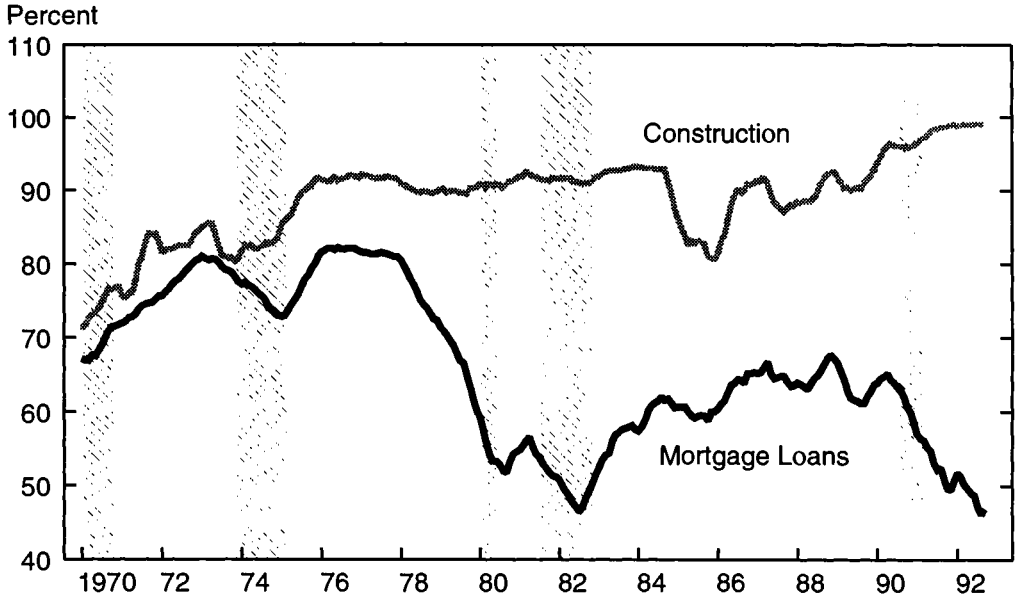


Chart 14: Single-family Depositories' Share



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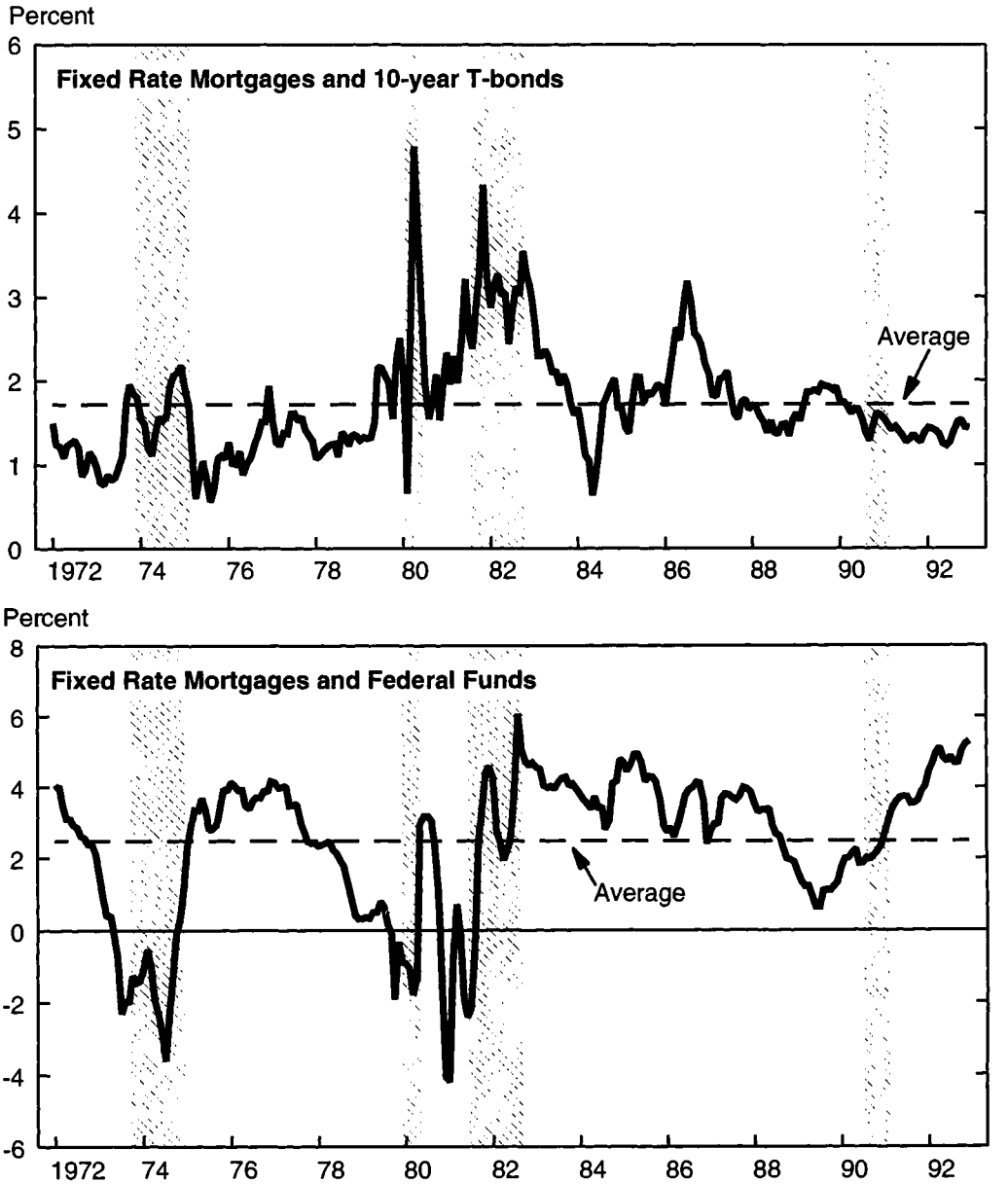
Hypothesis: Some generalized "price rationing" may have occurred.

With unregulated interest rates it is likely that more of the shock to the sector will be transmitted via interest rates rather than "non-price" rationing. Thus if banks were more reluctant to make mortgage loans this should cause an unusual spread between mortgage and other interest rates. Chart 15 shows two spreads that would be affected by a reluctance to lend. The top panel shows that over the last twenty years mortgage rates have averaged 174 basis points higher than comparable Treasury Bonds. This gap reflects the differential credit and prepayment risk of the two investments, as well as the relative availability of funds in the two markets. Since the onset of the crunch this gap has fallen below it historic average, suggesting that banks are not trying to discourage mortgage lending. Indeed, the declining gap probably reflects the steady increase in liquidity in the market as new financial products are developed.

Chart 15: The Interest Rate Spreads for Fixed Rate Mortgages



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The bottom panel of Chart 15, which plots the gap between mortgage rates and the Federal funds rate, tells a different story. This rough measure of the relative cost of funding investments has reached record levels. During past periods of Fed easing the gap has grown to an average of about 400 basis points. It is possible that part of the remaining 100 basis point spread reflects reluctance to lend. In simulations with standard housing models, this "excess spread" could account for a 5 1/2 percent or $5 billion shortfall in real single-family construction over the 1990-92 period.

Summary: Single Family

There is ample reason to suspect a credit crunch in single-family housing. Depositories have been under pressure to tighten up their real estate lending. Borrowers, particularly builders, have complained loudly about the lack of credit. And the usual array of suspects—demographics, the business cycle and tax law changes—do not appear sufficient to explain a housing recession in the face of declining mortgage rates. Indeed housing model simulations show a $20 to $30 billion unexplained decline in single family construction at the trough of the recession.

A careful sweep of the "crime scene," however, yields virtually no evidence of a crunch. Inventories are not tight; prices and other excess demand indicators suggest no shortage of housing; loans have fallen equally for all kinds of lenders; ARM and jumbo markets, with little access to secondary financing, appear to be functioning normally; and the spread between mortgage and Treasury interest rates is low. With little evidence of a tangible impact from the crunch, and several plausible alternative explanations for the contraction, it is difficult to put much blame on the credit crunch.

III. Multi-Family Residential Construction

On the surface, the multi-family sector looks like a clear-cut victim of the credit crunch. Since its peak in 1986, multi-family construction has been the weakest sector of the economy, with the sharpest contraction in both output and lending. Moreover, it has been touched by all of the elements of the credit crunch—the tightening of lending and capital rules, the implosion of the thrift industry and the credit crumble.

Despite these appearances we will argue that the credit crunch was "dominated" by a more fundamental problem in the sector: the speculative boom and the resulting overcapacity in the sector. Starting in the late 1980s, a combination of tax reform, weak demographic and income fundamentals and a shift toward more realistic investor expectations made only subsidized or specialized projects economically feasible in most markets. This left only a limited role for the credit crunch: it constrained some specialized projects; it may have affected the timing of the contraction; it probably hastened the fall in the price of existing structures, hurting the capital of lenders and thereby constricting loans to other sectors; and if the crunch persists, it could constrain a rebound in the sector. Nonetheless, given the adverse economic fundamentals and the grim reality of over-capacity, it is unlikely that the contraction would have looked significantly different in the absence of the credit crunch.

This section is organized as follows. First, we briefly review the multi-family cycle. We then describe the credit crunch and its interaction with the speculative bubble (later we will apply this argument to several components of nonresidential construction). Next, we explore two kinds of evidence. As for the single-family sector, we look for circumstantial evidence of a particular kind of supply-side constraint. We then document the extent of the overhang of unused space in these markets and, with some coun-

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terfactual exercises, we explore whether the contraction in construction was a "reasonable" response to this overhang.

The Multi-Family Cycle

A broad look at the multi-family data suggests that although the sector has been unusually weak during the period of the alleged credit crunch, this weakness could not have been important to the overall economy. Even at its peak in 1986 multi-family construction comprised less than one-fifth of residential construction and only about 0.7 percent of GDP. Furthermore, more than half of the subsequent drop in multi-family construction had already occurred by 1989, before the key elements of the credit crunch—the credit crumble, and regulatory restraints—had begun (Chart 16). Thus even a complete disappearance of this sector could have accounted for only a small part of the 2.2 percent drop in GDP in the 1990-91 recession.

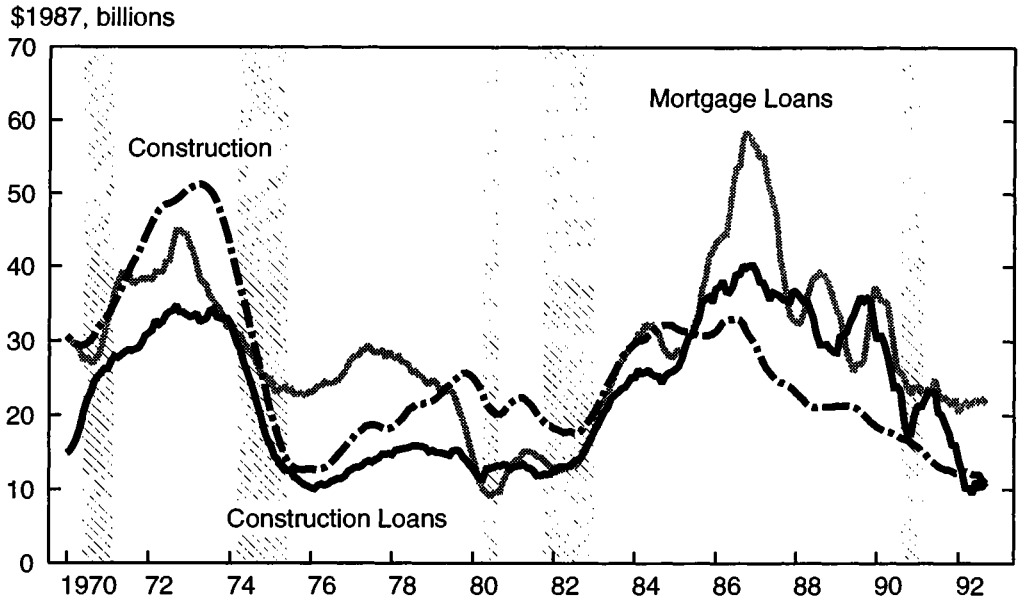
Although its macroeconomic significance is probably small, the data do suggest an unusually large and sustained drop in multi-family activity. At $10.2 billion in 1992-IV, real multi-family construction is less than half of its 1989-II level, and at the lowest level since data have been compiled (1964). The drop is also more than twice the 32 percent decline in single-family construction over its down-cycle (1987-IV to 1991-I). Over the 1986-91 period the decline in multi-family activity was greater than in three of the last four multi-family recessions. Clearly, however small its role in the overall activity, something caused an unusually steep drop in multi-family activity.

Alternative Explanations for the Decline

A variety of explanations for the multi-family collapse have been put forth, including adverse demographics, weak overall economic activity, tax law changes and the credit crunch.

Several of these explanations can be dismissed as only minor contributors. First,

Chart 16: Multi-family Financing and Activity



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there is a role for demographics in the multi-family contraction. As many analysts have pointed out, growth in the prime age group for new apartments—ages twenty-five to thirty-four—has slowed dramatically, from 3.2 percent in the 1970s to 0.6 percent in the 1980s. In the 1990s, the twenty-five to thirty-four year-old group is expected to decline at a 1.1 percent pace. However, other important renter age groups, such as the sixty-five to seventy-four cohort are growing in size. Combining population data with age-based rentership rates from the Bureau of the Census' American Housing Survey, we computed a modest slowing in the growth of the demographic demand for apartments (based on a weighted average calculation), from 2.1 percent in the 1970s to 1.3 percent in the 1980s and a 0.6 projected growth rate in 1990s. It is hard to imagine that these gradually evolving demographic variables could cause the rapid shifts in apartment construction that have been observed in recent years.

Neither does the recession take us very far in explaining the drop. Table 2 shows the change in real multi-family construction from peak to trough of the business cycle and the sector cycle. As the top of the exhibit shows, recessions have historically had mild effects on multi-family housing. Only in the 1973-75 recession, when changes in the tax treatment of Real Estate Investment Trusts crippled multi-family construction, have we seen declines of major macroeconomic significance. Only about one-sixth of the de-

Table 2: Peak-to-Trough Movements in Multi-Family Construction[a]

Business Cycles	Percent Change	Change in $1987
1969-IV to 1970-IV	3.1	1.0
1973-IV to 1975-I	-58.8	-27.1
1980-I to 1980-III	-22.7	-5.7
1981-III to 1982-IV	-8.6	-1.7
1990-III to 1991-I	-9.0	-1.5

Sector Cycles	Percent Change	Change in $1987
1966-I to 1967-I	-35.1	-8.4
1969-II to 1970-II	-11.2	-3.6
1973-I to 1976-I	-75.6	-38.9
1979-IV to 1982-II	-33.1	-8.6
1986-II to 1992-IV	-69.8	-23.6
1989-II to 1992-IV	-52.1	-11.1

a. For "Business Cycles" the peak and trough dates are from NBER; for "Sector Cycles" the dates are chosen to match the peak and trough in multifamily construction.

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cline in construction during the current sectoral cycle occurred during the recession. Apparently, apartment demand holds up well in periods of weak income growth because rentership is an "inferior good" relative to single-family housing (and like all inferior goods, demand for it typically increases during recessions).

That leaves only two plausible explanations for the bulk of the decline: reduced credit availability (the credit crunch) or a decline in demand for credit due to an overhang of unused space.

The Credit Crunch and the Real Estate Bubble

The credit crunch mechanism was more complicated in the multi-family (and commercial) sector than in the single-family sector. This added complication comes from the credit crumble—the impact of declining real estate values on the capital position of lenders and hence their willingness to lend. The credit crumble is intertwined with all the factors that led to the speculative bubble and bust in these sectors.

Any explanation for the collapse in multi-family construction and the role of the credit crunch in that collapse must start with the building boom that preceded it. In general, three kinds of developments were behind this boom: changes in tax policy, changes in lending behavior and "animal spirits"—a catch-all category for anything that contributes to long cycles in this sector.

The key tax change was the Economic Recovery Tax Act of 1981. ERTA significantly shortened and accelerated depreciation schedules on buildings and added other tax inducements for structures investment. As a result, investors were willing to accept low or negative pre-tax returns on real estate projects, leading to a proliferation of limited partnerships and syndicates. ERTA also encouraged some "churning" of properties by allowing investors to resell and depreciate the same property several times.[22]

The key regulatory change was the Garn-St. Germain Act of 1982. Garn-St. Germain was the outgrowth of problems inherited from the 1970s. Because thrifts traditionally fund long-term assets (mortgages) with short-term liabilities (savings accounts), rising interest rates in the 1970s ate into their capital. In 1975 insured Savings and Loans had a ratio of net worth to assets of 5.8 percent, by 1982 this ratio had fallen to just 3.4 percent and one-sixth of S&Ls had a ratio below 2 percent. To shore up thrifts the law allowed greater participation in the growing real estate loan market by removing rules against certain types of lending, allowing higher loan-to-value ratios, and increasing to 40 percent the proportion of assets that may be invested in commercial real estate. Garn-St. Germain and the Monetary Control Act of 1980 liberalized the rules on rates and types of deposits allowed at depository institutions. At the same time, regulators adopted more lenient accounting rules, allowing some thrifts to remain open despite net worth that by conventional measures was near zero or negative.

There were other related forces that helped build on this boom atmosphere.[23] First, competitive pressures in traditional loan markets forced depositories to either accept lower returns, downsize their operations, or expand into nontraditional areas such as more speculative real estate lending. Second, low effective capital requirements, deposit insurance, and the perception that many institutions are "too big to fail" created "moral hazard" problems, encouraging banks to invest in high-return, high-risk markets such as

[22] See Corker, Evans, and Kenward (1989).

[23] This discussion draws on Litan (1992), Hester (1992), Browne and Case (1992) and Gourkyo and Voit (1993).

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"hot" apartment and commercial real estate markets.[24] The incentive for risk taking was particularly strong at those thrifts that remained open despite low or negative net worth.[25]

Not only was there a willingness to take risk, there was also a tendency to underestimate the magnitude of the risks in real estate investment. A number of academic and professional studies during the period showed that over the period for which data were available real estate had been a consistently high return investment. And, like any speculative bubble the boom tended to feed on itself as investors scrabbled to buy up real estate regardless of economic fundamentals.

Exacerbating the excessive optimism of builders and their financiers was the long gestation period of large construction projects. Since it takes several years to plan and build a new building, once the sector gains momentum it takes time to put on the brakes. Many analysts argue that this helps explain the continued high pace of construction in the several years following the Tax Reform Act of 1986. It also implies that at least some of the sharp decline after 1989 was a delayed reaction to changing conditions in the mid-1980s.

Deflating the Bubble

Credit crunch advocates argue that credit restraints played a key role in the deflation of the bubble. They note that the tightening of lending rules for multi-family (and commercial) real estate was particularly dramatic, more than reversing the loose standards of the 1980s. They argue that FIRREA and FDICIA were particularly punishing to multi-family lending, giving loans to this sector 100 percent weights in the capital standards, limiting loans to any one developer to 15 percent of unimpaired capital, raising required loan-to-value ratios, forcing banks and thrifts to increase loan loss reserves, and prohibiting thrifts from taking direct stakes in real estate investment.

On top of the legislative changes, credit crunch advocates argue that public reaction to the excess of the thrift industry squeezed multi-family investment from two sides: on the one hand, the resolution of failed thrifts steadily removed generous lenders from the market; on the other hand regulators put increasing pressure on the remaining institutions to tighten their credit standards.

Low liquidity in the secondary markets for both mortgage loans and existing structures meant that these pressures on lenders were not easily passed off. Outside of single-family mortgages, real estate loans have been very difficult to package. Although there has been some secondary market activity, it is more an indication of market distress than market liquidity.

Of course credit constraints were not the only source of trouble. The demand for new apartment buildings was affected by four developments:

- First, adverse demographics—the aging of the baby boom—reduced the underlying demand for apartments.
- Second, the Tax Reform Act of 1986 had a chilling effect on the incentive to invest in large real estate projects. It removed the generous depreciation allowances for

[24] The Depository Institutions Deregulation and Monetary Control Act (DIDMCA) of 1980 added to this moral hazard problem by raising the deposit insurance ceiling from $40,000 to $100,000.

[25] Some commentators argue that there was a "lemming problem": as more investors delved into the market it became easier to justify their heavy exposure in real estate markets to their stock holders and regulators. Furthermore, if many financial institutions were heavily involved in the market private risk and systemic risk became increasingly connected, increasing the prospect of a government help in the event of trouble.

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structures and disallowed the tax loophole of using of "passive" losses from real estate investments as an offset to regular income. This effectively ended the widespread use of syndications to finance projects.

- Third, the national recession and the weak growth that both preceded and followed the recession reduced demand for new apartments and lowered expectations of future demand.
- Fourth, the oil price collapse in 1986 and the stock market crash in 1987 not only weakened demand for apartments in two key markets (the oil patch and New York City) but alerted investors to the dangers of speculative investments.

Together these adverse shocks from both the supply and demand side helped set in motion the reversal of the real estate bubble. Once the deflation got under way it fed on itself. Falling prices meant that investors could no longer count on capital gains to make up for any shortfall in income flows on their real estate investments. This, in turn, reduced the demand for real estate putting further downward pressure on prices. Similar logic applies to the supply side of the market. Falling prices cut into the capital cushion of lenders, inhibiting new lending and adding further downward pressure on prices.

Chart 17 uses stylized supply and demand analysis to illustrate three possible interpretations of a typical market for new multi-family structures. (The same analysis will be applied later to commercial structures.) The demand curve is determined by the expected after-tax return to new buildings, which in turn depends on the underlying demand for apartments, the state of the overall economy, the vacancy rate and the tax treatment of investment. The supply curve is determined by the cost of construction and the cost and availability of financing. Note that the supply of new buildings is zero if the rents fall below a level necessary to cover construction costs.

In the recent period, the supply curve shifts up and to the left (to S1) due to the credit crunch. Three interpretations of the demand shift are possible:

(5) For a modest shift in demand (D1), the shocks to supply and demand together contribute to the decline in activity in roughly equal proportion, putting little pressure on prices or other measures of excess demand. This would be an extreme view of credit crunch advocates.

(6) A more dramatic shift in the demand curve (D2) leaves a modest role for the credit crunch. There is a sharp contraction in prices and activity falls close to zero. Without the credit crunch there would have been Q-II of new construction. This is essentially what we test for in looking at indicators of excess demand.

(7) In the third case the demand curve (D3) shifts below the original supply curve (S0). Construction continues on projects with significant sunk costs, but only in special cases are new buildings started. Except for these special cases the credit crunch has no influence on the level of activity, although it could constrain activity if the demand curve rebounded. This represents the extreme argument against a binding credit crunch effect.

As we will show below, depending on the particular market a combination of (2) and (3) occurred.

Weighing the Evidence

Although the data are not as rich in the single-family sector, a variety of circumstantial evidence can be examined to distinguish among the three cases. In particular, if supply restraints were a major factor (that is, Case (1) above) in the construction contraction we

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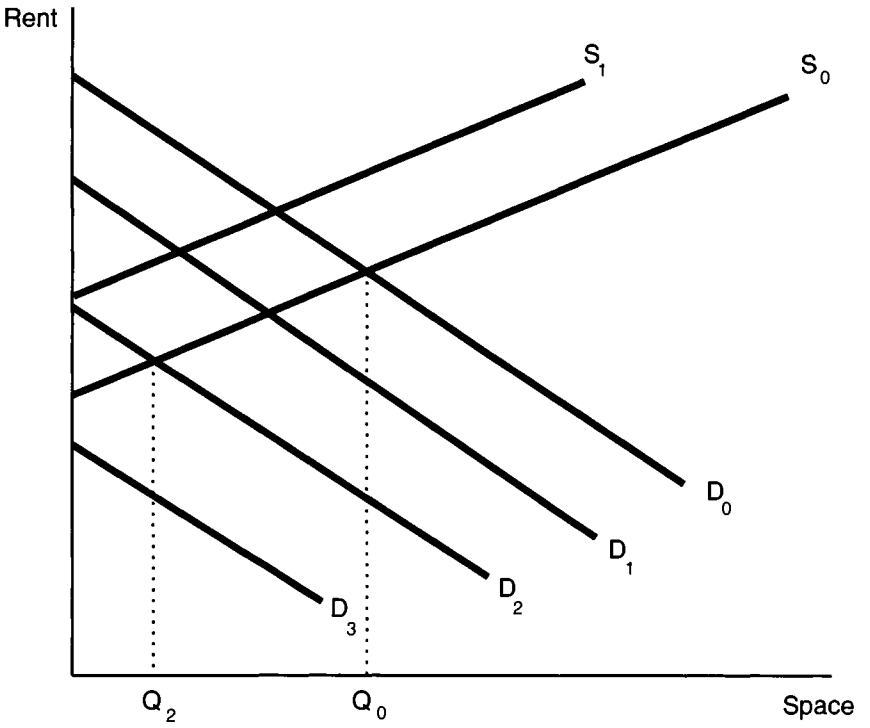
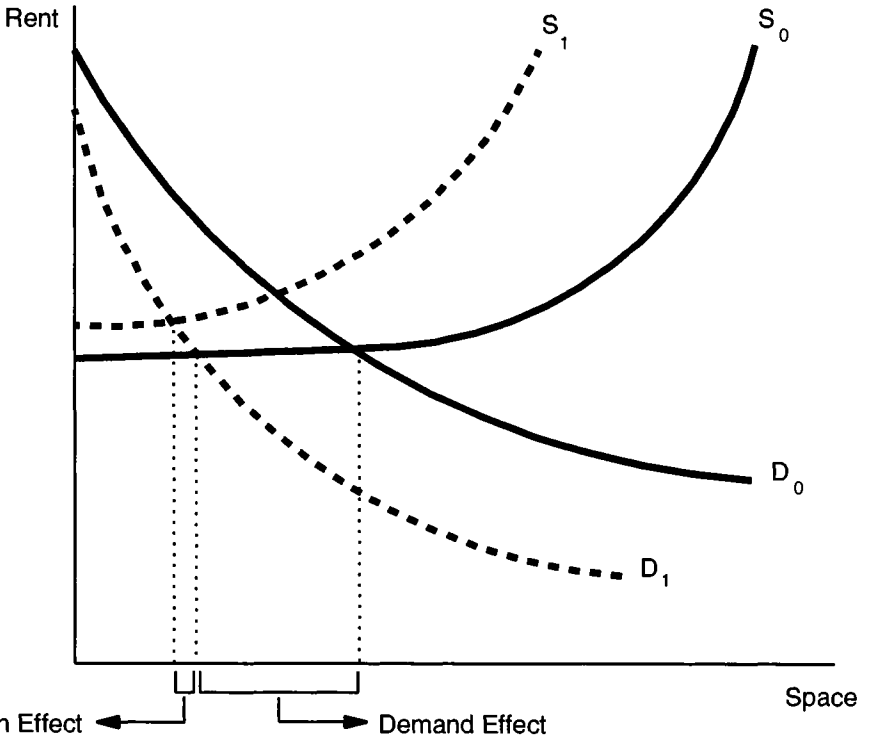
Chart 17: The Market for New Buildings





Note: The second chart gives a more sophisticated interpretation of the market. It assumes that demand for specialized buildings is highly inelastic because it cannot be satisfied by existing structures. The chart assumes the supply curve becomes increasingly inelastic at high levels of construction as lenders worry about excessive exposure to the market. The supply curve shifts up only moderately for the highly creditworthy specialized borrowers.

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would expect at least some downward pressure on vacancy rates, some upward pressure on rents and the prices of apartment buildings, and an easing in loan foreclosures and delinquencies as the surplus of apartments disappears. Furthermore, even if the credit crunch is only a modest factor in the contraction (Case (2) above) we would expect "constrained" lenders to cut back more on loans than "unconstrained" lenders. On the other hand, if the overhang of unused space is the dominant cause of distress in the sector we would expect sharp declines in loans from all sources, continued high vacancy rates despite falling real rents and low levels of construction, falling building prices, and persistently high loan foreclosures and delinquencies.

Multi-family loan activity

Although the credit crumble has presumably affected all major multi-family lenders, most of the regulatory and legal aspects of the credit crunch have been directed at depositories.[26] As in the single-family sector, this gives a lever for testing two key implications of the credit crunch hypothesis: (1) the credit crunch should have forced depositories to cut back lending more dramatically than nondepositories and (2) it should have induced all lenders to reduce loans relative to construction activity—in other words, force builders to put up more of a stake in their projects.

Although, as we noted earlier, the data are quite poor, they generally are *not* consistent with the crunch hypothesis. Chart 16 compares construction activity to construction loans, both expressed in real 1987 dollars. Until the mid-1980s construction loans were consistently below construction activity, reflecting in large part the role of direct (equity) financing of projects (as well as some coverage differences in the series). In 1985 financing surged ahead of activity and has remained ahead thereafter. During the alleged crunch period, there was some narrowing of the gap, but this may reflect the fact that in a weak market the most speculative, highly leveraged, projects tend to be cut first. In other words, despite the efforts of regulators and lenders to tighten loan-to-value ratios, the flow of loans remained high relative to construction activity.

Chart 18 plots the long-run pattern of the depository share of multi-family loans. In the early 1980s a combination of economic recovery and easy tax and lending rules caused a surge in both mortgage and construction loans, especially by depositories. Since the mid-1980s loans have dropped across the board but the share data show no evidence of a differential constraint on depository lending. In the mortgage market the depository share has actually risen during the alleged crunch period and is now above its historical highs. In the construction loan market the depository share was roughly flat during the worst of the crunch (1990-91) and today remains in the high end of historical experience.

As we noted earlier, these data are of dubious quality, so it is important to carefully interpret these findings. In particular, experts note that there may be double counting of construction loans made by commercial banks and their mortgage bank affiliates. Furthermore, some of the increased share of loans at depositories may be unwanted as they are forced to either roll-over loans or push the borrower to bankruptcy. Yet the double counting should work in favor of the credit crunch hypothesis since it should mean a sharper contraction in lending as loans counted twice are no longer made. Whether the loans are wanted or not, the data do suggest a continued flow of funds to the sector.

[26] For example, risk-based capital rules were not adopted by the National Association of Insurance Commissioners until December 1992 and were not slated to take effect until a year later.

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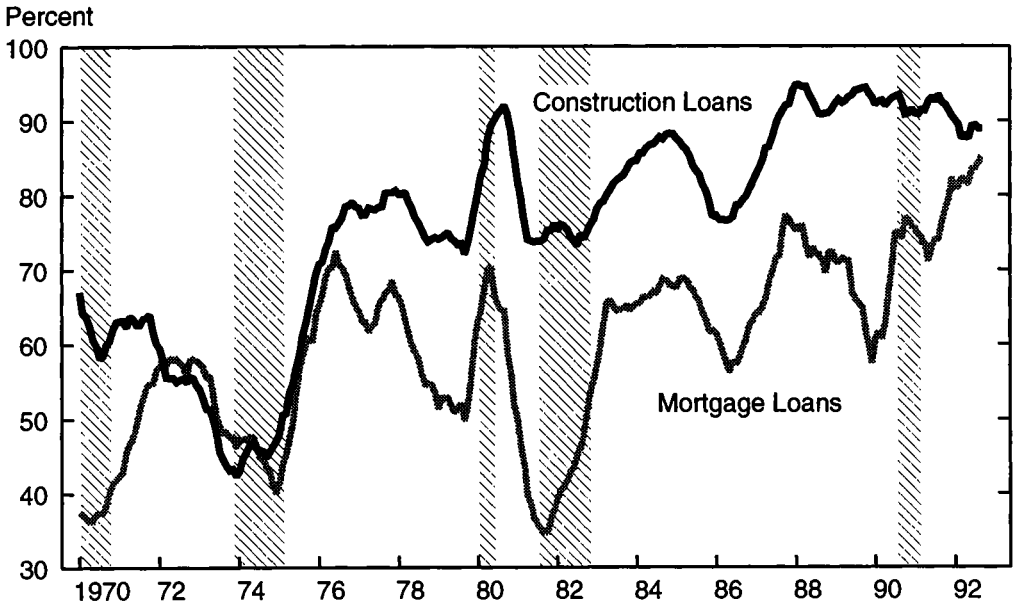
Chart 18: Multi-family Depositories' Share



The Overhang

The argument against a strong role for the credit crunch becomes more persuasive if we look at measures of excess capacity in the multi-family sector. Chart 19 shows how severe and persistent the excess capacity was despite the sharp drop in construction. Starts rebounded from the 1982 recession and despite a steady climb in the vacancy rate starts averaged 650,000 per year from 1983 to 1986. Starts tumbled to 300,000 in 1989, and the vacancy rate began to trend down, suggesting that the sector was moving toward a sustainable medium-term path. With the recession, however, the vacancy rate again began to climb, despite a virtual halt to construction.

A comparison of vacancy rates across building size gives an idea of the important role for tax incentives in the overbuilding. Most of this excess capacity was in the larger buildings most favored by tax shelters. Data from the American Housing Survey shows a downward trend in the vacancy rate for single-family rental units in the 1980s. By contrast, vacancy rates for two-to-four-family units and particularly larger buildings hit unheard of heights. Indeed, after hovering around 4 percent from 1970 to 1983, the vacancy rate for multi-family rentals more than doubled by 1987 and has eased back only slightly since then.

The regional data show the broad geographical spread of the over-building (Chart 20). In the South, already high vacancy rates combined with an oil-price induced collapse in the local economy pushed vacancy rates to record heights, while the national recession interrupted a gradual return to long-run equilibrium. In the West and Midwest, judging from the timing of the construction slowdown, tax reform helped halt a more modest overbuilding. In the Northeast, a severe regional recession prevented any improvement in the supply-demand balance as construction hit record lows. Indeed, had there been *no* construction in the Northeast in 1991 the vacancy rate would still have matched the record rate of the previous year.

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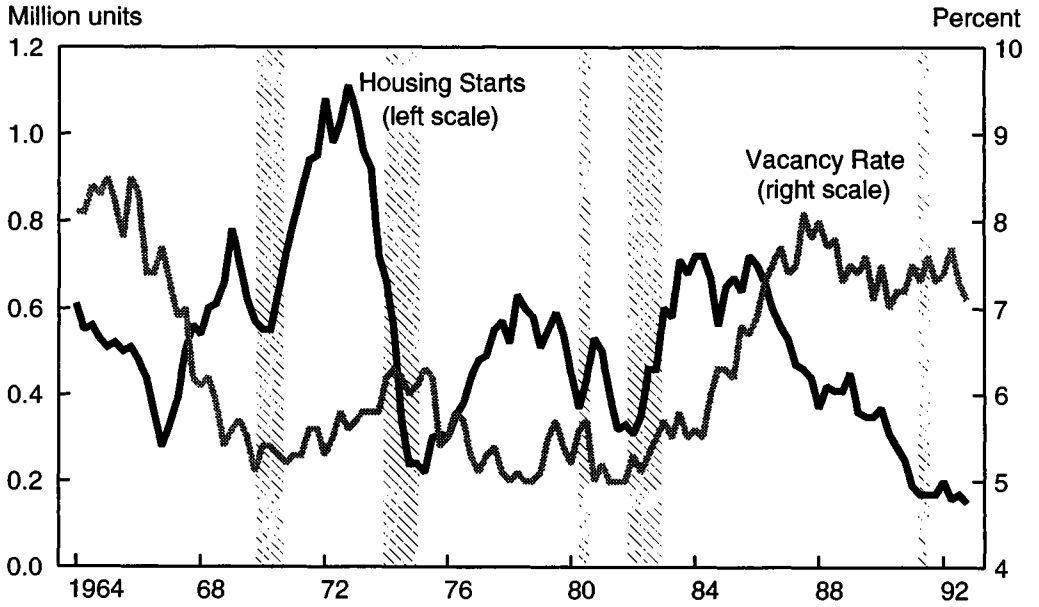
Chart 19: Multi-Family Housing Starts and Vacancy Rate



Note: The vacancy rate data are from the Bureau of the Census, "Housing Vacancy Survey."

Other excess-supply indicators tell a similar story. After turning up in the early 1980s, real rents (deflated by the core CPI) have trended down since 1986. By 1992 nominal rent inflation had fallen to just 2 1/2 percent, its lowest rate since 1968.[27] Mortgage delinquency and foreclosure rates tell a similar story. Both rose sharply in 1986 in response to tax reform and the oil shock in the Southwest. Both have also trended down since then, although they remain high by historical standards.

Model Simulations

One way to illustrate the dominant role of over-supply *vis-a-vis* the credit crunch is through a simple simulation model. The model compares the supply of apartments—determined by new construction and the rate of depreciation of old structures—to the demand for new apartments—determined by demographic trends and trends in average space use—to plot alternative paths for the vacancy rate. (The appendix provides details.) For our out-year projections we assume the depreciation rate remains unchanged and the absorption rate grows in line with reasonable demographic trends. The model is based on data for large apartment buildings, the most overbuilt sector. Table 3 shows the results of three such simulations.[28]

The table underscores the sheer unsustainability of the construction boom. On the one hand, holding construction near its 1992 trough and using realistic demand projec-

[27] Actual rent inflation may have been even weaker because the CPI rent does not fully capture the impact of "teasers" such as rent-free months for new tenants. According to the NAHB, rents for new units fell 5.3 percent from 1991-II to 1992-II, compared to a rise of 3.1 percent for existing units. Although part of the weakness in new rents reflects a composition shift towards cheaper, publicly financed housing, at least some of the drop probably stems from the excess capacity. Finally, since 1988 the BLS has adjusted the rent index for depreciation, adding about 1/2 percentage point to reported rent inflation.

[28] The appendix provides details on the model and the baseline projections.

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tions results in declining vacancy rates, but the projected level still exceeds 6.0 percent in 1997. On the other hand, assuming a counterfactual where construction holds steady in the 1988-97 period (at the 1983-87 average) would lead to a continually climbing vacancy rate even if demand grew at a robust pace of 1.4 percent per year from 1990-97.

The table also illustrates the implausibility of a truly constraining credit crunch effect. Suppose that from 1989 to 1992 the credit crunch reduced apartment construction by $4.0 billion per year. This is about one-fourth of the total peak-to-trough drop in activity for this sector. Further, suppose the absorption and depreciation rates followed their historical patterns. This implies that without the crunch, builders would have continued to find financing despite a 1992 vacancy rate of 12.5 percent. This scenario seems quite implausible when judged by historical patterns. Even in the 1980s, a booming economy, generous tax breaks, and robust apartments absorption could not support vacancy rates at these levels. In other words, it is hard to imagine that lenders could be induced to ignore the warning signal from rising vacancy rates in the late 1980s.

Looking ahead, even the current depressed state of construction will leave the sector overbuilt for years to come. Assuming that apartments are absorbed in-line with demographics and that the 1992 pace of construction continues indefinitely, the vacancy rate will not reach 5 percent until after the turn of the century. Given this dismal prospect, it is easy to imagine an even *lower* rate of construction during the current period.

Chart 20: Apartment Activity by Region

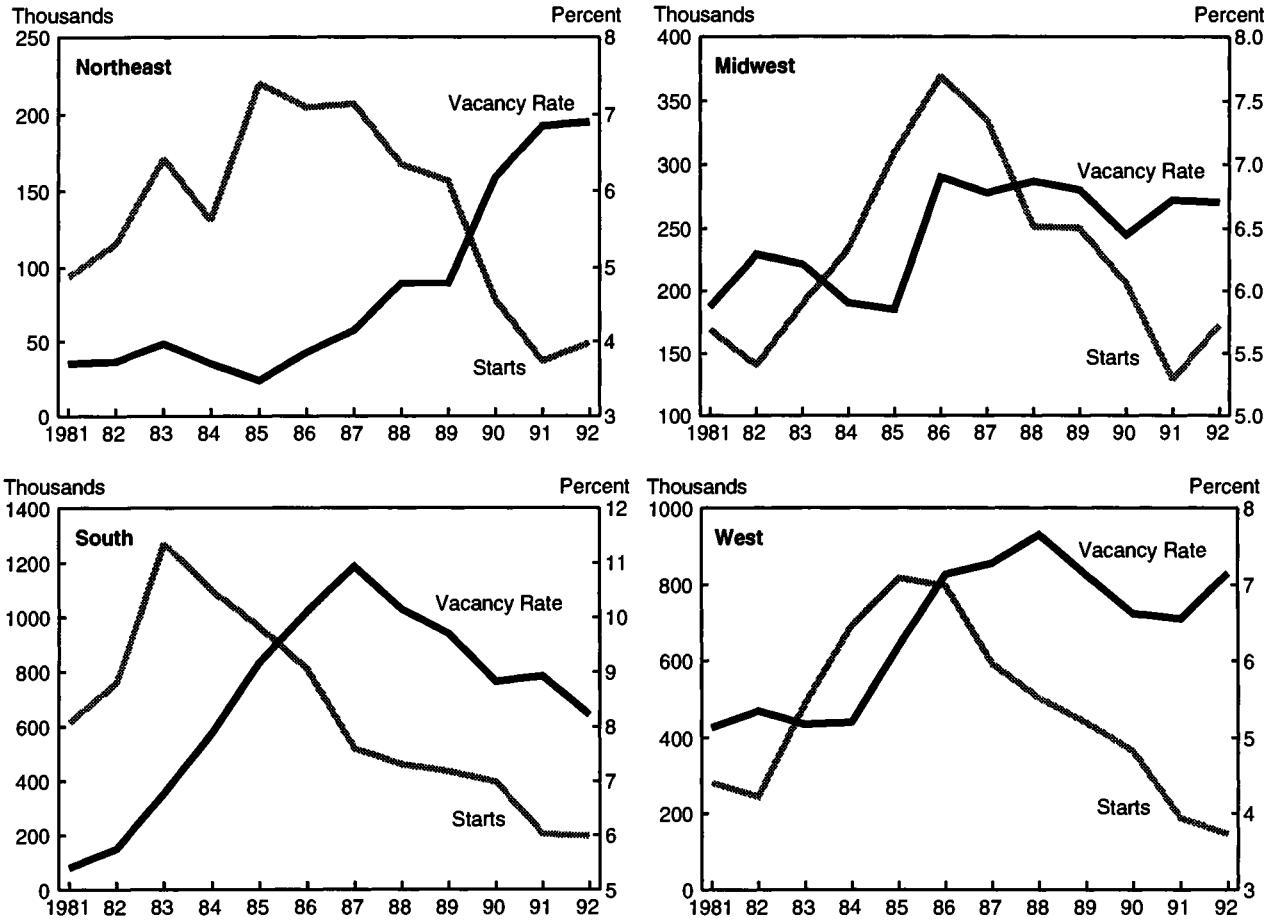

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Table 3: Multi-Family Sector Vacancy Model Simulations

Base Case and Realistic Forecast

	Demand Growth	Absorption	Construction	Vacancy Rate
1977	1.7	17.5	16.1	3.5
1978	1.8	18.1	18.4	3.5
1979	2.3	20.9	21.3	3.5
1980	2.0	20.1	19.3	3.3
1981	1.3	17.4	18.9	3.6
1982	0.9	16.0	17.4	3.8
1983	2.1	21.5	23.3	4.1
1984	1.1	17.4	28.6	6.2
1985	1.4	19.5	31.5	8.3
1986	3.3	28.9	34.0	8.9
1987	1.8	22.9	27.5	9.5
1988	2.4	26.2	24.7	9.1
1989	1.7	24.1	22.3	8.7
1990	1.0	20.5	19.7	8.4
1991	0.2	16.9	15.7	8.2
1992	-2.5	2.9	13.3	10.1
1993	0.6	18.8	14.0	9.3
1994	0.6	18.4	14.0	8.5
1995	0.6	18.6	14.0	7.7
1996	0.6	18.5	14.0	7.0
1997	0.6	18.6	14.0	6.2

Alternative Vacancy Rate Paths

	Optimistic[a]	No Crunch[b]
1988	9.8	9.1
1989	10.4	9.3
1990	11.1	9.7
1991	11.7	10.1
1992	12.3	12.5
1993	12.7	12.2
1994	13.2	12.0
1995	13.5	11.8
1996	13.8	11.5
1997	14.0	11.3

Notes: Base case uses actuals 1987-92. See appendix for further detail about these simulations.

a. Demand growth = 1.4% 1990-97, Construction = 29.0 1988-97

b. Demand growth = base case, Construction = base case + 4.0 Billion 1989-97

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Summary: Multi-family

The evidence suggests that the space overhang dominates any effect from the credit crunch for the multi-family sector. Lending was not weak relative to construction activity during the alleged crunch period. All major lenders who had not already exited the market cut back by similar amounts. Indicators of excess capacity, such as vacancy rates, foreclosures, and prices, continued to erode throughout the alleged crunch period. Although lending standards clearly tightened, it is hard to see that this had a substantive impact on aggregate lending and aggregate construction activity. Even if capital was not impaired (or equity investors were willing to recapitalize lenders) and loan rules were not tightened, it is hard to imagine that construction would have taken a significantly higher path, with a further accumulation of excess capacity.

There may have been some role for a crunch. There is little reliable data on local vacancy rates so we cannot tell whether some markets were credit constrained. It is also possible that in the absence of the crunch, the collapse in construction could have been delayed a quarter or two and might have been a little less abrupt during the national recession. However, the sector is simply too small and the crunch effect had too secondary a role to argue for more than a few billion dollar crunch effect via this sector.

IV. Nonresidential Construction

Introduction

During the last three years, nonresidential construction has been the second weakest sector of the U.S. economy, declining over 25 percent from pre-recession peaks and showing little evidence of an upturn since the overall expansion began in 1991 (Chart 21). As with the multi-family sector, nonresidential construction as a share of GDP reached a record low in 1992 (1.5 percent). On the one hand, this underscores how deep the drop in this sector has been; on the other hand, it shows that the sector is too small to have more than a modest *direct* impact on the overall economy.

The decline in nonresidential construction has been by no means uniform across types of structures. Construction actually increased in the industrial and institutional (religious, educational, hospital and other) sectors. The collapse in activity has been concentrated in three sectors; office buildings, hotels and motels, and wholesale and retail buildings more than accounted for the decline from 1986 to 1991. Together these sectors comprise more than half of nonresidential construction.

Why did these three sectors collapse? As with the multi-family sector, we compare the two principal explanations: overbuilding and the credit crunch. We examine financing trends, forecasts, model simulations and various measures of excess capacity in the nonresidential construction industry. Due to data limitations, much of our analysis focuses on the office sector, but we also bring evidence to bear on the other weak performing sectors.

We find that overbuilding problems were so pernicious and pervasive that they dominate any other explanations for the construction collapse in these sectors. Financial flow data do *not* indicate an unusual constraint on credit from depository institutions. A variety of measures show a large and sustained build up in excess capacity in these sectors. Although the fall in the price of nonresidential buildings has been dramatic, it appears to be consistent with the fundamentals of weak demand. Cross sectional data confirm virtually no metropolitan region had a need for additional office capacity. In other words, virtually all nonresidential indicators suggest that the collapse in construc-

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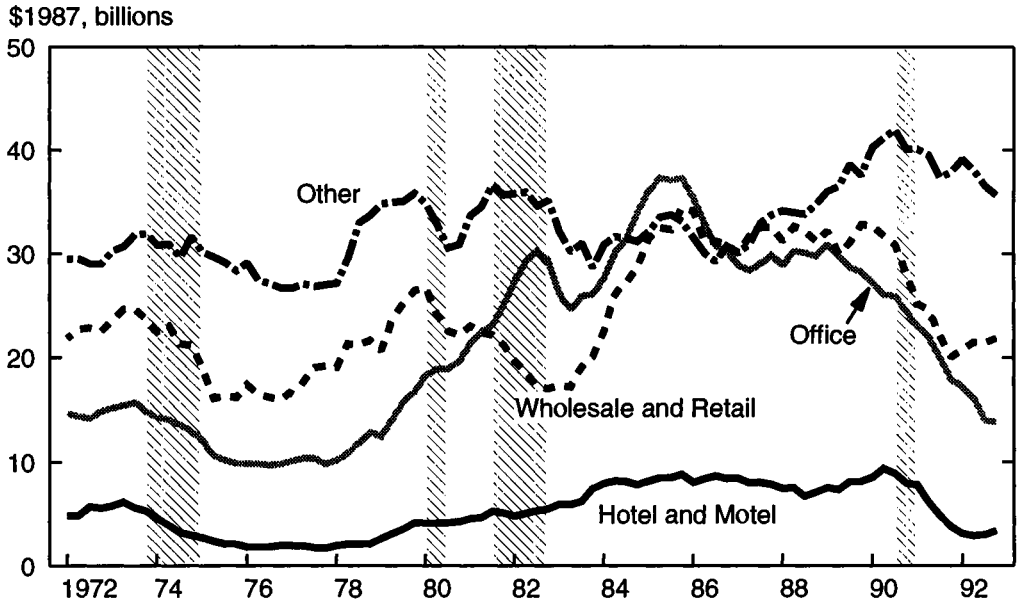
Chart 21: Nonresidential Construction Put-in-Place



Note: "Other" includes Industrial, Religious, Educational, Hospital and Institutional and Miscellaneous building classifications.

tion was a vain attempt to return the market to equilibrium and the credit crunch had, at most, a small influence on the process.

Model simulations confirm this impressionistic evidence. Econometric models fail to demonstrate an unusual shortfall in construction. Simulations of a simple accounting model show that even in the absence of a recession, higher office building was not economically justified during the period of alleged credit crunch.

Given the persistently high vacancy rates of the period, the drop in lending during the period seems to be a symptom, rather than a cause of the collapse in activity. We conclude that the observed decrease in nonresidential construction was reasonable from the perspective of profit maximizing individual investors, was consistent with normal standards of prudential lending, and was desirable from the perspective of efficient resource allocation. In fact, even if nonresidential construction continues to remain depressed, it is likely that there will be an excess supply of space in the three overbuilt sectors for much of the 1990s.

The Nonresidential Boom and Bust

As with the multi-family sector, any explanation of the collapse in nonresidential construction must start with the building boom of the 1980s. As Chart 21 shows, construction in all three key sectors—office, hotel/motel and retail/wholesale—reached record heights in the mid-1980s.

In general, the same forces driving multi-family construction were behind the boom in these sectors, but there were also some particular factors that added to the "froth," especially in the office market. Both the easing of depreciation rules under ERTA and the liberalization of investment rules under Garn-St. Germain were particularly dramatic for nonresidential real estate. Many academic and professional studies of real estate during the 1980s focused on the office market and extrapolated low-risk high-returns

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based on data from a relatively short historical period.[29] In addition, many builders and lenders assumed that new communications technology and other changes in the demands on office buildings would spur demand for new and larger space, regardless of the vacancy rates in older buildings.

Optimism was also fueled by a belief that demand for office space would continue to grow rapidly and would be immune to recession. Even in the double-recession of the early 1980s office employment grew, helping support a sharp increase in office construction. Indeed, as Chart 22 shows, in the typical cycle, office employment has grown rapidly up to the peak of the business cycle, leveled off during the recession and then reaccelerated during the recovery. By contrast, in the current cycle office employment growth was weak going into the recession, declined during the recession and has grown very little during the recovery (even in comparison to the weakness elsewhere in the jobs market).[30]

The collapse in the office market also had some unique elements. At the start of the crunch, the flow of loans to the nonresidential sector was several times larger than loans to the multi-family sector. Not surprising the losses from nonresidential loans and the resulting damage to capital was larger as well. One estimate has write-offs by U.S. banks for commercial real estate loan losses from 1989-91 amounting to $18 billion. "Other Real Estate Owned" by commercial banks grew from just 14 billion in 1989 to 28 billion in 1991.[31] Nonbank lenders suffered as well: by 1992 foreclosure rates for commercial mortgages at life insurance companies had reached 3 1/2 percent, more than double their mid-1970s peak.

The Case for a Credit Crunch

A strong case can be made that credit standards tightened in the nonresidential sector. A variety of surveys and testimonials argue that individual projects to meet special needs and in markets that are not overbuilt were starved of funds due to the credit crunch. Starting in 1990 the Senior Loan Officer survey has included questions on real estate investment. Although the responses have steadily moderated over time, it is well known that a large proportion of the lenders tightened lending standards.

Credit crunch advocates also point to the sharp collapse in credit flows (Chart 23). They first note that mortgage flows have fallen only modestly, but that this may be due to financial institutions being forced to either refinance short-term construction and mortgage loans with new mortgages or face defaults by their borrower. They then point out that construction loans, which are more reflective of the supply of funds to the market, have contracted much more rapidly than construction activity. From the first quarter of 1990 to the middle of 1991 construction loans were slashed by over half, while construc-

[29] For example, Browne and Case (1992) concluded that commercial construction, especially for office space, is inherently cyclical and "the cycle of the 1980s was magnified by tax and institutional changes and by a conviction—shared in by developers, banks, the academic community, and the general public - that real estate was a high-return, low risk investment."

[30] This optimism is understandable given the unpredictability of this sector. The consensus forecast as late as the fall of 1991 was for a sharp reversal of the previous year's decline, followed by a gradual mending process. It was only in 1992 that the prognosis shifted to a long convalesce, with little prospect of a complete recovery. The large and persistent errors by forecasters, using both models and judgment, suggests that fundamentals do not adequately explain major swings in construction. Although the vacancy rate looked dangerously high, there were few other warning signals— in terms of weak prices, illiquidity in resales etc.—that a bust was around the corner.

[31] Based on a survey by the *American Banker.*

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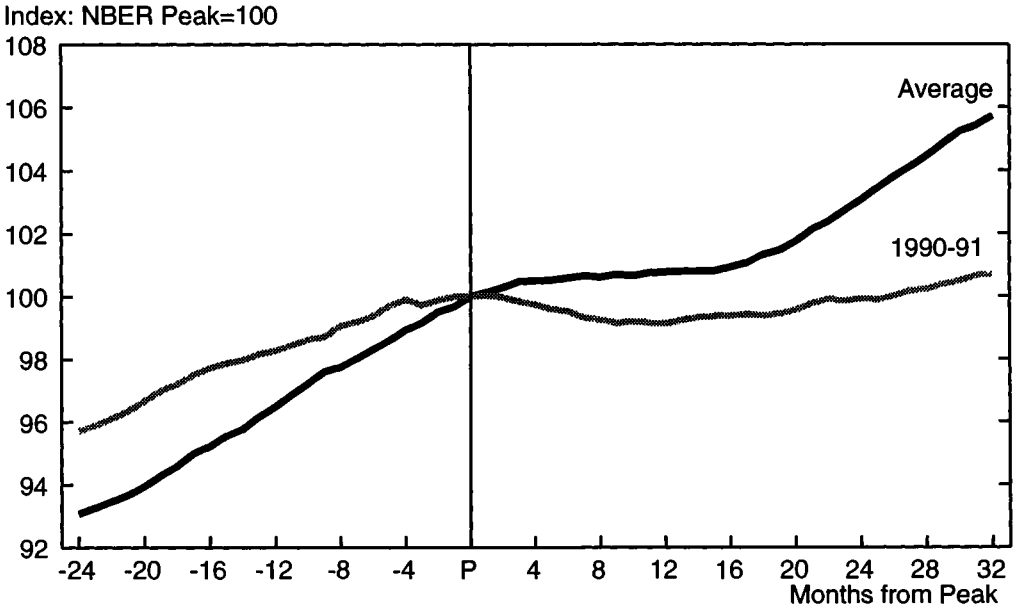
Chart 22: Office of Employment at Business Cycle Peaks
Employment Levels



Note: Average of 1960, 1969, 1973, and 1982 business cycles.

tion activity fell by less than a quarter. Putting these three pieces of circumstantial and anecdotal evidence together—the complaints from borrowers, the pressures on lenders and the contraction in credit—builds a plausible case for a binding credit constraint.

The Case for Overbuilding's Dominant Role

Overbuilding advocates see the other side of the coin in some of the crunch arguments. They argue that like the multi-family sector, effective demand has fallen so dramatically that in many markets only specialized new projects can yield an expected return sufficient to justify construction. In other words, in these markets the effective demand curve has shifted below the minimum point of the supply curve, as in Case (3) in the previous section. They argue that the anecdotal and survey evidence reflects not only tightening of lending standards relative to the high-flying 1980s, but also the failure of some borrowers to fully recognize that their creditworthiness has declined. The same project that was creditworthy in 1985 may not be creditworthy in the current period of less generous tax breaks, high vacancy rates and declining demand for space. They point out that the sharp drop in credit flows is consistent with the idea that the cutback in lending would be concentrated in the most speculative, highly leveraged projects.

Four kinds of evidence argue against a significant role for the credit crunch: financing patterns, indicators of excess capacity, cross-sectional vacancy rate data and model simulations.

Financing Patterns

Under close examination, patterns in financing do not support the credit crunch story. In particular, we find that depository institutions did not show signs of abnormal lending constraint. All types of lenders, both regulated and nonregulated, cut back sharply on

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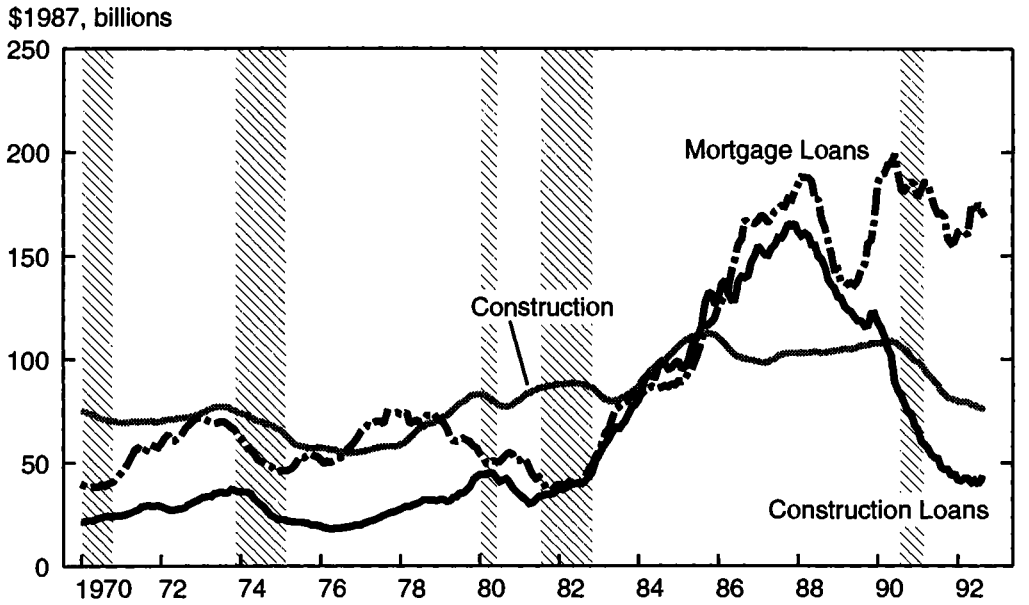
Chart 23: Nonresidential Real Estate Financing and Activity



their loans to the nonresidential real estate sector. It is possible that this reflects different kinds of credit restraints that were equally binding for all major lenders. More likely, however, it reflects a common factor—such as overbuilding or the recession—which affected the markets for all classes of lenders equally.

At first sight, the aggregate data appears consistent with an easing of credit followed by a tightening such that the "normal" gap between construction activity and loans has been reestablished (Chart 23). When the data are desegregated into depository and non-depository loans, however, the credit crunch hypothesis is rejected by the data. While construction loans from depositories have tumbled dramatically, they have virtually disappeared for other lenders and the depository share is now near its all-time high (Chart 24). Similarly, depositories have seen their share of mortgage loans scale new heights during the alleged crunch period. Of course, non-crunch factors may have offset the crunch effects and these data are not very reliable;[32] nonetheless, with every type of non-depository (Life Insurance Companies, Mortgage Companies and Pension Funds) cutting back on loans as much or more than every type of depository (Commercial Banks, Savings and Loans and Mutual Savings Banks), one has to question this aspect of the credit crunch hypothesis.

Excess Capacity

While the lending patterns across institutions are suggestive of a demand-induced drop in construction, indicators of excess capacity are conclusive: the constriction in the supply of credit to nonresidential structures was rendered more or less irrelevant due to the dramatic drop in demand for new space.

Chart 25 puts the high pace of office building in the mid 1980s into an historical perspective. Here, we graph the office stock per office employee and the downtown vacan-

[32] For example, mortgage companies cut back in part because banks curtailed lending to them.

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Chart 24: Depositories' Share of Nonresidential Loans

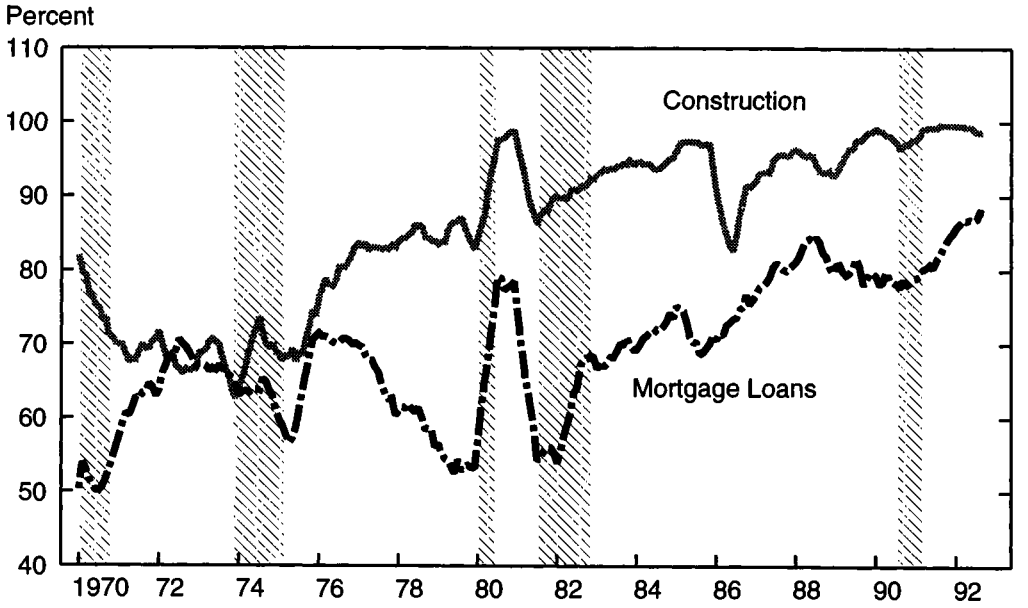
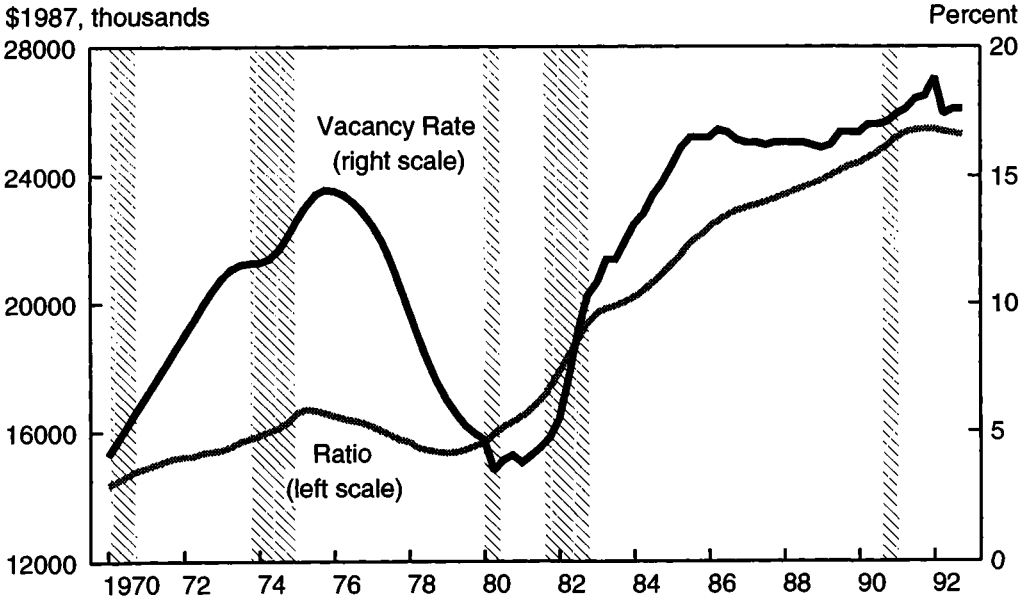


Chart 25: Office Stock to Employment Ratio and the Office Vacancy Rate



Note: Vacancy data from Coldwell Banker. Office employment is calculated by applying Torto/Weaton weights to major employment sectors. See text for details.

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cy rate.[33] The pattern is clear. In the 1980s, office construction steadily outpaced office employment growth, driving up the ratio of space to employment. The rising vacancy rates show that most of the additional space was not being absorbed, yet developers continued to build. Even with the collapse in construction in the past two years, neither ratio has declined to more reasonable levels.

The data available for the hotel/motel sector suggests a similar, and longer lasting, excess capacity problem. As Chart 21 illustrates, hotel/motel construction was twice as high in the 1980s as in the 1970s. In the face of this construction boom, the occupancy rate trended down throughout the 1980s, both in the boom periods of 1983-84 and 1987-89, and in the periods of weakness. In 1991 the occupancy rate fell to 60 percent, the lowest level in the history of this series, compared to the range of 62 to 66 percent in the 1980s.

Similar detail on other types of nonresidential space is not available, but the consensus view of industry analysts is that these markets are also suffering from severe excess capacity problems. Chart 26 shows construction flows hit new highs as a share of GDP in the mid and late 1980s for the office, retail/wholesale and hotel/motel sectors. Despite the subsequent decline in new construction, the stock of space continued to climb for all three sectors. The chart also shows that the building stock as a share of GDP rose through 1990, and then eased only slightly in 1991. Some of this rise undoubtedly reflects a desirable long-run process of capital deepening, and some may represent the need for more space to accommodate new technology in offices and increased product diversity at retailers. Much of the added space, however, appears to have little economic justification.

Price Data

Although there is little reliable data on nonresidential real estate prices, anecdotal evidence and expert opinion paints a clear picture. A wide range of news reports suggest that both the RTC and financial institutions have been selling properties at about a 50 percent discount.[34] Of course, most of these sales are for relatively distressed properties. In early-1992, Prudential Securities calculated the average decline in office building prices to be 17 percent since 1991 and predicted further declines of 8 percent.[35] Back of the envelope calculations by Browne and Case (1992) suggest a greater drop in prices is consistent with economic and tax fundamentals. Looking at a typical office building, controlling for changing tax effects and using reasonable assumptions of rental and vacancy rates, they show that declines of over 50 percent from mid-1980s values are reasonable. This suggests that the observed price declines can easily be justified by economic fundamentals. More important it confirms just how dramatic the drop in effective demand has been, and how plausible it is to assume that the demand curve now lies below the break-even point for new construction.

Cross-sectional data

Until this point we have focused on data for the nation and broad regions. Of course, real estate markets are inherently local in nature, segmented both geographically and by

[33] Coldwell Banker has collected data on suburban office vacancy rates only since the mid-1980s. Suburban vacancy rates have hovered above 20 percent for their whole history.

[34] See, for example, Barsky (1992), Kleege (1992), and Schmidt (1992).

[35] Corcoran (1992).

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type of structure. Therefore, although *on average* commercial real estate is clearly overbuilt, it is still possible that some markets are not severely overbuilt, leaving room for localized credit crunch effects. With this in mind, Chart 27 presents a scatter plot for 44 Metropolitan Statistical Areas. Presumably for any given market if vacancy rates are already low or are falling rapidly there may be room for additional construction. The chart plots the 1988 vacancy rate against the 1988-91 change in the vacancy rate for each area.[36] As a frame of reference the unshaded area on the chart encompasses cities with vacancy rates of 10 to 20 percent in 1991. The chart shows, for example, that the

[36] 1992 data was not available at the time of this analysis. Judging from the more up-to-date, but more aggregated, national data adding another year would not change the conclusions.

Chart 26: Nonresidential Investment as a Share of GDP

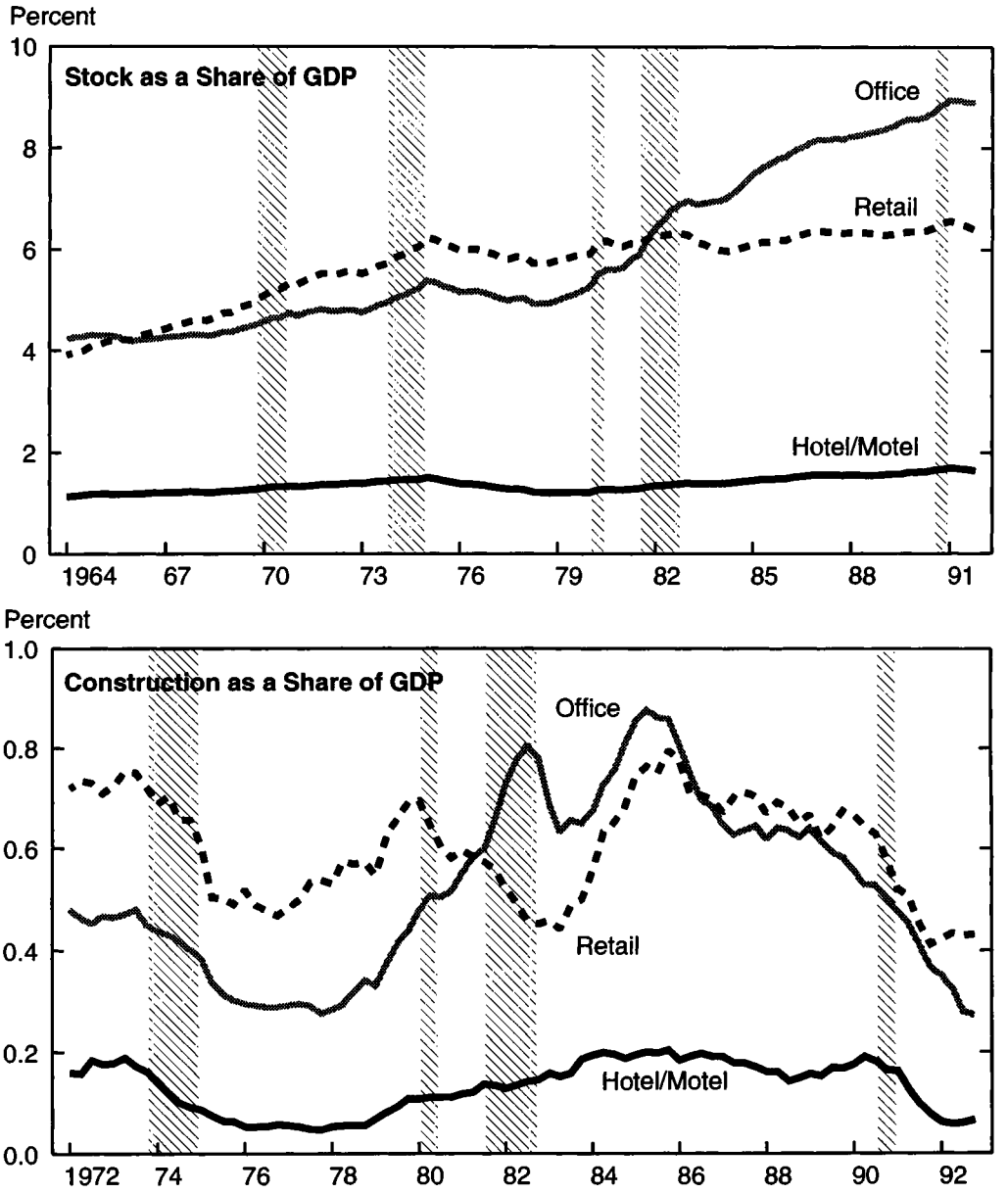

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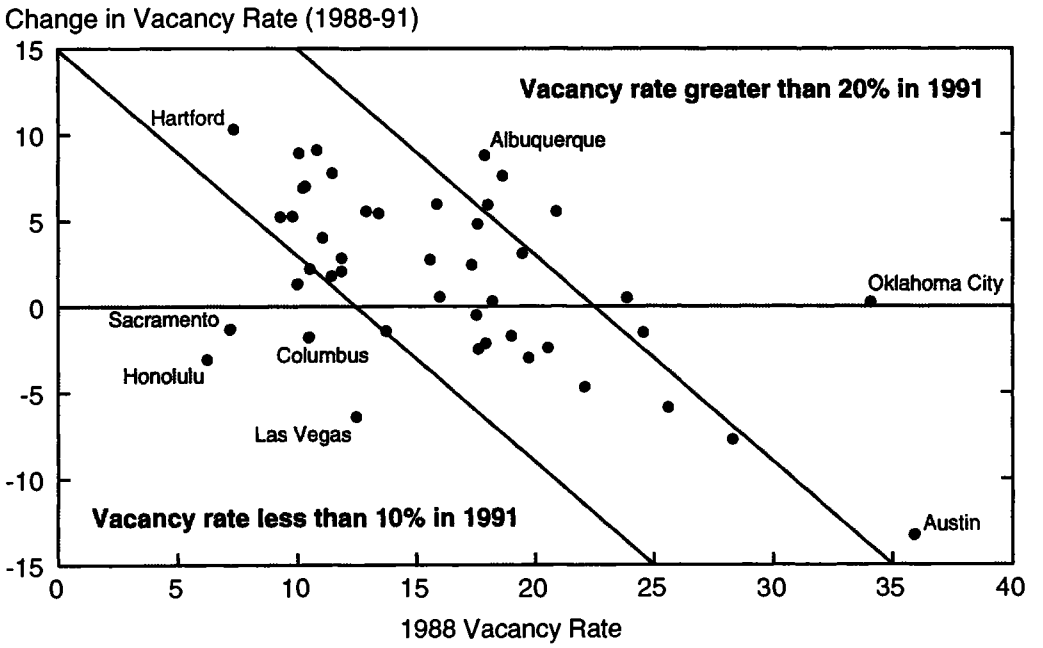
Chart 27: Vacancy Rates by Metropolitan Area



Source: Coldwell Banker

vacancy rate for Hartford was about 8 percent in 1988 and rose about 10 percentage points over the next three years. To put this in perspective, this compares to the average national vacancy rate of about 10 percent in the 1970s.

As you would expect the scatter plot slopes down to the right: cities with high initial vacancy rates tended to lower them and vice-versa. More importantly, the chart shows just how few markets had room to build in the 1988-91 period. Only four cities—Sacramento, Columbus, Honolulu and Las Vegas—had reasonably low (below 11 percent) and falling vacancy rates. Beyond these four cities, its hard to see where the credit crunch could have constrained new office construction.

Model Simulation Results

As with residential construction, model simulations can give us a sense of whether a "nonfundamental" factor such as a credit crunch was depressing nonresidential construction. We first explore formal econometric models and then turn to a simple vacancy rate model.

Econometric Models

The first equation we looked at was the specification for total nonresidential structures investment that is used in the MPS macroeconometric model. We then attempted to develop an improved equation that utilizes error-correction (ECM) concepts and apply it to office construction only.[37] The in-sample fit of the model was quite good, explaining

[37] In the MPS model polynomial distributed lag (PDL) techniques relate past levels of business output and capital costs to current levels of construction. The use of a PDL is based on a Jorgenson investment function where there are lags between changes in fundamental conditions (the level of business output and capital costs in this case) and construction. The ECM framework explicitly incorporates long-run factors by

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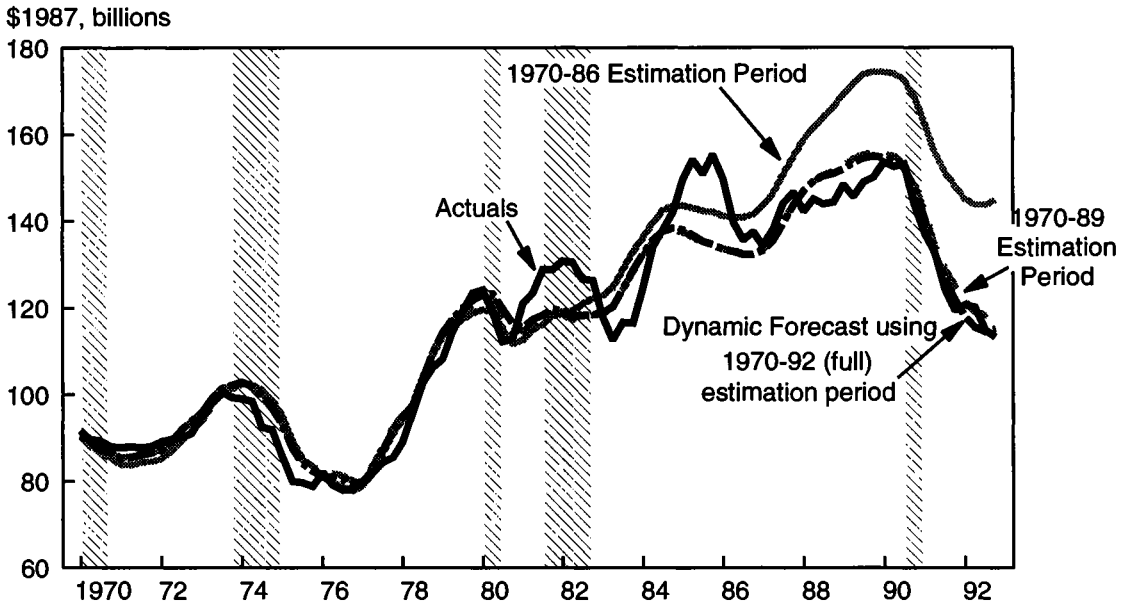
Chart 28: Nonresidential Structures Investment Revised MPS Model Results



about 98 percent of the variation in the ratio of investment to capital. Unfortunately, the simulation results were quite sensitive to changes in the sample period. This problem of poor out-of-sample results is common in nonresidential models and helps explain why industry analysts did not provide early warnings to the overbuilding and high vacancy problems.[38]

Chart 28 shows predictions from the MPS equation when estimated over three different sample periods: the full sample (1970-1992), the pre-tax-reform period (1970-1986), and the pre-crunch period (1970-1989).[39] All three equations yield substantial positive errors in the early and mid 1980s, confirming the overbuilding hypothesis. The three simulations yield conflicting results for the current period: the 1970-86 version predicts a sharp decline in construction, but not as deep as the actual collapse; on the other hand, both other versions track the recent period quite closely. Although these results cast doubt on the credit crunch hypothesis, the generally poor fit over the 1978-1982 period and the sensitivity of the results to the sample period chosen point out the danger of drawing strong conclusions from this modelling and forecasting exercise.[40]

Footnote 37 continued
first fitting a trend line to the stock of buildings. A second equation models construction, using both the effect of trend reversion forces that are based on the results of the first step (the error-correction adjustment) and additional short-run factors to explain cyclical fluctuations.

[38] See Kopcke (1993) for evidence that conventional investment models fit structures construction substantially worse than they fit equipment spending.

[39] Using data only from the partial sample is useful because it allows us to compare out-of-sample results to in-sample fits. All three full period forecasts were created using a dynamic process that fully simulates the dependent variable. For this model, the dynamic forecasts do not include AR(2) effects that are included in the estimated equations since calculation of the error terms requires knowledge of the actual dependent variable.

[40] More formally, diagnostic tests showed that both equations are subject to instability problems.

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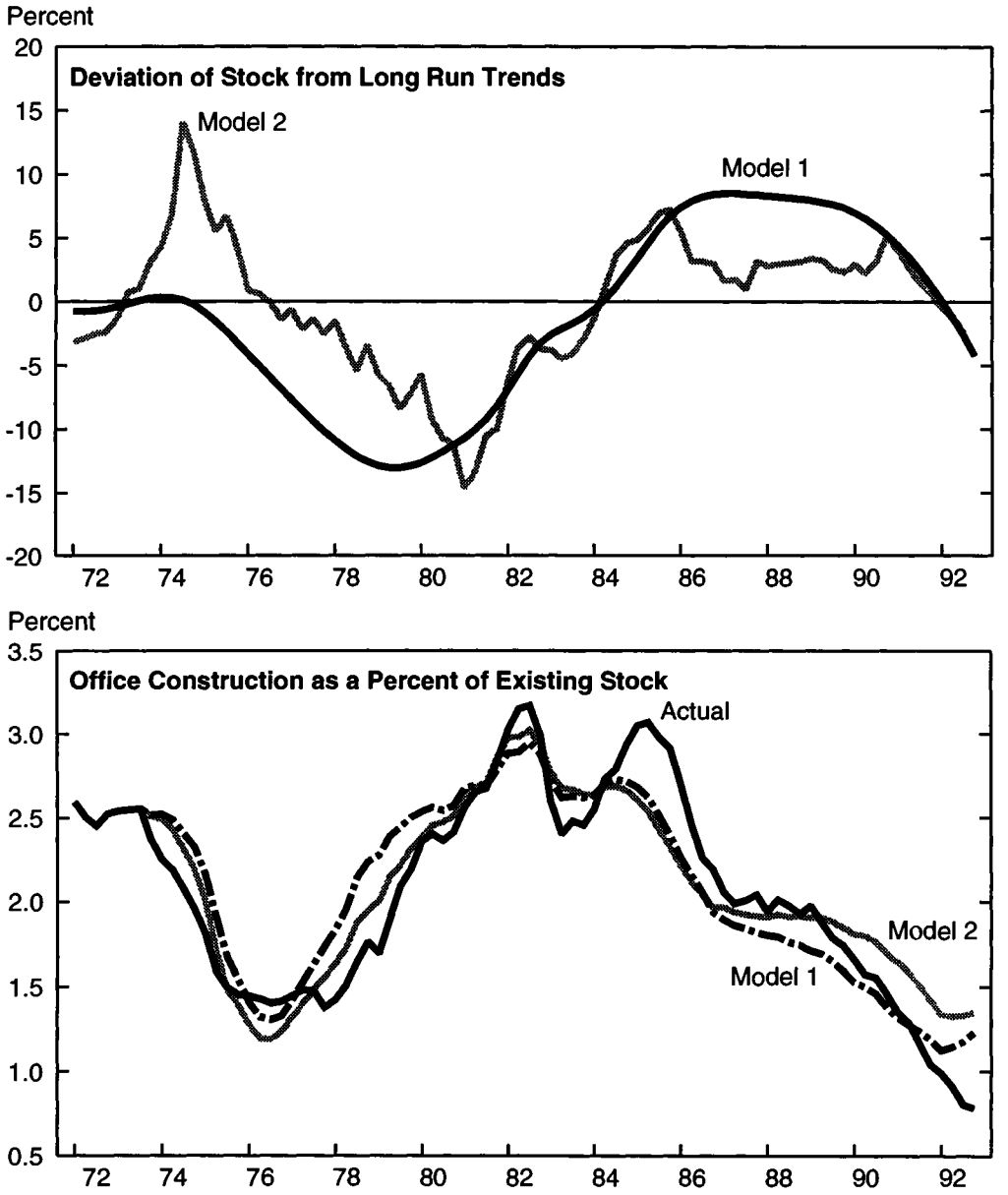
Results from ECM specification for office building construction also seem to confirm the overbuilding story. The top panel of Chart 29 shows the error term from two different specifications. The first simply fits the stock of office buildings to a time trend. The second fits the stock of office buildings-to-employment ratio to a time trend and the MPS business cost of capital measure.[41] Both equations attempt to capture the trend in the stock of office buildings and yield similar patterns for the deviation of actuals from trend. The bottom panel shows the results from using these trend deviation terms in

[41] Because of multicollinearity, including both a time trend and (unrestricted) office employment as explanatory variables led to unstable parameter estimates.

Chart 29: Error Correction Model for Office Construction



Note: Model 1 employs a long run equation between office stocks and a time trend. Model 2 employs a long run equation between stock per office employee, a time trend, and the MPS cost of capital.

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modelling short-run construction movements with an equation (along with some short-run factors in an ECM framework that is consistent with the long-run trend assumptions).

Both long-run equations point out overbuilding in the 1980s, as seen by positive deviations between the actual stock and the trend level. The errors turn negative by 1992, however, implying a shortage of office space. This conclusion is at odds with the high vacancy rates discussed earlier and stems from a very strong time trend effect. Experimenting with different model specifications and trying various explanatory variables, we found that a pure time trend effect dominates the office stock series and the results are quite sensitive to whether breaks in this time trend is allowed. In particular, the surge in construction in the mid-1980s—whether due to speculative excesses or a real need for space—greatly affects estimates of long-run trends and therefore any conclusion drawn from the model. As with the MPS model, the sensitivity of these results calls into question any conclusion from this part of the model.[42]

Despite problems with interpreting the long-run equations, the short-run equations track office construction reasonably well. In particular, both track the peaks and troughs in the dependent variable quite well, explaining about 95 percent of the movement in the dependent variable. The only additional explanatory variables, besides the error-correction term, are changes in business output, changes in capital costs, and the office vacancy rate. The results in Chart 29 show that a decline in construction is consistent with these fundamental forces, such that no additional "X factor" such as the credit crunch is needed. However, because the estimated deviations from trend turned negative, an upturn in 1992 is predicted by both models. We believe these prediction errors are due to overly optimistic trend lines, not credit-crunch effects.

Vacancy Rate Model

Given the estimation problems, it is difficult to draw conclusions from the formal econometric models. To get an idea of the magnitude of overbuilding and its implications for new construction, we created a simple accounting model for downtown office space that uses observed depreciation rates and the historical relationship between office space in use and office employment growth to simulate vacancy rate paths under various economic assumptions for the construction and absorption of office space. (This model is very similar to the vacancy rate model for multi-family housing discussed in Part III and is also described in the appendix.) For out-year projections, the depreciation rate remains unchanged and office space per employee grows at a modest rate of 1.3 percent per annum. Table 4 shows the results of three such simulations.

The table begins with our "baseline" scenario. In this case, the vacancy rate falls to 8.4 percent in 1997 after rising to the unprecedented level of 17.8 percent in 1992. This simulation assumes no rebound in construction and the growth in office demand is equal to population growth—in other words, no cyclical recovery in either demand or supply. Looking back on the 1989-92 period, the baseline shows that the sharp drop in office construction was swamped by an even greater decline in demand, resulting in a rising vacancy rate. Looking forward, it shows that even at the current pace of construction it will take four years to get the vacancy rate under 10 percent—a reasonable estimate of the maximum long-run sustainable vacancy rate. This suggests that the actual plunge in office construction has put the sector back on a path toward long-run equilibrium.

[42] The sample period is not large enough to exclude the 1980s and then adequately estimate and run an out-of-sample simulation.

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Table 4: Office Sector Vacancy Model Simulations

Base Case and Realistic Forecast

	Demand Growth	Absorption	Construction	Vacancy Rate
1977	4.7	11.6	11.6	0.0
1978	-3.3	2.4	13.8	6.2
1979	7.3	21.1	18.3	4.5
1980	8.2	24.2	23.4	3.7
1981	8.3	26.4	28.3	4.3
1982	6.7	25.0	35.3	8.0
1983	3.5	19.6	31.1	11.6
1984	6.6	28.0	37.5	13.9
1985	7.6	32.8	44.5	16.1
1986	6.8	33.2	38.8	16.6
1987	6.0	33.1	35.1	16.3
1988	5.3	32.7	36.0	16.3
1989	4.9	33.2	36.3	16.3
1990	2.8	27.4	32.1	16.8
1991	0.8	21.5	25.3	17.5
1992	-0.5	17.2	18.7	17.8
1993	2.1	26.6	18.7	16.0
1994	2.1	26.5	18.7	14.2
1995	2.0	26.6	18.7	12.4
1996	2.2	27.2	18.7	10.5
1997	2.3	27.7	18.7	8.4

Alternative Vacancy Rate Paths

	Optimistic[a]	No Crunch[b]
1988	18.1	16.3
1989	19.2	16.3
1990	19.7	17.2
1991	19.9	17.8
1992	19.6	17.6
1993	18.9	17.3
1994	18.0	16.9
1995	16.8	16.4
1996	15.3	15.8
1997	13.5	15.2

Notes: Base case uses actuals 1987-92. See appendix for further detail about these simulations.

a. Demand growth = 5.3%, 1988-97; Construction = 44.5, 1988-97.

b. Demand growth = 2.1%, 1991-97; Construction = 36.0, 1988; 36.3, 1989; 34.0, 1990; 30.7, 1991; 27.2, 1992-97.

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The other scenarios in the table underscore the sheer unsustainability of the construction boom of the 1980s. For example, if we assume that the rapid demand growth of the mid-1980s (which averaged 6.5 percent in the 1983-88 period) continued and that construction levels were kept at their 1985 peak, the vacancy rate would have ballooned to 19.9 percent in 1991 before trending down. Extending the employment boom forward, the vacancy rate would not have fallen below 10 percent until the turn of the century.[43] The second alternative assumes a constraining credit crunch that can be illustrated as follows. First, suppose that the credit crunch accounted for half of the decline in construction from 1989 to 1992. Further, assume a middle-of-the road path for office employment growth after 1988 that is equal to the growth in the working age population. Together this no-crunch, no-recession scenario results in a vacancy rate of 17.6 percent in 1992, which is close to the actual rate of 17.8 percent. However, holding construction constant from 1992 on, the vacancy rate would still be above 15 percent in 1997. Given the current tax environment and reasonable investor expectations about the likely return to investment, it is hard to imagine such a large, persistent and voluntary accumulation of unused capacity.

Summary: Nonresidential Construction

In concluding this section it is important to be clear about the limits of the evidence we have presented. First, although the loan data suggest no special constraint on depository lending to this sector, this may reflect equally strong credit restraints for all lenders. Our judgement, however, is that this argument is not compelling because many elements of the credit crunch, including most of the legislative and regulatory actions of the period, were specifically aimed at depository institutions. Second, while it appears that excess capacity was so great that a collapse in construction was inevitable, the overbuilt sectors had "lived with" this excess for some time, even after the shock of tax reform. It may be, therefore, that the credit crunch played a key role in the timing of the collapse. Again, it is our judgement that changes in market fundamentals—tax reform, the unexpected weakness in service jobs, the recognition of the severity of the excess capacity and the likely low return to investment—were sufficient to trigger the collapse in construction. In the absence of credit constraints the collapse might have been delayed a few quarters, but it might have been even more severe.

None of our arguments about the modest impact of the credit crunch on new construction contradicts the notion that real estate problems caused considerable collateral damage—both literally and figuratively—to other sectors. All of the factors that drove down real estate prices helped damage both the capital of lenders and the loan collateral of borrowers. With few creditworthy new building projects available this "credit crumble" probably had little impact on the overall construction industry. We cannot deny that it may have had a major impact on borrowers in more creditworthy sectors of the economy, however.[44]

[43] The situation may be worse than the reported data suggest. Throughout the 1980s the "absorption" of office space consistently outpaced the growth in office employment. In the first half of the 1980s this upward drift probably reflected a desired trend to spend more on space per employee. After tax reform, however, the excess space built probably began to reflect unwanted space that was still under rent (and therefore "occupied") but not in actual use. If all of the growth in space per worker after 1986 is counted as unused, the "true" vacancy rate in 1992 would be more than 25 percent!

[44] Even here we need to be careful about how much "blame" we ascribe to the credit crunch. A large part of the drop in real estate prices was due to the noncrunch factors we have been discussing. The resulting "capital crumble" is the *proximate* cause of the drop in lending and economic activity; but the *ultimate*

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IV. Conclusion

In concluding it is useful to pare down the wide range of evidence and focus on a few key findings. For the single-family sector we find that the weakness in construction cannot be easily explained by housing fundamentals. A close look at a range of indicators—such as the inventory of homes for sale and data on credit flows and credit terms for different segments of the market—however, fails to uncover any sign of a credit crunch. Since there are several other plausible explanations for the housing shortfall—debt retrenchment, less sanguine home price inflation expectations and competition from the glut of apartments—there is little reason to believe in a strong credit crunch effect.

The argument for multi-family and nonresidential construction is more complicated. In many respects these sectors were at the heart of the credit crunch: many of the legislative and regulatory changes were made in response to excesses in these sectors. Yet, we find compelling reasons to believe the credit crunch did not have a binding impact on new construction in many of these markets. Excess capacity was so widespread geographically, so resistant to declining construction and seems so likely to persist (given the weak demand prospects) that it is hard to imagine a higher path for construction during the crunch period. To complete our crime investigation metaphor, the credit crunch may have put a bullet into the heart of the real estate sector, but it had already been bludgeoned to death by a combination of excess capacity, adverse changes in tax law, weak demand fundamentals and, because of all of the above, negative investor expectations.

The evidence does not rule out some limited credit crunch effects. The collapse in real estate prices probably caused considerable collateral damage to other sectors of the economy. In the single-family sector credit restraints on smaller builders may have modestly depressed overall construction. In addition, the lack of a well-developed secondary market for "jumbo" loans may have caused a small increase in the interest rate spread for those kinds of mortgages. In the multi-family and nonresidential sectors credit restraints may have sped the adjustment to excess capacity, and there may have been a few metropolitan areas or special markets where overbuilding was not a problem, leaving room for binding credit restraints. The data simply are not rich enough to rule out these possibilities.

As a final note, this paper's principle findings of a small role for the credit crunch and a large role for excess capacity has important policy implications. In reviewing the policy options we start from the premise that the primary challenge is to ease the short-run adjustment problems from excess capacity, without adding to that excess capacity. By this criteria, an easing of tax and credit rules would be counterproductive. Tinkering with the tax and regulatory code will not have a meaningful near-term impact on new construction and any easing of the rules which would be sufficient to revive commercial and multi-family construction would only divert more investment into economically unproductive uses. Even in the single family sector, where there are not large visible vacancy rates, it is hard to justify new tax or regulatory incentives. After all, this sector is already heavily subsidized due to the deductibility of mortgage interest and various programs to support mortgage markets. In this light, the apparent efforts of households to

Footnote 44 continued
causes of the decline in activity are the factors that caused prices to fall in the first place. Adding another layer of complication is the fact that the capital crumble is not the only channel from falling real estate prices to declining lending. The fall in values also helped change investor and lender expectations about the likely capital gains on new projects. This caused lower lending but should not be considered part of the credit crunch.

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reduce their real estate commitments seems like a positive move toward better resource allocation.

There is another reason to argue against major policy actions: time is on our side. As we have shown, it will take years before excess capacity is worked off in many markets and by that time credit crunch concerns should be far behind us. The mending process is already well under way in terms of bank capital. For example, among the 100 largest banks the average ratio of Tier I capital to risk adjusted assets rose from 8.5 percent in 1991 to 10.0 percent in 1992, matching the regulatory requirement for a "well capitalized" bank. Our feeling is that any tendency toward over zealous regulation will also fade over time. In other words, in terms of our supply and demand diagram, as the demand curve shifts up the supply curve should recover as well, so that we may never have a binding impact from the crunch.

Of course, the real estate contraction has caused considerable collateral damage. Is this to be ignored as well? Here policy action is appropriate. In particular, all else equal, it makes sense to ease overall macroeconomic policy to stimulate other sectors of the economy and offset the impact of the real estate contraction. Stimulative macroeconomic policy will probably have little immediate impact on the overbuilt sectors, but it will accelerate the long-run mending process. In the interim such a policy will help ensure that capital diverted from the over-built sectors ends up increasing other forms of investment rather than lowering overall economic activity.

Appendix

Vacancy Rate Models

Both the Multi-family and Office Space models rely on the stock-flow identity:

$$S_t = (1-\delta)\, S_{t-1} + I_t \qquad (1)$$

For example, in the Multi-family model S is the stock of apartments, δ is the net rate at which old structures are abandoned and I is new construction. The growth in the demand, or absorption, of apartments is a function of weighted population growth: p, which accounts for apartment use rates for each age group and a drift factor: α, which captures the change in per-person space use:

$$D_t = D_{t-1}\,(1 + p_t + \alpha_t) \qquad (2)$$

The vacancy rate is then simply:

$$V_t = (S_t - D_t)/S_t \qquad (3)$$

To make the model operational, we use historical series for V, P, and I and an estimate of δ to calculate the implied history of D, S, and α. Then by assuming different future values for α and I plus projections of p derived from census projections, we calculate the future path of V for these various scenarios.

For the nonresidential or office space model, we use an estimated series for the number of office workers as our primary determinant of demand (p). These estimates use are based on a Torto/Wheaton study that calculated the shares of the major employment sectors to "office" employment: 6.7% of manufacturing; 15.0% of mining; 3.0% of construction; 6.0% of wholesale and retail trade; 1.5% of transportation, communication and public utilities; 25.2% of services; and 100% of FIRE (finance, insurance and real estate) industries.

Additional insight into these models can be gained by substituting (1) and (2) in (3) and rearranging to get:

$$V_t = 1 - (1-V_{t-1})\,[(1 + p_t + \alpha_t)/(1 + g_t)]$$

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and:

$V_t \cong 1 - (1-V_{t-1})\,[1 + p_t + \alpha_t - g_t]$

where $g_t = I_t/S_t - \delta$ is the net investment rate. Here, we see that changes in the vacancy rate are due to a net factor that combines demand and supply growth. Therefore, the scenarios that we report are really dependent on assumptions about the combination of p, α, and g and not individual components. In other words, simultaneously raising p_t one percent, lowering α_t one-half a percent, and raising g_t one-half a percent would not change the V_t projection. (Further detail on these simulations are available upon request from the authors.)

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Credit Supply Constraints on Business Activity, Excluding Construction

by Charles Steindel and David Brauer[1]

This paper explores possible effects of the pronounced slowdown since 1989 in credit growth, particularly from banks, on nonfinancial business activity excluding construction. Businesses routinely use various financial intermediaries and credit markets in order to finance both current operations and long-term projects.[2] How individual firms are affected by a disruption in the supply of bank credit, which may arise either from a radical change in the terms of funding or from outright credit rationing, will depend both on the firm's economic environment and on its access to alternative funding sources.

Firms facing such a disruption and unable to obtain credit from other sources could be forced to cut costs in order to conserve working capital. We may therefore observe cutbacks in any of a number of activities, including overall production and employment, capital spending, inventory accumulation, and expenditures on research and development. The fact that in 1990 and 1991 both bank lending and employment fell in most industries does *not*, however, establish a direct or significant causal linkage between the two. With the economy in recession, a decline in activity is to be expected, and the decline in economic activity may itself limit firms' demand for credit.[3]

One potentially fruitful approach to the credit constraint issue is to examine small and large firms separately. A growing body of academic literature focuses on the hypothesis that the connection between small firm credit problems and their activity can explain significant elements of cyclical downturns—a hypothesis one might expect to hold with special force during the recent episode. Small firms tend to rely on bank credit to a much greater extent than do large firms, and thus may be especially vulnerable to a bank credit crunch (Radecki 1990). One reason for their vulnerability is their limited

[1] Our thanks to M.A. Akhtar, Michael Boldin and Ethan Harris for comments. Joseph Abate and Stuart Sclater-Booth provided extensive assistance with this paper.

[2] Strategic uses of finance—"financial engineering" as a profit center, and financial restructuring in the course of reorganization—will not be discussed in this paper.

[3] Other papers in this study examine the relationships between the credit slowdown and the economic environment.

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access to close substitutes for bank credit (Gertler and Gilchrist 1993). Access to commercial paper and other securities markets tends to be limited to large firms. A credit crunch would likely have its greatest impact on firms with a high rate of investment demand relative to cash flow (Fazzari, Hubbard, and Petersen 1988). Such firms are likely to be small and fast-growing.

Thus, we can examine various measures of small firm activity and see how the recent experience compares with earlier cyclical downturns, keeping in mind the relative mildness of the current episode. An alternative approach is to examine the behavior of firms or industries that ended the 1980s with relatively strong or weak financial positions. We might hypothesize that even if all firms have equal access to various sources of credit, those with a high ratio of debt to equity or a high interest burden could react more strongly to a loss of any single funding source than those in a stronger financial position.[4] Thus, we can check whether the relative contraction of activity in already distressed firms was worse in recent years than in earlier downturns both with and without adjustments for the different macroeconomic environment.

The first part of the paper documents movements in borrowing and output in several highly aggregated business sectors. All the sectors saw unusually sharp retrenchments in borrowing during the early 1990s but output measures tended to be in line with past periods around recessions, suggesting that the weakness in borrowing was in great part due to supply problems.

As a preliminary step toward gauging any impact of credit restrictions, we next examine survey evidence. The early 1990s saw a moderate increase in the frequency of complaints about credit tightness from smaller firms—especially when the overall state of the economy is taken into account—and rather more extensive evidence that banks tightened lending standards.

The balance of the paper uses a variety of sources to explore relative movements in activity across firms scaled by size and measures of financial conditions. We find that neither the absolute nor the relative performance of smaller firms was notably poorer over the last few years than during past periods of overall economic weakness. Across a number of dimensions, however, firms in weak financial shape did do worse in recent years than in the past. Thus, our overall conclusion is that credit constraints may well have played a significant role in impeding business activity in recent years. We find little or no evidence to suggest that these constraints were an unusually severe burden for small business, although we emphasize that all of our evidence in this area is indirect.

I. The Slowdown in Lending and Business Activity

This section looks, impressionistically, at trends in lending and activity in highly aggregated sectors. The purpose is to identify any unusual weakness in activity in recent years that appears to be correlated with weakness in borrowing. Any such correlation might suggest that credit constraints inhibited both borrowing and activity. Three sectors are examined: All nonfarm nonfinancial business, nonfarm nonfinancial corporations, and nonfarm nonfinancial noncorporate business.

Other papers in this study discuss the overall slowdown in business borrowing in more detail. The key point for this paper is that movements in cyclically sensitive components of business activity, such as corporate cash flow and spending on inventories

[4] Cantor (1990) found that capital spending by firms with relatively high ratios of debt to assets showed greater sensitivity to cash flow changes.

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and fixed capital can account for only a portion of the slowdown in business borrowing. Because a very substantial fraction of the slowdown in debt growth remains unexplained by these basic nonfinancial demand factors, the possibility exists that the supply of credit to business was cut significantly (see Mosser and Steindel, in this volume).

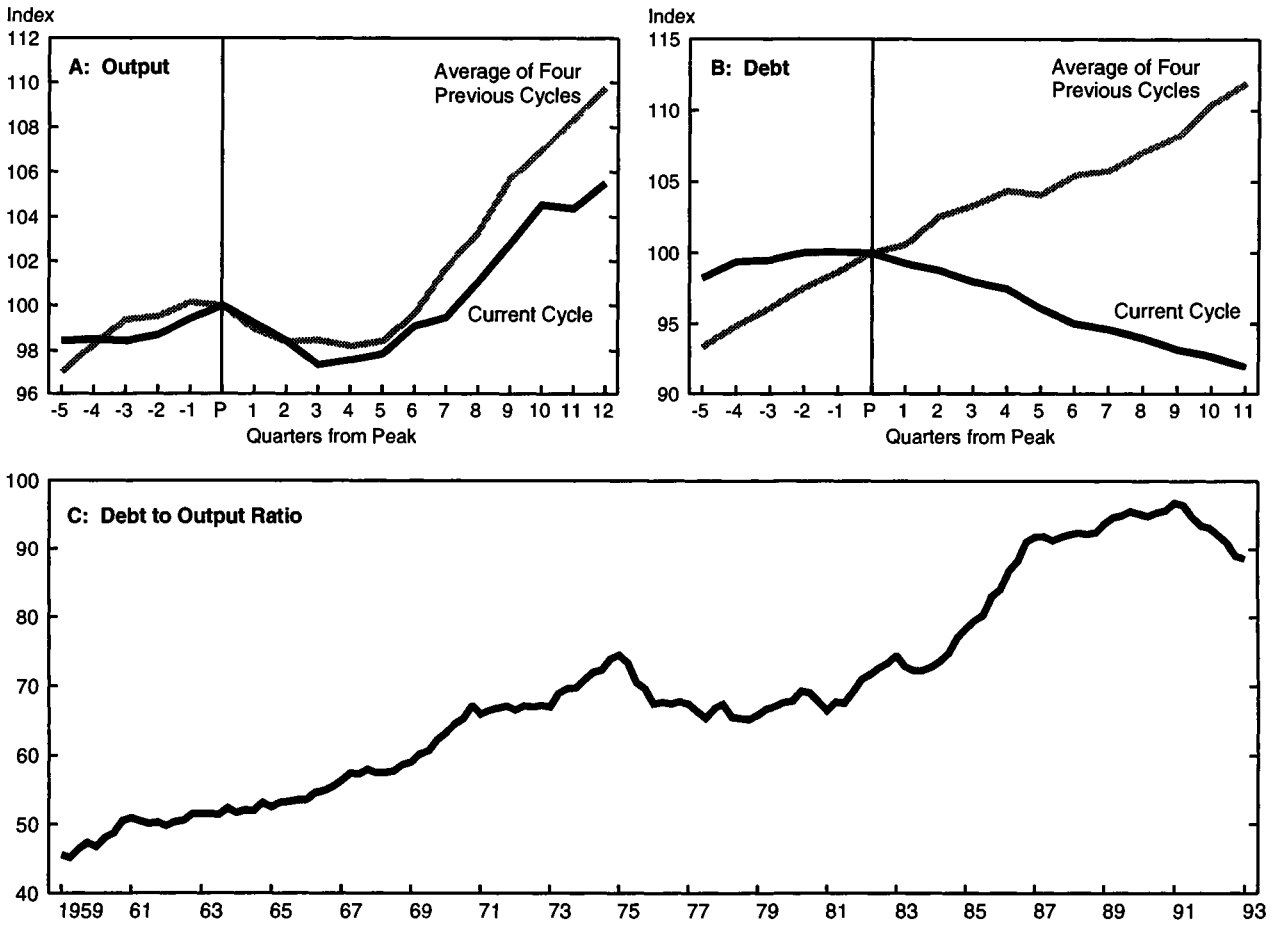
Charts 1-3 examine activity and debt measures for the three sectors we are considering.[5] Each chart contains three panels. Panel (A) compares a sector's activity, measured as real output, over the most recent business cycle with the average of the four preceding cycles. The data are illustrated such that the reading at the business cycle peak equals 100. Data are presented from six quarters before the business cycle peak to ten quarters after. The most recent peak occurred in July 1990, but because real GDP fell in the third quarter of 1990, we treat the second quarter as the peak. Thus, the data from the current cycle cover the period from 1988-IV to 1992-IV. Panel (B) presents a similar comparison for the real value of debt owed by the sector. Panel (C) charts the historic values of the debt-to-output ratio for the sector.

The first sector examined is aggregate nonfinancial business.[6] Chart 1A shows that

[5] See Brauer (1993) for a more extensive discussion of economic activity for the period since 1989.

[6] Aggregate nonfinancial output is the sum of real nonfinancial corporate output plus nonfinancial noncorporate output. In turn, noncorporate output is measured as the difference between nonfarm nonhousing output and corporate output, divided by the deflator for nonfarm nonhousing output, less real personal

Chart 1: Total Nonfarm Nonfinancial Business



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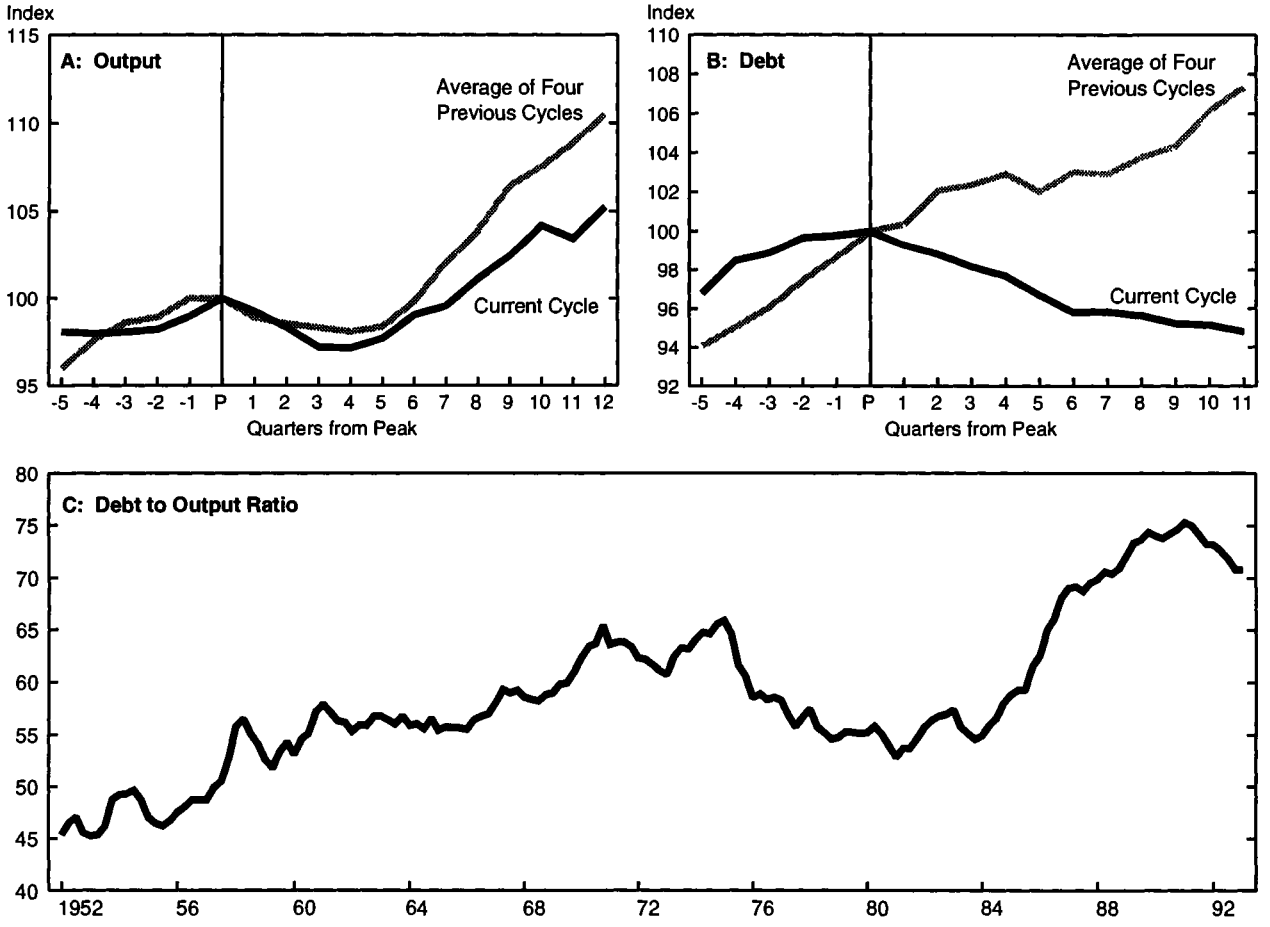
the pattern of output in this sector since the 1990 peak has been in line with that of past cycles, although growth going into the peak was weak. Chart 1 shows the data on the cyclical performance of this sector's debt.[7] The dramatic shrinkage of real debt in this cycle, in contrast to its sustained growth in earlier cycles, is clearly evident. Chart 1 plots the debt to output ratio for the sector. The continued high *level* of the ratio is clear, and although the ratio has shown a pronounced decline its fall does not stand out as greatly against history; the decline in the ratio in the mid-1970s was comparable.

In the corporate sector output since the last peak has generally been on a par with the average of past cycles (Chart 2A), although growth was unusually slow going into the peak. Real corporate debt has fallen since the last cyclical peak, but the shortfall has been less severe than for business as a whole (Chart 2B). Finally, the recent decline in the corporate debt-to-output ratio seems in line with earlier periods (Chart 2C). It does not appear that in the corporate sector as a whole—which is, of course, dominated by

Footnote 6 continued
consumption expenditures on professional medical and legal services. The last adjustment is made because movements in these services, while a component of noncorporate output, are clearly governed by very different forces than businesses such as retailing. The noncorporate and total nonfinancial output series also encompasses the output of noncorporate financial business, including real estate firms.

[7] The debt includes that owed by medical and legal partnerships and proprietorships. (see note 6, above).

Chart 2: Nonfarm Nonfinancial Corporate Business



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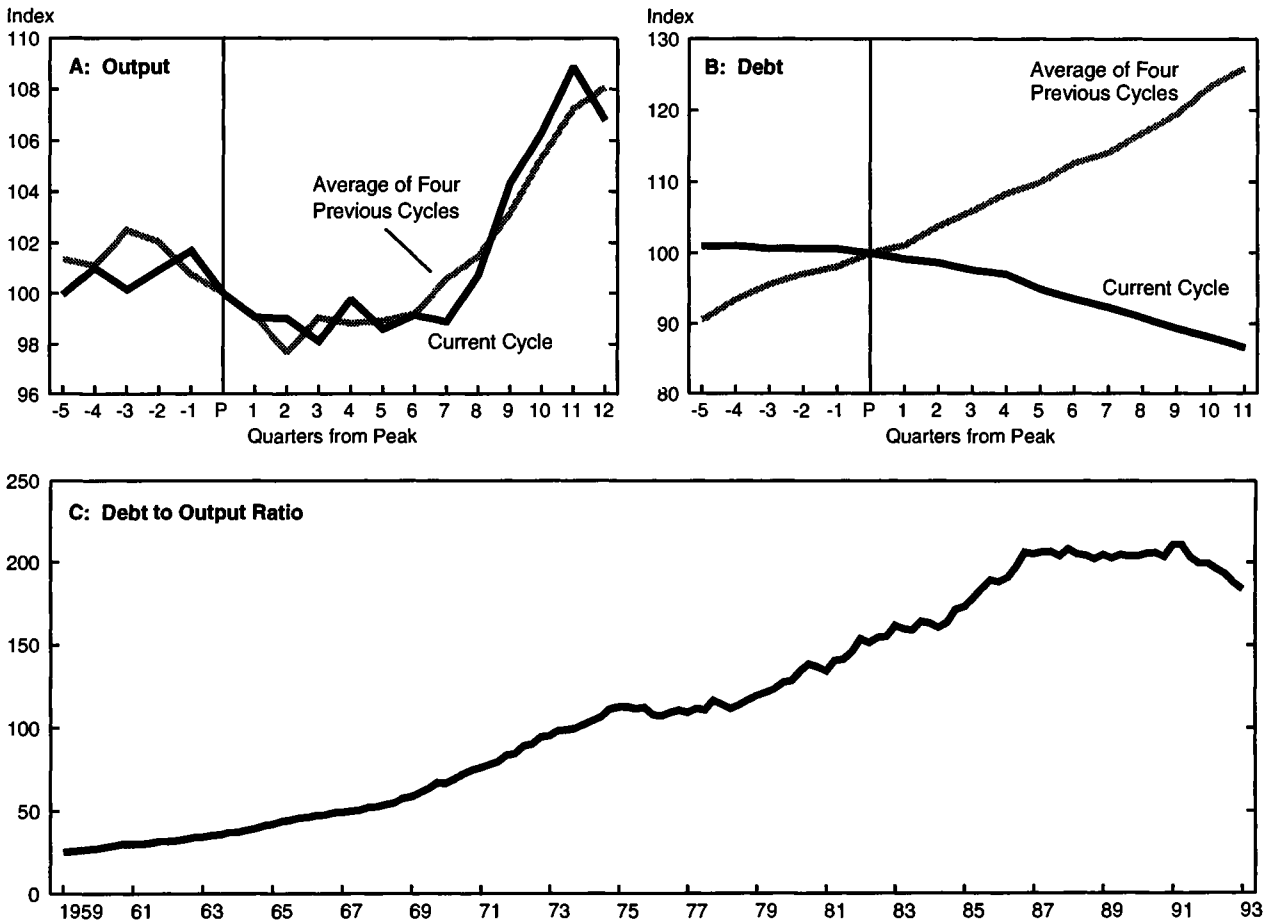
large firms—that debt problems are associated with weakness in activity.[8]

The noncorporate sector, dominated by smaller businesses, tells a very different story. Chart 3A shows that noncorporate output has tended to track above its average path in this cycle. However, by late 1992 the shortfall of real debt widened to the neighborhood of 30 percentage points (Chart 3B), and the decline in the ratio of debt to output in this sector was unprecedented (Chart 3C). It is unlikely, then, that demand factors can by themselves account for the weakness in debt growth in this sector. This disparity suggests that disruptions in the supply of credit probably played a significant role in the weakness in this sector's debt growth, and this may have worked to hold down activity.

The impressionistic evidence of this sector supports the notion that smaller firms may have borne a disproportionate share of the retrenchment in debt. It does not necessarily follow from this, though, that a "credit crunch" centered on smaller firms weakened activity in this sector, given the relative strength of noncorporate activity. To get a firmer handle on small business problems, the next section of the paper examines survey evidence on credit conditions for smaller firms.

[8] The output and debt performance of manufacturing—which is dominated by corporations—has been roughly similar to that of nonfinancial corporations as a whole.

Chart 3: Nonfarm Nonfinancial Noncorporate Business



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II. Survey Evidence on Lending to Smaller Firms[9]

The most comprehensive survey covering smaller firms is conducted by the National Federation of Independent Business (NFIB), whose over 500,000 member firms together account for roughly half of total private sector output and employment. Most members are small to medium-sized and consequently can be presumed to have limited access to nonbank capital markets.

The NFIB survey includes questions about activity measures such as employment, price changes, inventories, capital expenditures, and the cost and availability of credit. With regard to credit, members are asked whether they normally borrow at least once every three months. Those who are regular borrowers are asked what interest rate they paid on their most recent loan, how that rate compared with the rate paid three months earlier, and whether such loans were "easier or harder to get than they were three months ago." [10] In addition, the survey asks "What is the **single** most important problem facing **your business** today?," and lists "interest rates & financing" as one of nine answers.[11]With this survey, then, it should be possible to detect periods in which credit availability as perceived by borrowers either worsened or improved significantly.[12] We identify periods during which many small businesses complained about credit availability and cost.

Despite the anecdotal evidence of a credit crunch, results of recent NFIB surveys offer surprisingly little direct evidence that businesses have perceived unusual difficulty in obtaining credit during the last several years. Between mid-1990 and mid-1992 the net percent of respondents reporting that credit was harder to get (percent harder minus percent easier) ranged from 11 to 14 percent (Chart 4). These figures, however, were lower than in previous recessions and much lower than in 1980. Perceived credit conditions have been unusually stringent in New England since early 1990 and in the Southwest since 1986, but in other regions credit availability problems have been less frequently reported than in previous recessions. Breakdowns by industry show unusual financing difficulties only in the wholesale trade sector, and even then only to a limited degree relative to past recessions. By early 1993 the net percent reporting that credit was harder to get had fallen to just 8 percent.

At the same time, the available credit became less costly over the 1989-92 period. Short-term interest rates paid by businesses declined from an average of 11.7 percent in July 1989 to 5.0 percent in December 1992, and less than 5 percent of respondents have reported paying higher rates at any time since 1990. In contrast, rates were much higher and rising during the 1979-82 period, when nearly all regular borrowers reported higher rates during several quarters (Chart 5).

Finally, in the last few years relatively few firms have considered interest rates or

[9] A more exhaustive analysis of such evidence can be found in the paper by Hamdani, Rodrigues, and Varvatsoulis in this volume.

[10] Note that we cannot directly compare perceived current credit conditions with those of earlier years, only the extent to which they have recently worsened.

[11] Emphasis in original. The other choices offered are "taxes," "inflation," "poor sales," "cost of labor," "government regulation(s) & red tape," "competition from large businesses," "quality of labor," and "shortage of fuels, materials or goods." Respondents also have the option of writing in a different answer to this question.

[12] Respondents tend to accentuate the negative. Since the survey's inauguration in 1973 the number of members reporting easier credit conditions has never exceeded the number reporting that credit was harder to obtain.

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Chart 4: Small Business Credit Problems
Percent Harder To Get - Percent Easier

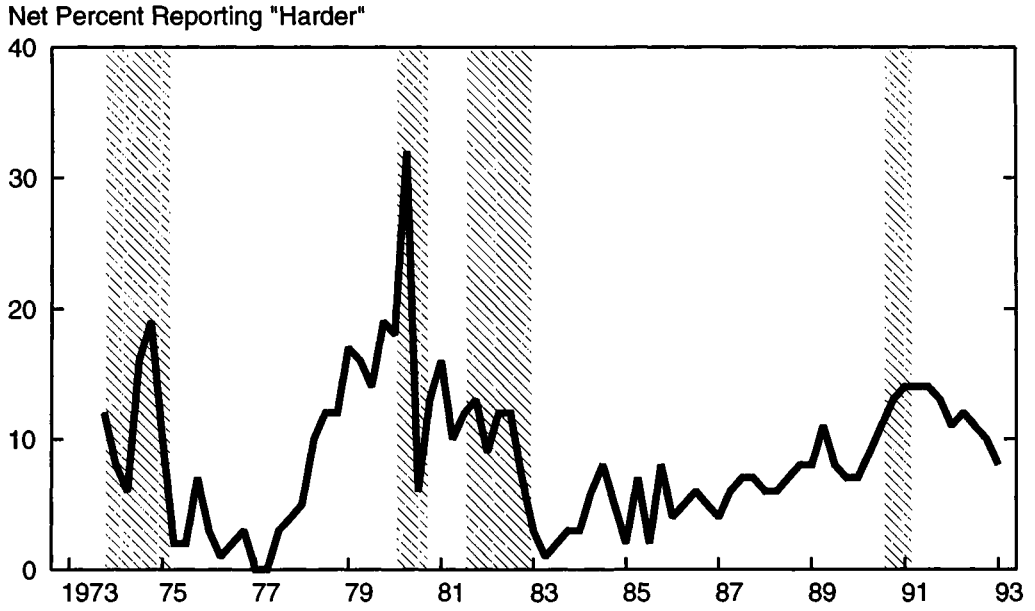
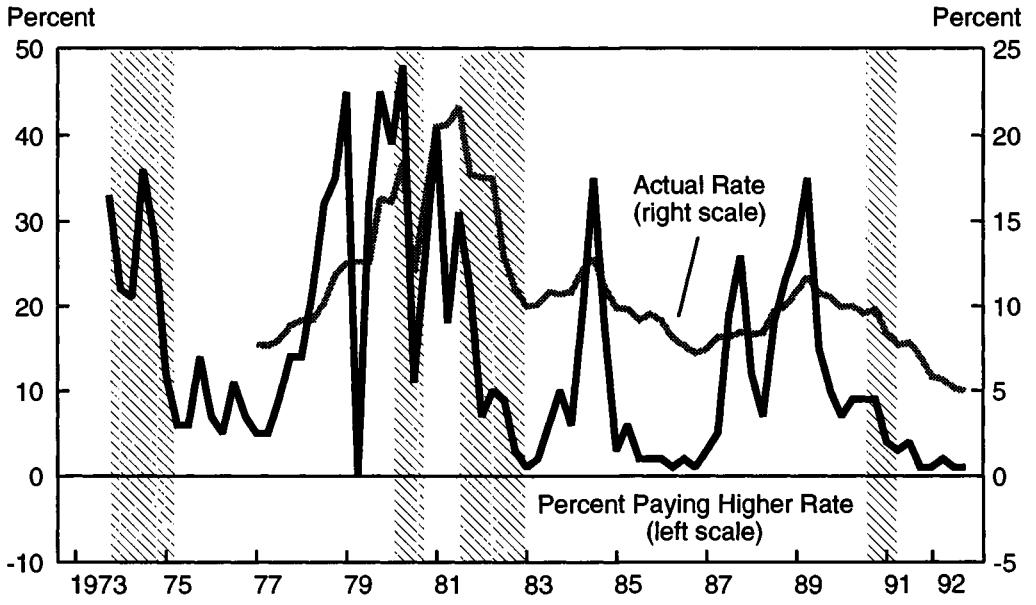


Chart 5: Interest Rates on Commercial and Industrial Loans



Sources: Quarterly NFIB Survey and FRB Release E.2 "Survey of Terms of Bank Lending."
Notes: Actual rate is the effective average interest rate on short-term commercial and industrial loans. Shaded areas represent recessions.

credit availability a serious problem. In the fourth quarter of 1992 only 3 percent listed interest rates and financing as the most serious problem facing their business, and that

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figure has not exceeded 7 percent since 1989. These results can be compared with figures as high as 37 percent during the 1982 recession. As a group, small businesses appear to be much more concerned with taxes, regulation, and weak demand. The NFIB itself has concluded that the survey findings for all areas except New England cast doubt on the existence of a credit crunch (Dunkelberg and Dennis 1992). The organization points to the decline in the fraction of respondents seeking to borrow as evidence that the main problem has been lack of demand.

Nevertheless, the survey results should be judged in light of the overall economic situation. The 1990-91 recession was much less severe than that of 1981-82. In the earlier period, rapidly plunging sales would have cut many firms off from credit without any change in supply conditions. An important criterion in judging the existence of a credit crunch is the continuing availability of credit to firms in comparable financial shape. This suggests that we should adjust the credit survey responses to the general economic environment. Hamdani, Rodrigues, and Varvatsoulis (this volume) find that such an adjustment boosts the recent credit availability readings considerably. In fact, the adjusted reading in 1989 was much higher than in the 1973-75 recession and not far short of the levels seen in 1982. This adjusted reading suggests that there was a fairly significant curtailment of credit to many, mostly small, businesses.[13] Appendix 1 summarizes some of the recent structural impediments to small business lending.

At first glance, the survey evidence from the lender's point of view offers little solid evidence that the contraction in the supply of bank credit was more pronounced for small than for large business. The responses from the Federal Reserve's periodic survey of Senior Loan Officers show a considerable tightening of the terms of lending for all businesses in 1990 and 1991, but little difference between small and large firms in the degree of tightening (Board of Governors 1992). However, because small firms are likely to have fewer alternatives to bank loans than do large firms, what appears to be an equal degree of tightening from a bank's viewpoint could ultimately lead to a more pronounced degree of contraction in overall small business credit and activity.

All in all, then, the surveys provide some evidence of a significant tightening in credit conditions to smaller firms, which may well have held down activity. In the next section of the paper we focus on activity in smaller firms to see if any weakness is evident in the disaggregated data.

III. Evidence on Size Effects

Evidence that smaller firms have underperformed larger firms in recent years would be suggestive, at least, that credit crunch effects have been important, given the evidence of significant tightening of credit to smaller firms. We will look at four sets of data: employment in small- business-dominated industries; production, employment, and capital spending, trends in manufacturing industries ranked by size; Quarterly Financial Report data on lending to manufacturing firms ranked by size; and Compustat data on employment, research and development (R&D) spending, and inventory accumulation in firms ranked by size.

[13] Regression analysis of the relationship between nonfarm noncorporate output and the Hamdani, Rodrigues, and Varvatsoulis adjustment to the credit availability index found a modest negative relationship between the adjustment and output but this disappeared when the relationship was corrected for serially-correlated errors.

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Small Business Employment

As a first pass at evaluating small firm performance, we look at employment trends in the two and three digit industries that the Small Business Administration (SBA) has identified as being small- business-dominated. The SBA defines a small business industry as one in which a minimum of 60 percent of employment is in firms with fewer than 500 employees, and a large business industry as one in which 60 percent of employment is in firms with 500 or more workers. Although we cannot produce consistent time series that precisely replicate the SBA aggregates, we can make reasonable approximations.

According to our series, employment in the small business sector fell 1.2 percent between July 1990 and March 1991, while other private employment declined by 1.6 percent (Table 1). We find that small-business-dominated industries experienced more modest employment losses in 1990-91 than during the three earlier recessions, but that their performance relative to other industries was moderately weaker than in the 1973-75 and 1981-82 recessions. Small business industries did exhibit unusually weak employment growth during the first two years of the recent recovery. This weakness could reflect firms' difficulty in obtaining the credit necessary to finance expansion. Nonetheless, other industries also experienced much weaker than normal employment growth during the recovery.

Small Establishment Manufacturing Industry Performance

Next we examine data for the manufacturing sector by two digit industry.[14] Although this breakdown is somewhat cruder than the one based on the SBA definition, it offers

[14] The term "two-digit" is a bit of a misnomer, since we can decompose the transportation equipment industry into its two three-digit components: motor vehicles and other transportation equipment.

Table 1: Employment Growth
Small-Business-dominated and Other Industries

	Small-Business-dominated Industries[a]	Other Private Industries
A. Recession		
November 1973-March 1975	-2.6%	-4.0%
January-July 1980	-2.0	-1.5
July 1981-November 1982	-2.1	-4.2
July 1990-March 1991	-1.2	-1.6
B. Early expansion		
March 1975-March 1977	8.7	6.0
November 1982-November 1984	11.7	7.1
March 1991-March 1993	1.4	0.1

Source: Bureau of Labor Statistics, seasonally adjusted by authors.

[a] Based on SBA definition (see text).

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much richer data on activity. We focus on manufacturing as the largest sector that exhibits a strong cyclical pattern. Table 2 ranks the two-digit manufacturing industries by their average establishment size.[15] We look at how four measures of industry activity—industrial production, payroll employment, real investment, and the real inventory to sales ratio, have behaved relative to establishment size over three recent periods: 1980-83, 1984-88, and 1989-91.[16] These periods encompass two recessions and the bulk of the long 1980s expansion. We want to know whether activity has contracted

[15] The industrial production, inventory-sales ratio, and payroll employment data are the standard Bureau of Economic Analysis (BEA) series used at a quarterly frequency. The investment data is the annual BEA series on constant-dollar spending on nonresidential fixed capital used in compiling the data on capital stock by industry. (The data on plant and equipment spending, which are available quarterly, have limited two-digit coverage).

[16] Because the average establishment size in manufacturing industries has been little changed we use the 1972 size as the standard for all periods.

Table 2: Mean Establishment Size in Manufacturing Industries, 1972
Employees per Establishment

Lumber	20
Printing	25
Miscellaneous manufacturing	29
Stone, clay, and glass	39
Nonelectric machinery	45
Furniture	50
Fabricated metals	51
Food	56
Apparel	56
Rubber	67
Petroleum	69
Chemicals	73
Instruments	76
Leather	85
Paper	105
Textiles	132
Electrical machinery	135
Primary metals	168
Other transportation equipment	169
Transportation	195
Motor vehicles	238
Tobacco	244

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more in the recent period for small firm industries than for large firm industries, and whether the relative small firm industry performance has been worse recently than in the past.

Results are shown in Charts 6-9. The vertical axis of each chart measures the cumulative percentage change in activity over each period, while the horizontal line measures average establishment size. Each point plotted represents an industry. The information we are trying to extract from the charts relates to the *relative* performance of small and large industries in each period, as opposed to their *absolute* performance. In other words, wish to know whether growth for an activity in a period tended to be greater for large firms than for small firms. We are not concerned here with whether or not the cumulative growth of the activity variable was positive for the industry during the period in question.

A simple way to summarize the relative performance of small and large firms is to calculate the regression line fitting the points in each scatter diagram. If the regression line slopes up, it suggests that large industries tended to show greater cumulative growth for an activity during the period shown. A negative slope suggests better performance for smaller firms. The solid lines in Charts 6-9 are these regression lines. To give some notion of the statistical reliability of the slope of the regression lines, we include in the charts dashed lines with slopes greater and less than the regression line by a magnitude of one standard deviation from the estimated slope.[17] Chart 6 summarizes the evidence for industrial production as it relates to establishment size. The negative slope of the regression line in each period indicates that on the whole industries with the fastest growth (or smallest decline) in output tended to be smaller than average, although in no case is the negative relationship statistically significant. This relationship appears most clearly in the recent period, suggesting that small establishment industries did <u>not</u> experience unusual weakness relative to large establishment industries. Chart 7 shows that small establishment industries likewise did not reduce employment by a greater amount than large establishment industries, either in the most recent period or in the past. Charts 8 and 9 show positive but insignificant connections between establishment size and both investment and inventory behavior in all periods.

To this point, the activity measures suggest little or no relative contraction of small establishment industries in the 1989-92 period. The above analysis, however, did not normalize for external demand conditions facing the industry. As a useful, albeit imperfect, proxy for demand for the industry's products we use the performance of industrial production by industry.[18] We derive predicted levels of employment and capital spending by industry by regressing them against industry output over the 1980-92 pe-

[17] The regression calculations provided both the slope and the standard error of the slope estimate. We then added this standard error to the slope estimate and drew a line with this new slope through the point representing the means of the horizontal and vertical values of the points plotted through the scatter.

The new line is plotted through the point of means for convenience. A regression line, by construction, must go through this point, and this procedure gives some visualization of the possible ranges of regression lines summarizing the data.

[18] Industrial production has some flaws as a demand measure. An industry can in the short run use inventory swings to break the connection between demand and production, and in the long run, production and demand can drift apart because production is an index of value added (sales less purchased inputs), and the fraction of industry sales representing value added at the manufacturing level can change. Nonetheless, production is probably a very good proxy for demand when we look at horizons of a year or two, which is the focus of this paper. Data on real shipments, an alternative demand measure, are not available for many industries.

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Chart 6: Percentage Change in Industrial Production against Average Establishment Size

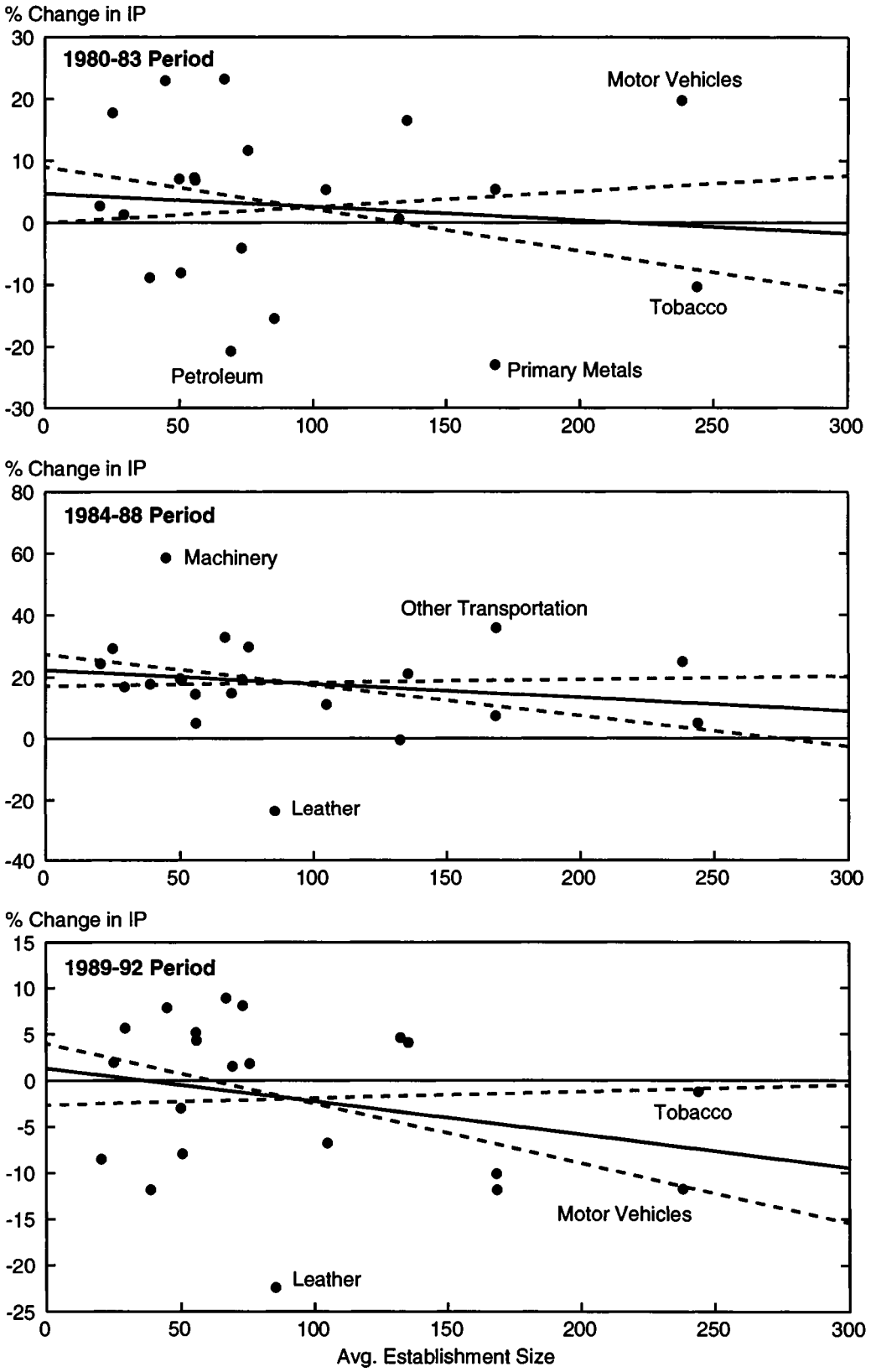

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Chart 7: Percentage Change in Employment against Average Establishment Size

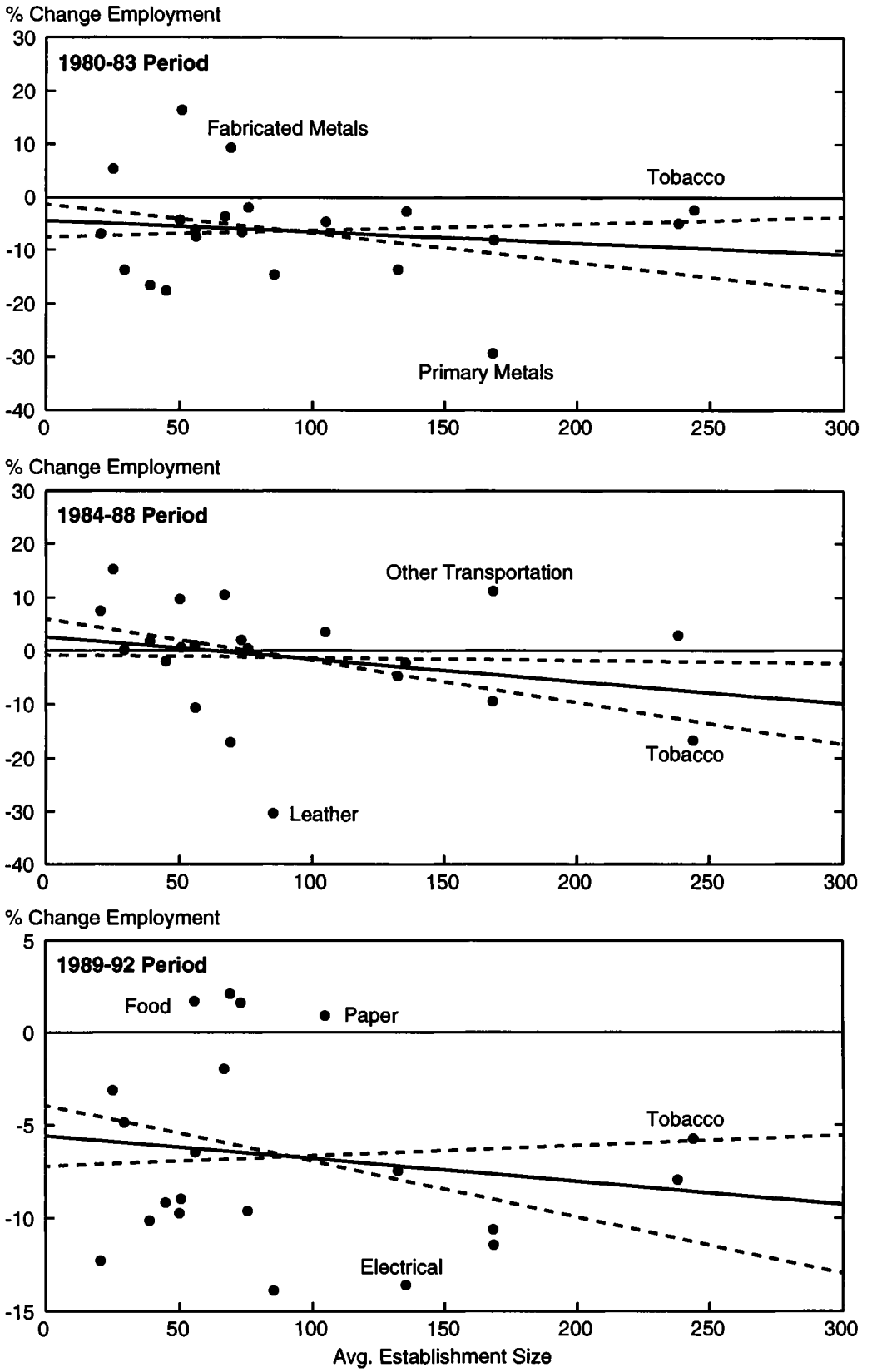

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Chart 8: Percentage Change in Investment against Average Establishment Size

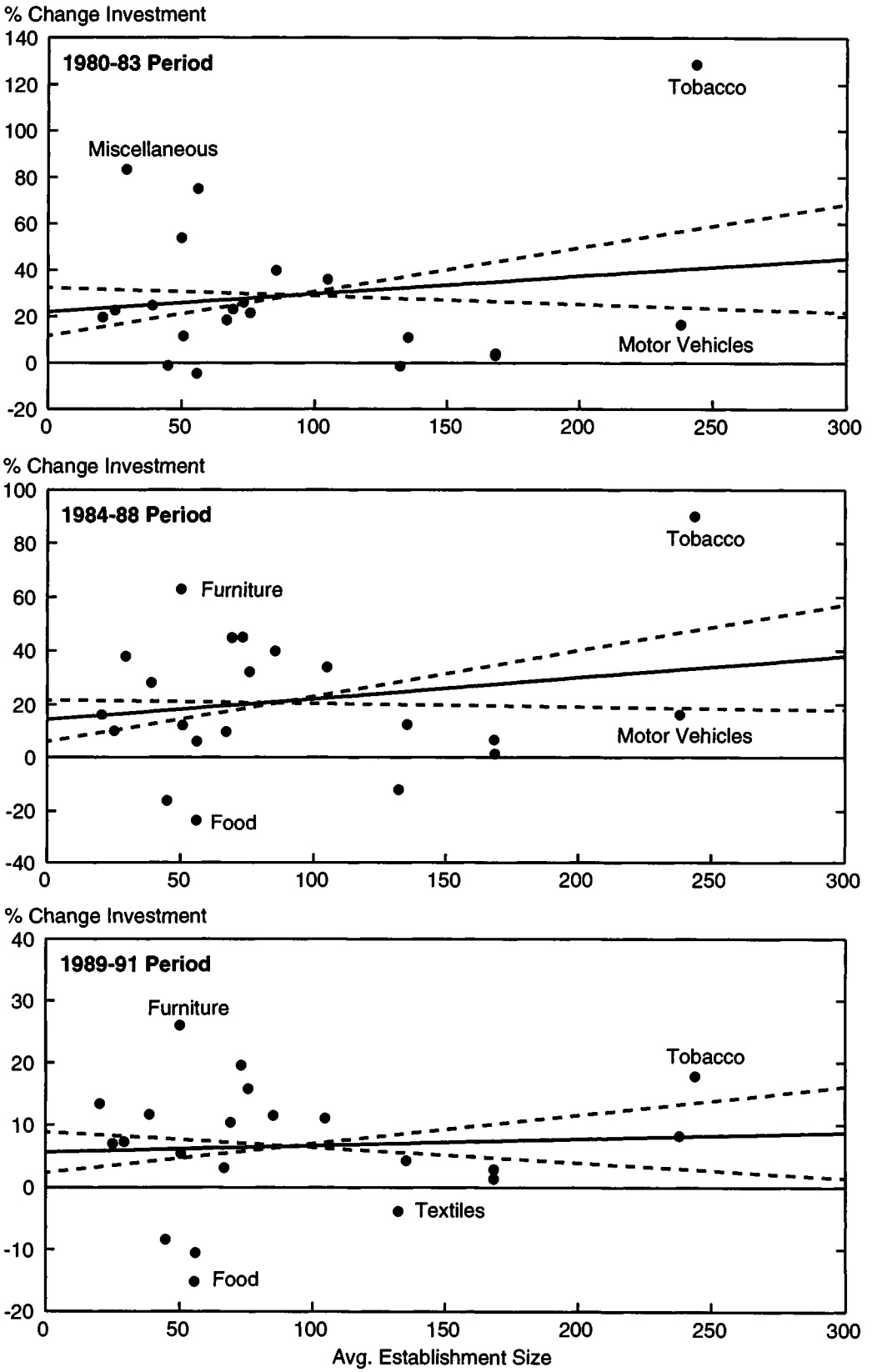

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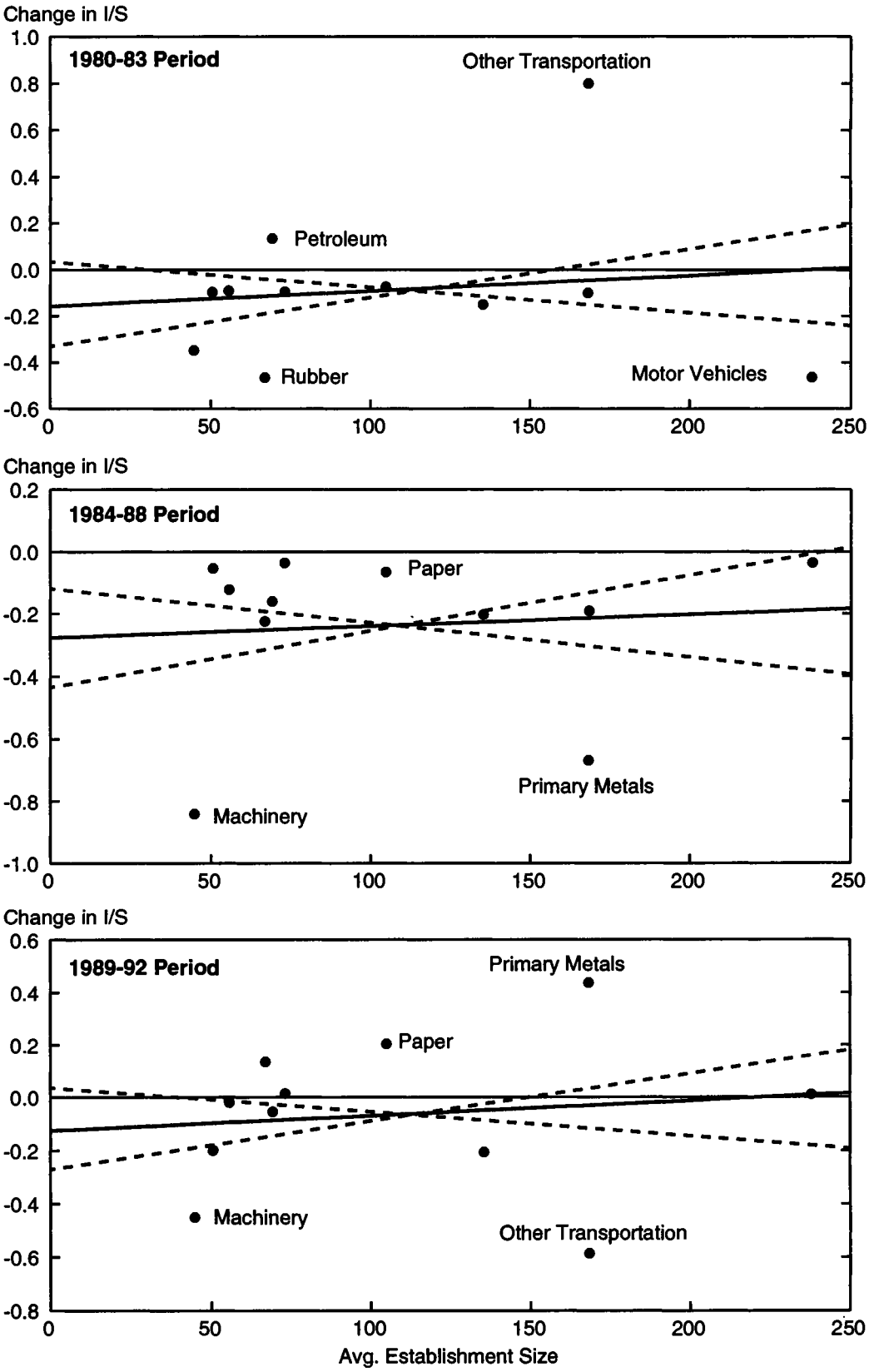
Chart 9: Change in Inventory/Sales Ratio against Average Establishment Size



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riod.[19] The period of estimation is intentionally kept short to avoid consideration of long-term structural changes in factor demand. For inventories we follow a slightly different procedure. Because ratios of inventories to sales in most of the manufacturing sector have exhibited a pronounced downward trend in recent years, we derive a normalized predicted ratio of inventories to sales from time trends.

These regressions give benchmarks for industry factor demands. To relate the shortfall or excess of actual activity from these benchmarks to average firm size by industry, we plot the cumulative residuals for these regressions over the different periods against the industry's average employment per establishment. For any industry the (cumulated) error for the entire 1980-92 period will be zero (since the average difference between a regression prediction and an actual value will be zero, the (cumulated) difference, or error, will also be zero). In any subperiod, however, a regression can under- or overpredict actual values. We hypothesize that if credit restrictions are important then unusual weakness in activity will be more likely to occur in small establishment industries, especially during recessionary periods.[20]

Charts 10-12 show the scatters. As in Charts 6-9 we show an estimated line summarizing the data, as well as lines with slopes differing from the estimated line's by one standard deviation. These estimated lines are derived from cross-sectional regressions summarizing the data shown in the charts; they are separate from the time-series regressions for each industry that are used to produce the points in the data scatter.

Chart 10 plots the cumulative residual change in employment over each of the three periods against average establishment size. A positive reading for any industry in any period would imply that employment growth was unusually strong in that industry given actual industrial production during that period—in other words, a positive reading indicates that the regression relating employment growth to industrial production underpredicted employment growth in the period. As in Chart 7, we find that during the 1980-83 period a positive employment "surprise" was more likely to occur in industries dominated by small establishments—the solid line shown in the chart slopes down. This negative relationship disappeared during the mid-1980s but reappeared more strongly than before during the most recent period. In other words, large-establishment industries experienced greater employment retrenchment relative to production in 1989-92 than did small-establishment industries.[21] Charts 11 and 12 repeat this exercise for capital spending and ratios of inventories to sales. Capital spending shows a weak positive relationship between establishment size and activity over the last few years, while the relationship between establishment size and surprises in the ratios of inventories to sales was strongly negative. Thus, when demand is controlled for, there is no strong evidence that industries dominated by small firms saw unusual contractions in activity during the most recent period. Like Charts 6-9, Charts 10-12 show little sign that the slopes of the lines summarizing the data are significantly different from zero.

[19] The employment equations were estimated in growth rates; the capital spending equations were estimated in log-levels. In estimation we occasionally obtained a negative coefficient on current industrial production. Where this was the case, the equation was reestimated using lagged industrial production. If this coefficient was also negative the industry was excluded from the analysis. The regression coefficients and summary statistics are tabulated in Appendix 2.

[20] It is possible that recent restructuring by large corporations, which has involved contractions in their factor demands, has tended to reduce any positive relationship between the residuals and size. One response to this objection is that the regressions are estimated over the entire sample period, so the predicted levels of activity already at least partly incorporate the influence of restructuring.

[21] Alternatively, productivity growth was particularly strong in large-establishment industries.

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Chart 10: Sum of Errors of the Percentage Change in Employment against the Pecentage Change in Industrial Production Plotted against Average Establishment Size

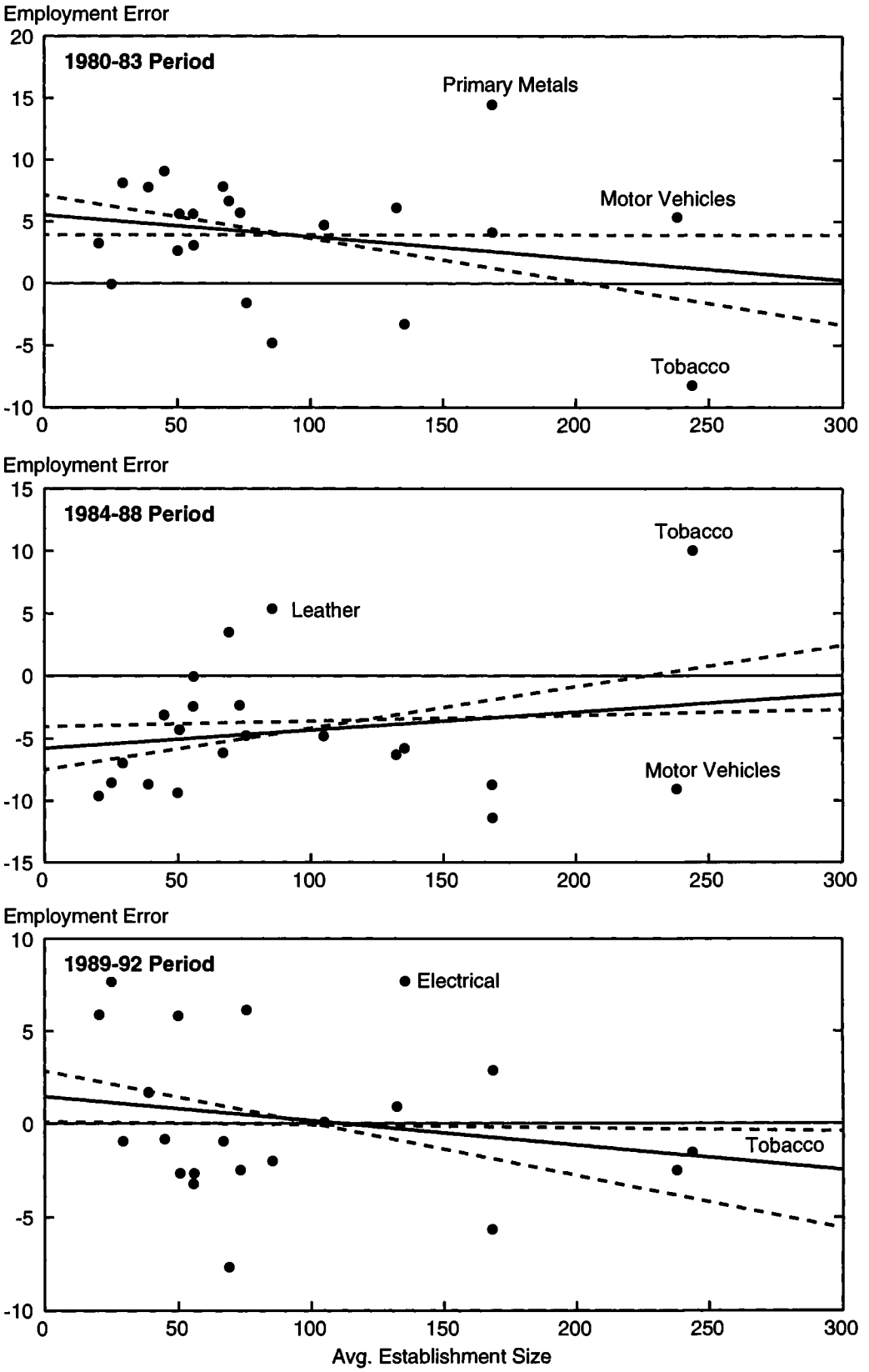

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Chart 11: Sum of Errors of the Log of Investment against the Log of Industrial Production Plotted against Average Establishment Size

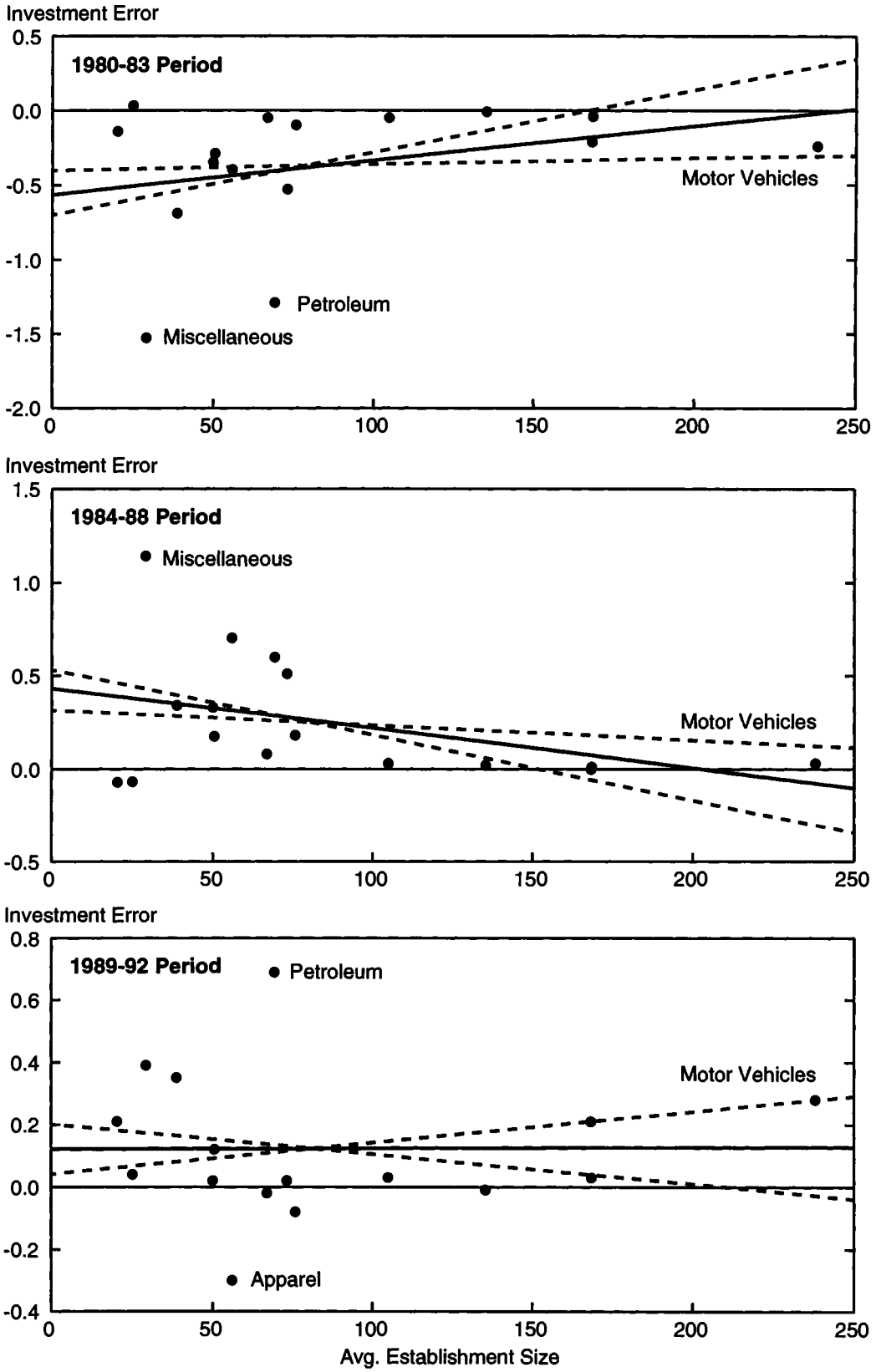

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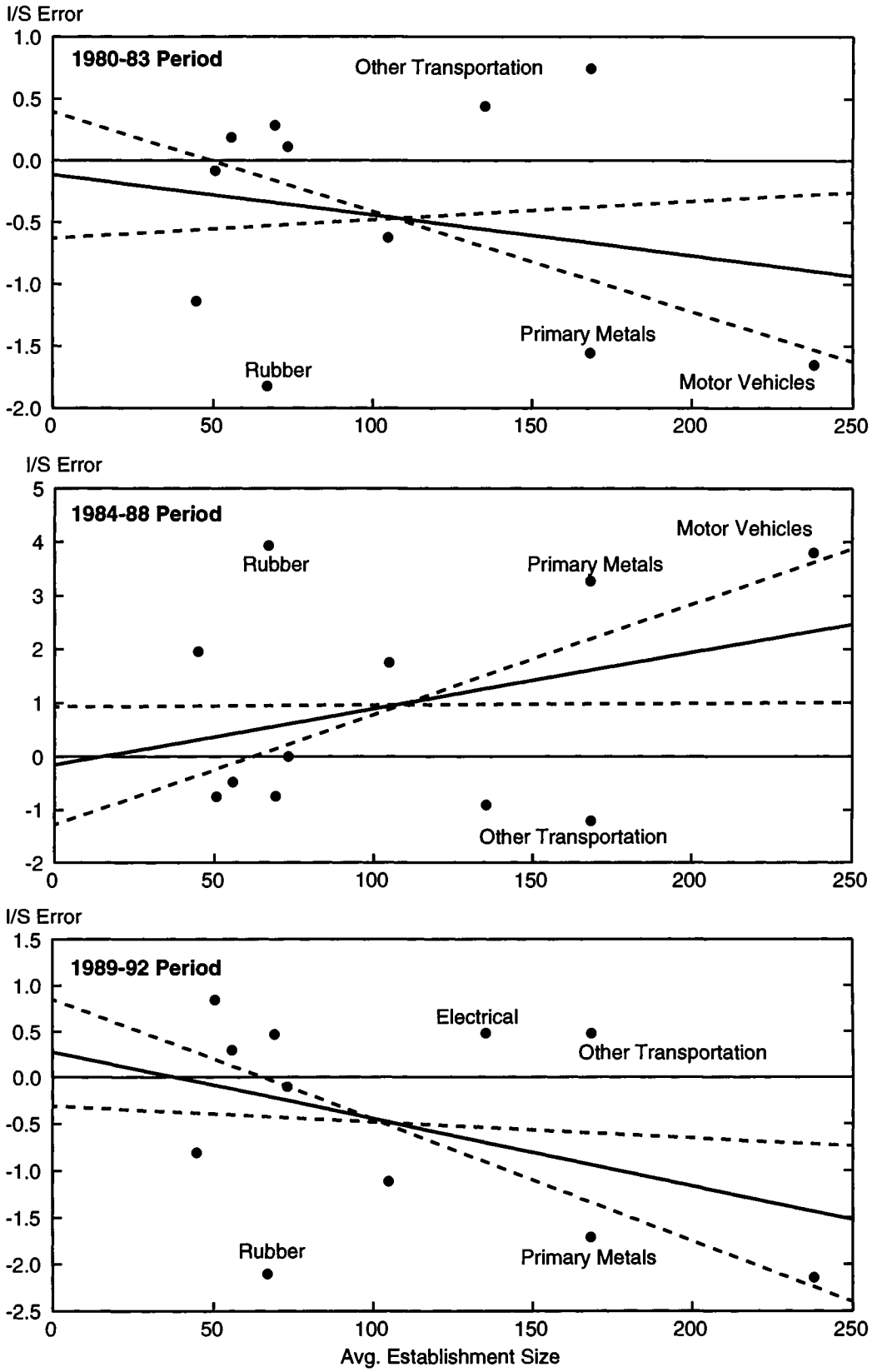
Chart 12: Sum of Errors of Inventory/Sales against Time Plotted against Average Establishment Size



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Small Manufacturing Firms: Borrowing and Activity

We next look at data from the Commerce Department's Quarterly Financial Report for Manufacturing, Mining and Trade Corporations (QFR). The QFR data provide income and balance sheet information, and are broken down by firm size for the manufacturing sector as a whole. For most manufacturing industries this information is also supplied at the two-digit level. Moreover, the QFR data enable us to identify industries with unusually high exposure to bank debt. These industries, including textiles, paper, fabricated metals, and petroleum, should be the most vulnerable to tightening bank lending standards. Compared with the data discussed in the previous section, the QFR data allow us to compare developments among small and large *firms*, as opposed to small- and large-establishment *industries*.

The aggregate data show that bank lending to manufacturers did contract sharply over the last several years, but not to a significantly greater extent than in past recessions or early stages of recovery (Table 3). During the 1990 recession (with the second quar-

Table 3: Commercial and Industrial Loans Outstanding, Manufacturing Firms, by Source
Annual Average Percent Change

	Current Dollars			1987 Dollars[a]		
	Bank	Nonbank	Total	Bank	Nonbank	Total
Recessions						
1990-II to 1991-I	3.0	6.4	5.3	-1.5	1.7	0.7
1981-III to 1982-IV	3.1	4.0	3.7	-2.1	-1.2	-1.5
1980-I to 1980-III	5.8	20.9	16.1	-3.6	10.3	5.8
1974-I to 1975-I	14.1	16.6	15.7	3.0	5.3	4.4
Average of previous three	7.7	13.8	11.8	-0.9	4.8	2.9
Recoveries						
1991-I to 1992-III	-3.5	-1.2	-1.9	-6.0	-3.8	-4.5
1982-IV to 1983-IV	-4.4	-1.8	-2.6	-8.0	-5.6	-6.3
1980-III to 1981-III	21.0	13.5	15.7	10.1	3.2	5.2
1975-I to 1976-IV	-10.0	8.6	2.3	-15.5	2.0	-4.0
Average of previous three	2.2	6.8	5.1	-4.5	-0.1	-1.7
Expansions						
1983-IV to 1990-II	14.6	12.4	13.1	10.4	8.3	8.9
1976-IV to 1980-I	16.9	12.1	13.5	8.0	3.6	4.9
Memo: Loans outstanding in billions of dollars						
1992-III	258.1	555.8	814.0	213.0	458.6	671.6

a. Based on deflation using implicit GDP deflator.

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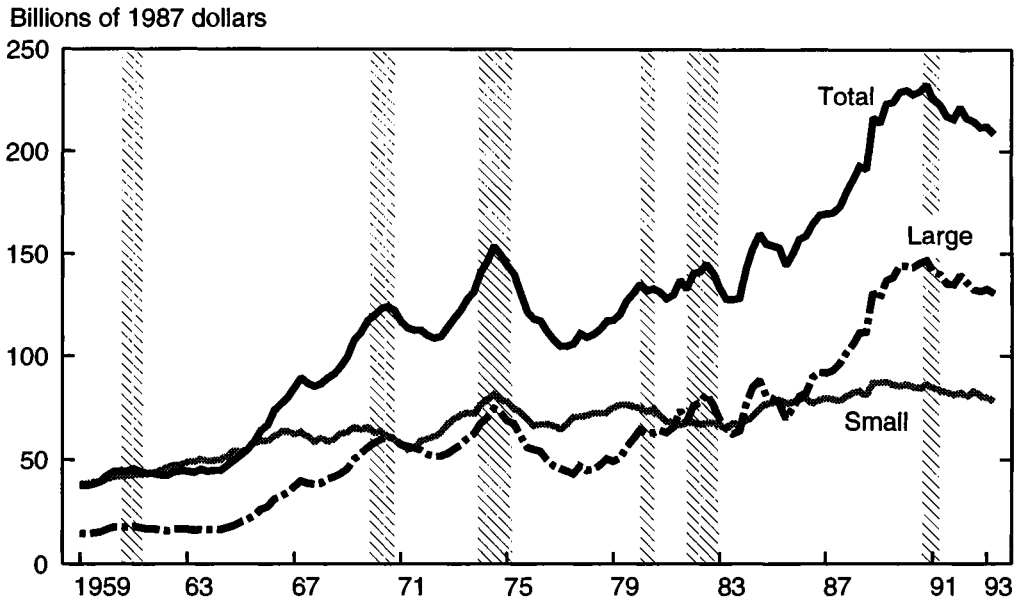
ter of 1990 again treated as the cyclical peak), nominal bank lending rose at a modest 3.0 percent annual rate, a sharp slowdown from its growth rate during the 1980s expansion. In real terms, outstanding bank loans fell at a 1.5 percent annual rate, a slightly smaller decline than during the 1980 and 1981-82 recessions. During the first six quarters of recovery, the rate of decline in bank lending accelerated. This pattern is consistent with the experience following the 1973-75 and 1981-82 recessions. During the 1990-91 recession the slowdown in bank lending was partially offset by a small increase in real credit from nonbank sources. From the trough through late 1992 nonbank lending also declined, though not as much as in the aftermath of the 1981-82 recession. Nonetheless, even though more than two-thirds of manufacturers' total outstanding credit is derived from nonbank sources, taking such lending into consideration does not markedly alter our characterization of the latest period as one of unusually weak credit growth.

In examining lending by firm size, we define small and medium firms as those with under $250 million in assets in 1990. We follow Gertler and Gilchrist (1992) in retabulating the QFR data so that at all times large firms represent the same proportion of total manufacturing sales as in 1990.

Chart 13 shows real bank lending to both size classes has declined during the last several years, but similar declines also occurred during earlier recessions. Large firms experienced a sharper decline in borrowing from banks than did small firms. A closer look at the long-term pattern of small firm finance reveals a slow upward trend in bank lending, but a decline in nonbank lending in the late 1970s (Chart 14A). In recent years, a moderate contraction in bank credit beginning in 1989 interrupted a sustained uptrend in small firm debt that began in the expansion of the mid-1980s. Small firm debt in 1991 was about $11 billion (roughly 8 percent) below this trend. Large firm debt was also below its mid-1980s trend, but the shortfall was not as great in percentage terms (Chart 14B).

Chart 13: Bank Debt by Firm Size



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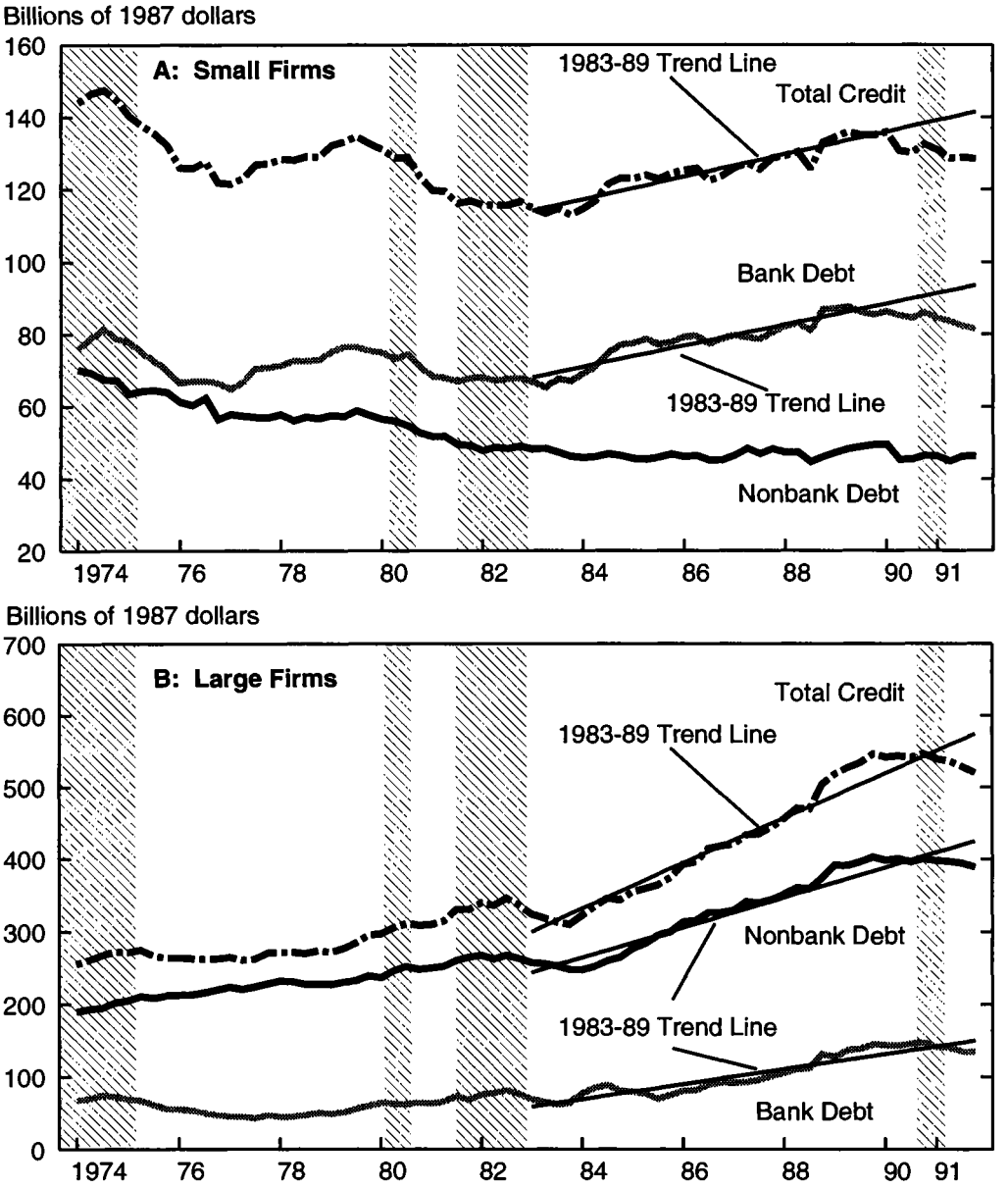
The observed reduction in loan volume, especially relative to the earlier trend for small businesses, is consistent with the existence of a credit crunch. However, it does not constitute proof of one or establish that any crunch affected real activity. In particular, the QFR data do not enable one to distinguish between a change in banks' ability and willingness to finance business activity, and a shift in businesses' demand for bank credit. The only direct measure of activity provided by the QFR involves inventory stocks. Although the data indicate that small manufacturing firms do indeed hold fewer inventories relative to sales than larger firms, this pattern has not changed markedly over the latest decade.

Chart 14: Type of Debt by Firm Size



Source: Quarterly Financial Report and Gertler and Gilchrist (1992).
Note: Shaded areas represent recessions.

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Data from Compustat

In a final set of exercises, we analyze firm-level data from Standard and Poor's Compustat data base to see if patterns of employment or other measures of real activity can be explained by firm size. In using the Compustat data we would ideally like to develop a sample consisting of a wide cross section of firms, offering a rich variety of data, and spanning a number of years. Unfortunately, firms enter and drop out of the data base, and the quality of many of the reported variables is poor. As a compromise, we selected sets of data from three time periods spanning recessions: 1972-75, 1980-83, and 1988-91. A firm in the manufacturing and trade sectors was chosen for the sample in each period if it had plausible data for the following variables: employment, sales, and assets.[22]

For each of the three periods we begin by stratifying the sample by firm size during the initial year of the period, and then examine movements in several variables of interest over the subsequent three-year period. Results of this exercise offer little evidence that activity in the smaller firms has been unusually weak during the recent period. In fact, average employment in the lowest quartile grew a surprising 48.5 percent between 1988 and 1991, far outpacing the growth in real sales.[23] By contrast, employment growth was considerably weaker than sales growth in the other quartiles (Table 4).[24]

[22] Note that we do not include firms that may have dropped out of the sample because of bankruptcy. However, if the assets and operations of the bankrupted firms were acquired by other firms in the sample, they are implicitly taken into account.

[23] Because of late reporting, the 1991 sample is considerably smaller than that of the previous three years. This disparity, however, does not affect measures of average employment relative to sales, since both measures are based on the same set of firms in each year.

[24] Results in these tables are based on stratification by net sales in the initial year. With the exception of inventories, alternative stratifications by either assets or employment in the initial year do not significantly alter the results.

Table 4: Employment and Sales Growth, by Firm Size in Initial Year
Selected Three-Year Periods, Percent Change

	Quartiles[a]			
	Low	Second	Third	High
Average employment				
1972-75	14.4	14.1	7.6	1.3
1979-82	13.7	-1.4	-3.7	-7.7
1988-91	48.5	1.4	-3.7	-5.6
Average real sales[b]				
1972-75	27.8	22.5	20.3	21.7
1979-82	19.0	-0.5	-1.3	-8.2
1988-91	20.1	17.7	0.9	0.5

Source: Compustat.

a. Based on sales in initial year.
b. Deflated by GDP deflator.

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During the earlier periods, employment growth tended to lag behind sales, with no particular pattern by firm size. Even during the recession, and with average sales flat, average employment in the lowest quartile grew by 22 percent between 1990 and 1991. In that year employment and sales essentially moved in tandem in the other quartiles, as was the case for all quartiles during previous recessions (Table 5).

Other activity variables offer only weak evidence that smaller firms have fared unusually poorly during the most recent period. In all quartiles, reported R&D spending grew in real terms, but the most rapid increase took place in the two middle quartiles. In the past there has been some tendency for R&D expenditures to grow fastest in small firms (Table 6). Since 1988, ratios of inventories to sales have fallen in all size quartiles based on initial year sales, but especially in the lowest one. However, the relationship between size and the decline in the inventory-to-sales ratio disappears under alternative size stratifications. Regardless of the stratification, no such pattern appeared during either of the earlier periods.

Summary of Small Firm Effects

The data in this section provide little support for the proposition that small firms have experienced unusually steep declines in activity in recent years. Employment in industries dominated by small firms fell less during the 1990-91 recession than in previous recessions, although the proportion of the decline accounted for by these industries was somewhat greater than in the 1973-75 and 1981-82 (but not 1980) recessions. The two-digit data, the QFR data, and the Compustat data show no striking difference between small and large firm performance.

IV. Financial Distress Effects

In this section, our approach generally parallels that of the previous section, but here we

Table 5: Employment and Sales Growth, by Firm Size in Initial Year
Recession Years, Percent Change

	Quartiles[a]			
	Low	Second	Third	High
Average employment				
1974-75	-1.1	-2.5	-3.1	-4.1
1981-82	-6.9	-0.4	-5.2	-7.8
1990-91	21.9	0.3	-4.2	-7.6
Average real sales[b]				
1974-75	-4.5	-4.2	-3.5	-6.2
1981-82	-8.0	-2.8	-6.2	-6.4
1990-91	-0.6	2.2	-3.4	-9.1

Source: Compustat.

a. Based on sales in initial year (1972, 1979, 1988).
b. Deflated by GDP deflator.

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focus on indicators of financial strength. If a credit crunch was a significant factor impeding activity in recent years, it is plausible to expect that businesses in a weak financial position suffered disproportionately. We will look at two of the data sets used in the last section: the two-digit data on manufacturing activity and the Compustat data on corporations.

Two-Digit Manufacturing Data

Manufacturing industries with very high ratios of net interest to cash flow or output may plausibly be viewed as distressed. Thus, we can compare and contrast the relative performance of distressed and nondistressed industries with evidence from earlier recessions. Given the starting conditions for any industry, we want to know whether activity has contracted more in high-net-interest industries than in low-net-interest industries.

We examine how the same four measures of industry activity used earlier—industrial production, payroll employment, real investment, and the real inventory-sales ratio have behaved relative to the ratio of net interest to cash flow in the 1980-83, 1984-88, and 1989-91 periods. Results are shown in Charts 15-18, which essentially repeat Charts 6-9 but use the start-of-period ratio of net interest to cash flow on the horizontal axis, rather than establishment size.[25]

Chart 15 summarizes the evidence for industrial production as it relates to net interest. The downward slope of the solid line in the top panel of Chart 15 indicates that on the whole, industries with strong output growth during 1980-83 did in fact start the period with lower than average ratios of net interest to cash flow. However, the corresponding line for the 1989-92 period slopes upward. Similarly, Chart 16 shows that past negative relationships between employment and the ratio of net interest to cash flow were not evident in 1989-92. Charts 17 and 18 show little or no sign of significant negative relationships between investment or the ratio of inventories to sales and the ratio of net interest to cash flow.

These results provide little evidence that financially distressed manufacturing industries have contracted activity to a greater extent than others in recent years. Again, however, we need to control for external demand conditions facing the industry, using industrial production as the primary measure of demand. Thus, we repeat last section's

[25] All data are from the BEA. Cash flow is defined as the sum of pretax profits, capital consumption and proprietors' income.

Table 6: Average Research and Development Spending, by Firm Size
Percent Change

	Quartiles[a]			
	Low	Second	Third	High
1972-75	62.7	35.8	39.5	39.5
1979-82	110.2	69.3	67.2	51.7
1988-91	29.8	90.1	25.5	29.3

Source: Compustat.

[a] Based on initial year sales.

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Chart 15: Percentage Change in Industrial Production against Net Interest/Cash Flow

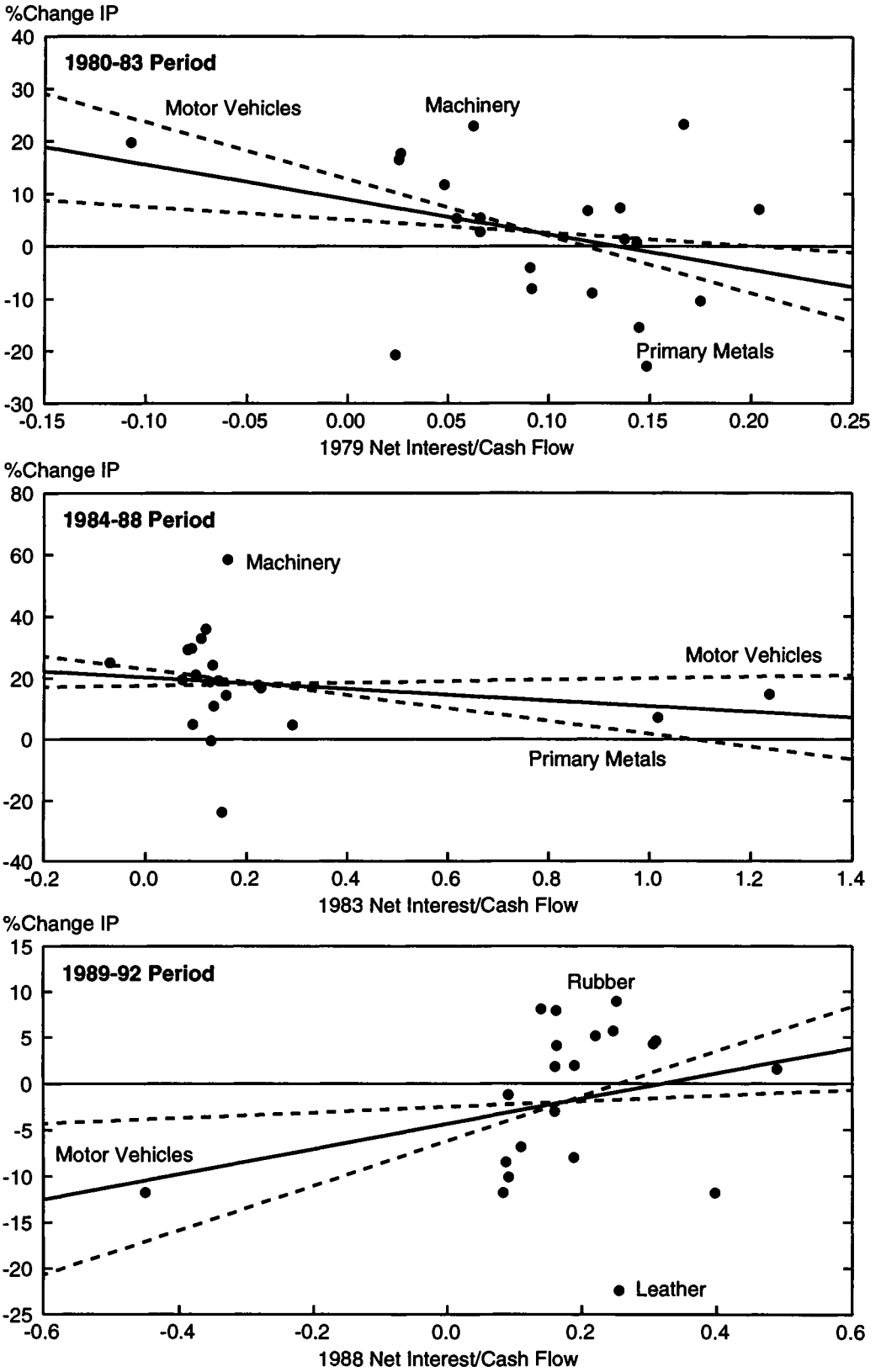

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Chart 16: Percentage Change in Employment against Net Interest/Cash Flow

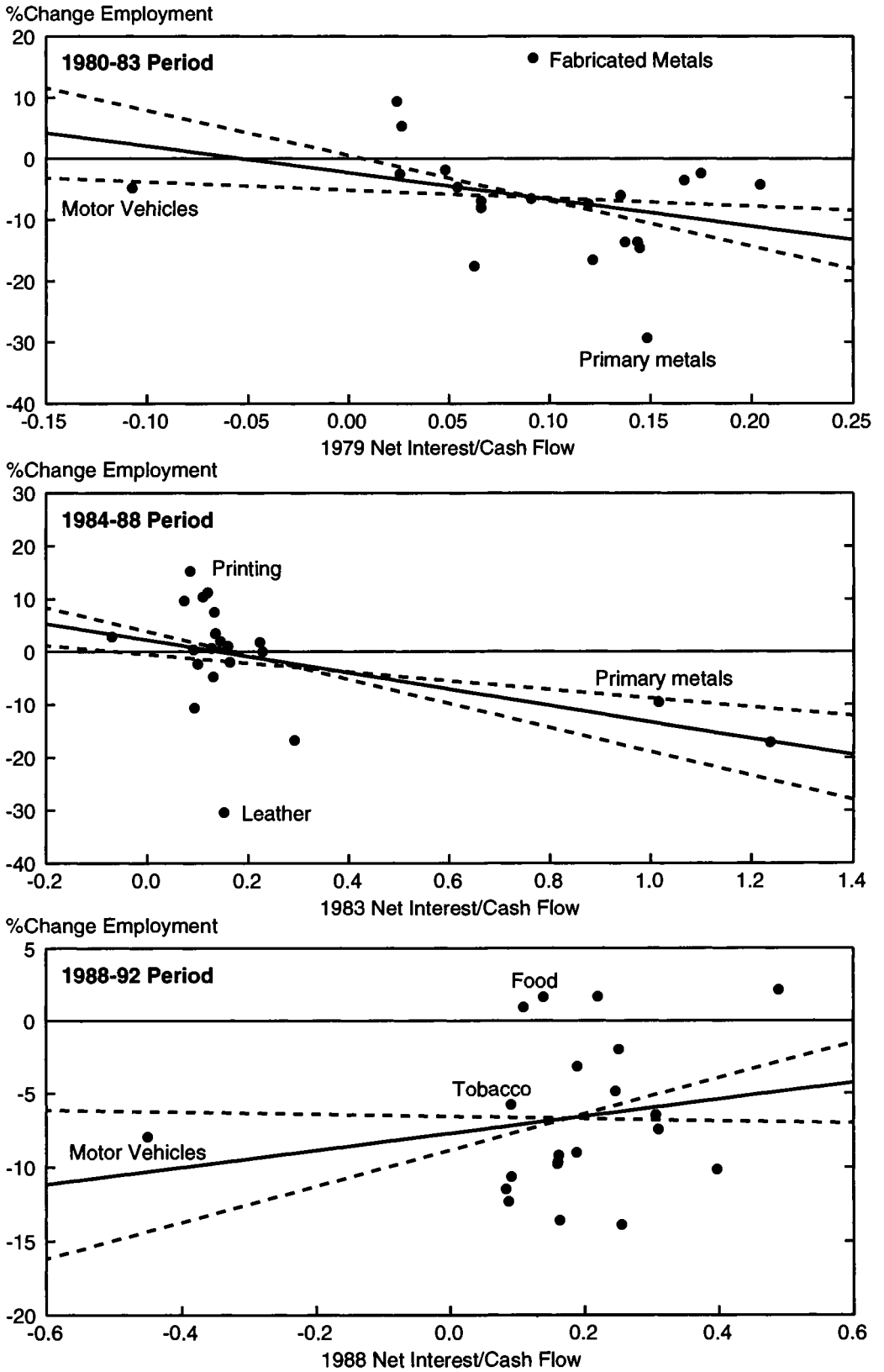

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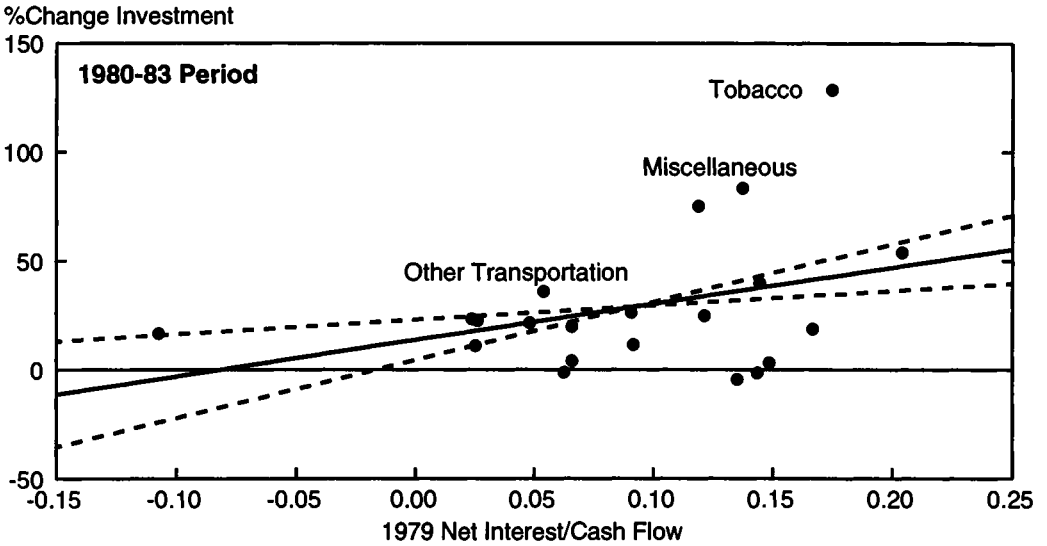
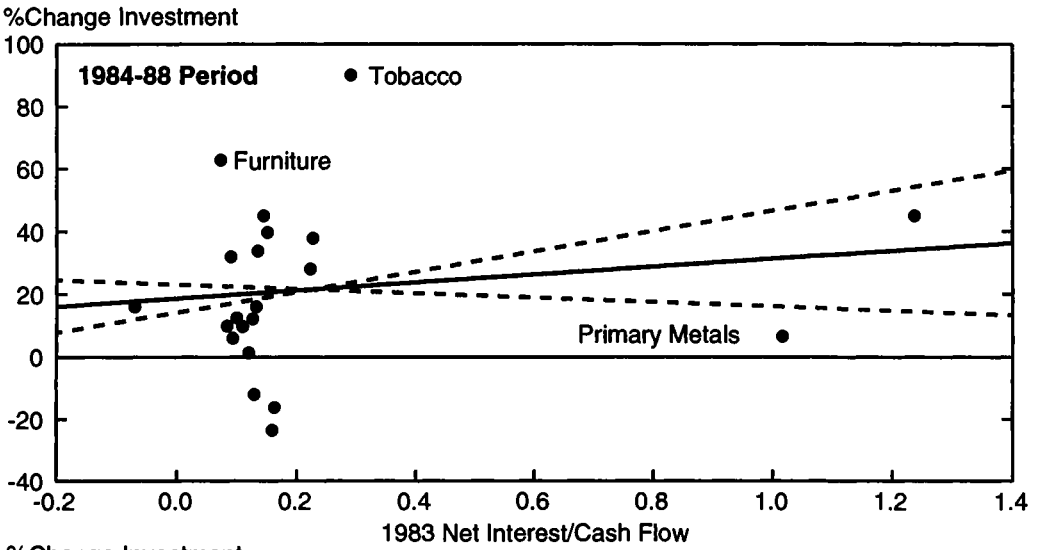
Chart 17: Percentage Change in Investment against Net Interest/Cash Flow





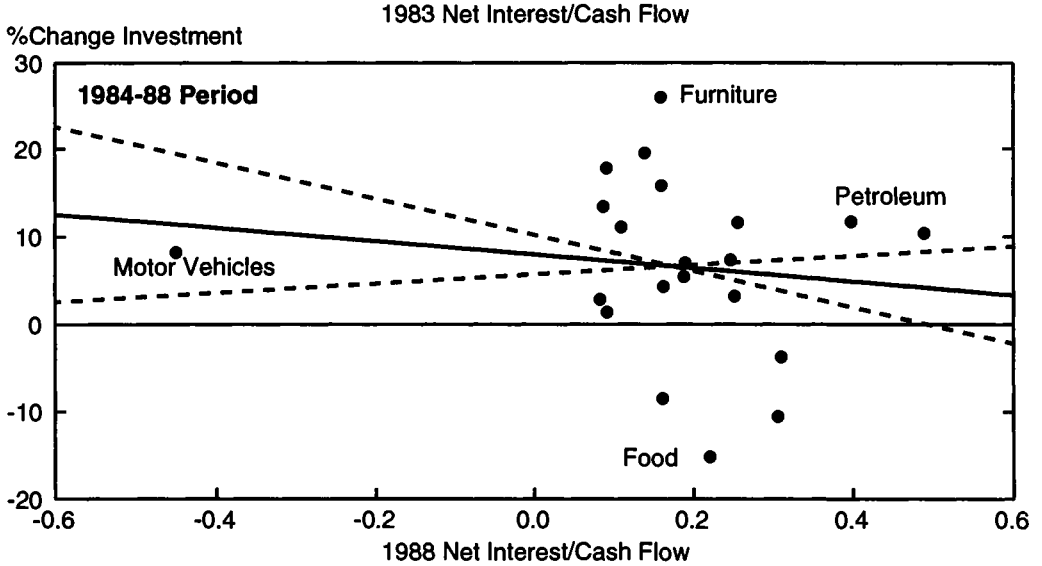


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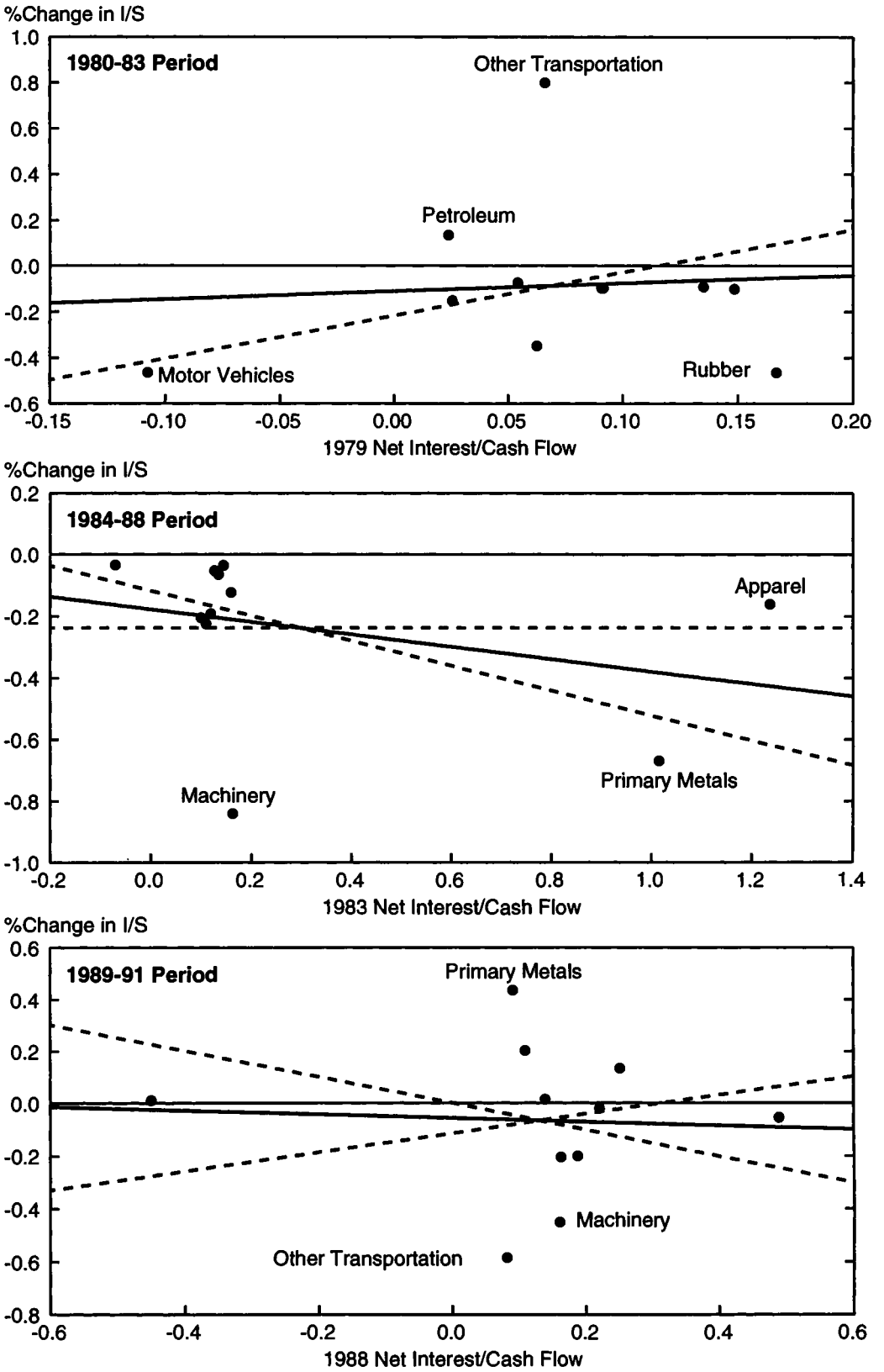
Chart 18: Change in Inventory/Sales against Net Interest/Cash Flow



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exercise, as summarized in Charts 10-12, only here we plot a period's shortfall or excess in activity relative to that predicted by industrial production against the industry's initial net interest burden, rather than establishment size.

Chart 19 summarizes the evidence for the employment data against net interest. For each of the three periods we plot the cumulated residual employment change—over and above that explained by industrial production growth—against the initial ratio of net interest to cash flow. Recall that a positive reading for any industry implies that employment growth was unusually strong given the actual performance of production. We see little sign that industries with above-average ratios of net interest to cash flow in 1979 exhibited weaker than expected employment growth in 1980-83, and in the mid-1980s, a positive relationship appears. The most recent period saw a weak negative relationship, albeit one with little formal statistical significance. In other words, high net interest industries saw greater employment retrenchment relative to production over the last few years.[26] Interestingly, petroleum—an industry that the QFR data records as unusually dependent on bank debt—showed an unusually large decline in employment relative to levels predicted by that industry's production, even though in an absolute sense it was one of the stronger industries in terms of employment growth.

We repeated this exercise for capital spending and ratios of inventory to sales.[27] Both of these variables appeared to be *positively* related to the ratio of net interest to cash flow during the current period and were not negatively related in the past. Thus, when demand is controlled for, evidence that industries facing high interest burdens have shown unusually weak activity during the last few years appears to exist only for employment.

Compustat Data

Because industry statistics may mask important differences between firms within an industry, we once again turn to Compustat for firm-level data, using the same three periods as in the previous section. To highlight firms that may have been unusually constrained by debt and thus particularly vulnerable to tightening credit conditions, we now stratify firms on the basis of the debt to asset ratio in the initial year. This ratio itself fell significantly among the most debt-ridden firms during the most recent period, but there is little evidence that this has translated into weaker activity. Between 1988 and 1991, employment growth trailed sales growth in the quartile with the highest debt-to-asset ratio, but by less than in the two lowest quartiles (Table 7). The top quartile was in fact best able to maintain both employment and sales growth in the face of recession in 1991. By contrast, the top quartile suffered the greatest employment losses (both absolute and relative to sales) during the 1982 recession. There was no sign of a relationship between debt and either inventories or R&D spending in this or past recessions. Thus, firms particularly vulnerable to credit tightening on the basis of initial indebtedness do not appear to have been unusually affected by a "credit crunch."

Summary of Financial Distress Effects

This section produced mixed results on the relationship between measures of financial distress and business activity. The two-digit industry data suggest that in recent years the more debt-burdened industries contracted employment by an unusual amount, rela-

[26] An alternative view is that their productivity growth was surprisingly strong.

[27] The relevant charts are available from the authors.

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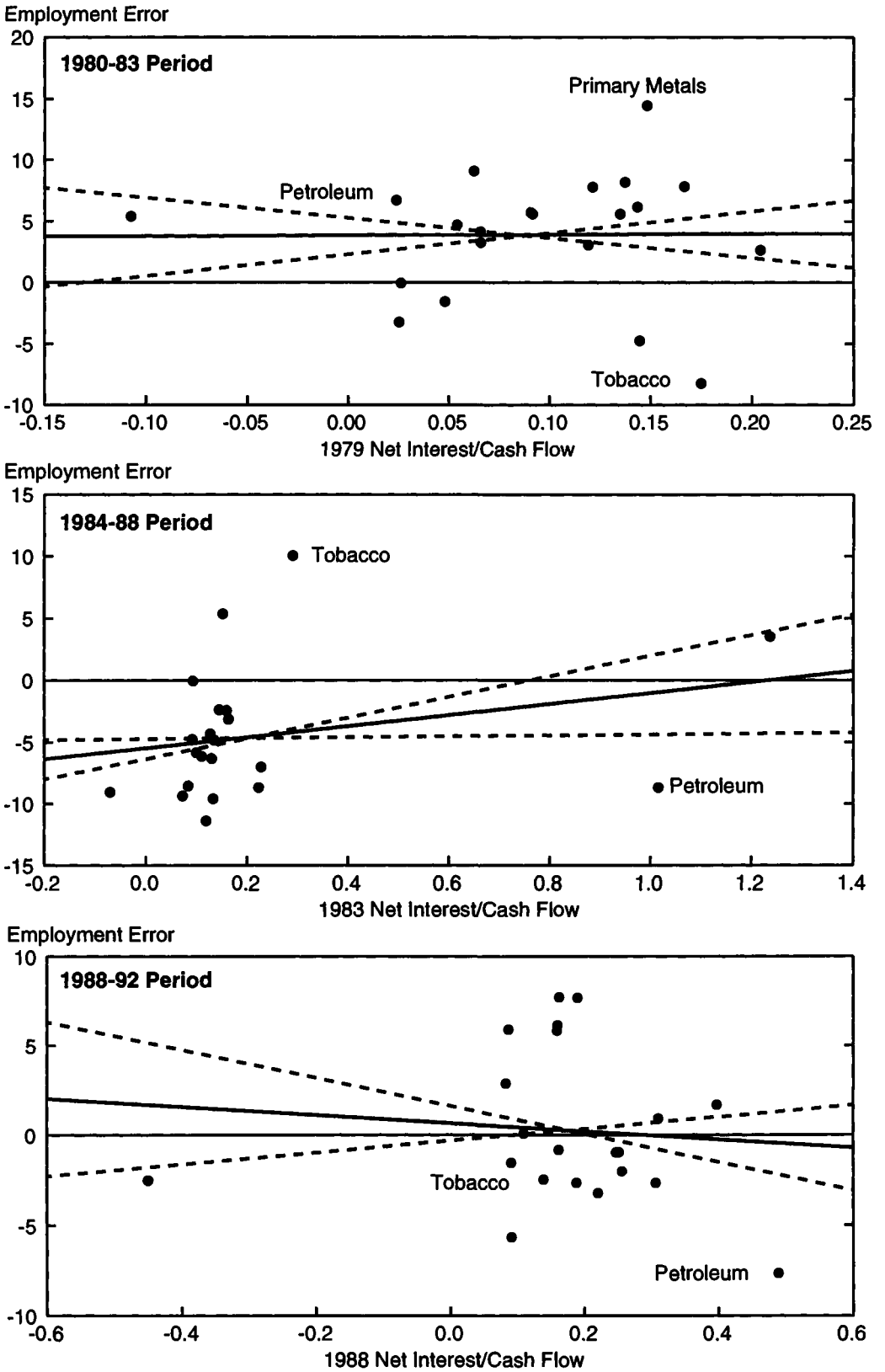
Chart 19: Sum of Errors of the Percentage Change in Employment against the Pecentage Change in Industrial Production Plotted against Net Interest/Cash Flow



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tive to their contraction in production. Other measures of activity show little or no sign of unusually large contractions by heavily indebted firms or industries.

V. Quantifying Size and Distress Effects Using the Compustat Data

The two sections preceding produced only modest evidence that either small firms or firms with large debt burdens experienced unusually large contractions in activity during the recent recession. In this section we use the Compustat data to carry out somewhat more formal tests of the relative effects of size and financial stress effects.

As an alternative to the sorting by size and debt-to-asset ratio, we can perform regression analysis to formally test whether size and debt-to-asset ratios are important determinants of a firm's activity. We can also see whether the effects of these variables have shifted over time. Accordingly, for the three time periods 1972-75, 1980-83, and 1988-91 we estimated simple regression models of employment, inventories, capital spending, and R&D spending.[28] These three periods encompass the last three prolonged recessions and the initial stages of recovery (actually, with 1980 included, the last four

[28] Cantor (1990) and Boldin (1992) used the Compustat data to test more general hypotheses about the determinants of capital spending by firm and their relationship to financial variables. To that end, they estimated more fully elaborated models and used panel data over substantial periods. Their models can be used to address such questions as: Given well-established trends, which firms would have been expected to have weak capital spending in 1989-91, and did they? For our purposes, this analysis would need to be extended to address the further issue of classifying the weak firms by financial distress or size, and comparing that breakdown to earlier recessions. We chose to address these latter issues through direct reduced form equations relating activity to sales and measures of initial firm size and financial distress. This approach also sidesteps the vexatious issue of the degree to which a firm can by itself change such variables as its cash flow (say through renegotiation of labor contracts and refinancing of debt) in response to an unfavorable financial environment, such behavior clouds the use of Cantor and Boldin's structural models in the evaluation of historic episodes.

Table 7: Employment and Sales Growth, by Debt Exposure
Selected Three-Year Periods, Percent Change

	Quartiles[a]			
	Low	Second	Third	High
Average employment				
1972-75	7.0	3.5	8.9	-0.0
1979-82	6.4	8.7	1.3	-10.7
1988-91	14.1	-5.7	12.1	15.5
Average real sales[b]				
1972-75	30.8	20.2	29.1	16.6
1979-82	2.7	13.6	2.2	-6.0
1988-91	43.0	9.8	6.8	23.2

Source: Compustat.

a. Based on initial year debt-to-asset ratio.
b. Deflated using GDP deflator.

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recessions of any length), and comparisons can show how the relationship between firm activity and firm characteristics during downturns has changed. We also included estimates for the 1984-87 time period to see whether the relationships significantly differ between expansions and contractions.

Our model proposes that a firm's activity is determined by both employment and debt-to-asset ratios in the initial year. If initial leverage has a significant impact on decisions, such that heavily indebted firms curtail their activity more than other firms during recessions, we would expect this coefficient to be negative. Similarly, if, other things being equal, smaller firms tend to shrink more in recessions than larger firms, we would expect a positive coefficient. If leverage or size effects have been more important recently, then the coefficient in the 1988-91 period should be of greater absolute magnitude than in earlier periods. The regressions also include year and industry dummy variables as proxies for aggregate shocks and industry-specific factors. The model is very similar in spirit to the cross sectional regressions on the two-digit industry data, although the details differ because of differences in the type and quality of the data available.

Results for employment are shown in Table 8. They suggest that smaller firms suffer more extensive employment losses than larger firms during periods around recessions. In particular, the coefficients imply that a firm that enters a recessionary period with a 1 percent smaller work force than an otherwise similar firm will experience job losses over the period about .2 percent a year greater. In contrast, the relationship between employment growth and initial debt-asset ratios is *positive,* albeit statistically insignificant, in all three recession periods. There is no sign of a marked change in these patterns in the more recent period. On the whole, these results suggest that smaller firms, other things equal, have suffered a greater loss of employment than have large firms over the last few years. However, there seems to be no evidence that more indebted firms have contracted jobs to a greater extent recently than have less indebted firms.

Table 8: Determinants of Employment in Compustat Sample

Period	Initial Employment	Initial Debt-to-Asset Ratio	$\bar{R}^2$
1. 1972-75	.197 (.019)	.330 (.266)	.078
2. 1979-83	.241 (.019)	.048 (.286)	.104
3. 1988-91	.287 (.025)	.115 (.324)	.127
4. 1984-87	.205 (.022)	-.254 (.330)	.084

Model:

$\text{Log } E_{ijt} - \text{Log } E_{ijt-1} = a \log E_{ijo} + b(D/A)_{ijo} + c_j + dt + e.$

E_{ijt} = employment in firm *i* of industry *j* in year t.

D/A = debt to asset ratio.

c_j = industry dummy (= 1 if firm is in 2-digit industry j; 0 otherwise).

d_t = dummy for year t.

e = constant term.

Note: Standard errors in parentheses.

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In the expansion period of the mid-1980s (equation 4), the response of employment growth to size was slightly smaller than in the recession periods, suggesting that the tendency for initially larger firms to grow more rapidly than smaller firms was less pronounced. The coefficient on the debt-to-asset ratio bore the opposite in sign from that in the recession periods; firms with higher initial debt-to-asset ratios grew more rapidly in the mid-1980s. However, the employment coefficient for the expansion period differed only slightly from that for the recession periods, and the negative debt-to-asset coefficient was statistically indistinguishable from zero.

The model for inventories is similar to the employment model, with the inventory-to-sales ratio as the dependent variable. As Table 9 shows, these patterns have shifted significantly, but in the opposite direction from that which was hypothesized. Thus, in the most recent period, we see a greater increase of inventories relative to sales in firms with high initial debt-to-asset ratios. This result represents a sharp turnaround from previous recession periods, when the relationship between indebtedness and inventory-to-sales ratios was negative (and significant in 1972-75). There is no evidence that firms with larger initial employment better maintained inventory-to-sales ratios in any recession period. The results for the mid-1980s (equation 4) suggest that the switch in sign on the debt-to-asset ratio occurred about then.

Results for a variable related to investment are shown in Table 10. The dependent variable is the ratio of net plant to sales. We express the model in terms of the stock of net plant, rather than the flow of capital spending, because many firms report zero or *negative* levels of capital spending. Because the value of net plant can change from depreciation and revaluation and accounting changes, as well as actual spending on new capital, the connection between these results and capital spending is somewhat loose. The equations consistently show that firms with high levels of initial employment had high levels of net plant relative to sales. Thus, these results suggest that smaller firms either reduced capital spending or shed assets more quickly than did large firms in the most recent episode.

The most interesting item in Table 10 is the shift in the coefficient on the initial debt-to-asset ratio. In 1972-75 and 1979-83 there was a strong positive relationship between

Table 9: Determinants of Inventory Levels in Compustat Sample

Period	Initial Employment	Initial Debt-to-Asset Ratio	$\bar{R}^2$
1. 1972-75	.005 (.007)	-.338 (.105)	.294
2. 1979-83	-.024 (.006)	-.007 (0.94)	.294
3. 1988-91	-.021 (.008)	..309 (.105)	.355
4. 1984-87	-.046 (.008)	-.028 (.116)	.321

Model:

$\text{Log } I_{ijt} - \text{Log } S_{ijt} = a \log E_{ijo} + b(D/A)_{ijo} + c_j + d_t + e.$

L_{ijt} = inventories of firm i of industry j in year t.

S_{ijt} = sales of firm i of industry j in year t.

Note: Standard errors in parentheses.

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initial debt-to-asset ratios and the ratio of net plant to sales; in 1988-91 that relationship became negative. To the extent that the ratio of net plant to sales is correlated with capital spending, this shift is evidence that high ratios of debt to assets inhibited such spending to an unusual degree in recent years. This effect appears to be a recent phenomenon; equation 4 shows that the positive association between high debt and high ratios of net plant-to-sales continued through the mid-1980s.

Finally, we estimate the determinants of research and development spending normalized by sales. The equations of Table 11 show a consistent and growing negative relationship between debt-to-asset ratios and R&D spending. Thus, we have some evidence that credit constraints as exemplified by initial debt-to-asset ratios were present in the past few years. Also compared to the larger firms, there is some evidence that smaller firms responded to weak sales by greater cuts in R&D spending in the 1988-91 recession

Table 10: Determinants of Net Plant in Compustat Sample

Period	Initial Employment	Initial Debt-to-Asset Ratio	$\bar{R}^2$
1. 1972-75	.090 (.008)	.730 (.120)	.276
2. 1979-83	.084 (.007)	.394 (.111)	.259
3. 1988-91	.095 (.011)	-.229 (.139)	.358
4. 1984-87	.032 (.010)	.399 (.151)	.274

Model:

$\text{Log } NP_{ijt} - \text{Log } S_{ijt} = a \log E_{ijo} + b(D/A)_{ijo} + c_j + d_t + e.$

NP_{ijt} = net plant of firm i of industry j in year t.

Note: Standard errors in parentheses.

Table 11: Determinants of Research and Development Expenditures in Compustat Sample

Period	Initial Employment	Initial Debt-to-Asset Ratio	$\bar{R}^2$
1. 1972-75	-.093 (.056)	-1.554 (.793)	.189
2. 1979-83	.125 (.059)	-3.863 (.897)	.206
3. 1988-91	.177 (.079)	-6.343 (1.044)	.305
4. 1984-87	.298 (.075)	-3.688 (1.104)	.261

Model:

$\text{Log } RD_{ijt} - \text{Log } S_{ijt} = a \log E_{ijo} + b(D/A)_{ijo} + c_j + d_t + e.$

RD_{ijt} = research and development expenditures of firm i of industry j in year t.

Note: Standard errors in parentheses.

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period than in earlier ones. Equation 4 suggests that large firms more aggressively expanded R&D spending during the prosperous mid-1980s than in the recession periods before and after.

The regression evidence does not suggest that smaller or more indebted firms suffered greater contractions in *all* dimensions of activity in recent years. In some significant areas, however, such relationships do appear: there is evidence of an unusual negative connection, starting in the late-1980s, between debt-to-asset ratios and the ratio of net plant to sales, as well as a continuing positive relationship between firm size and the net plant-to-sales ratio. A negative relationship between debt-to-asset ratios and the ratio of R&D spending to sales intensified during the most recent period, while positive relationships between firm size and employment growth and the ratio of R&D spending to sales ratio continued. On the whole, then, it does appear that smaller firms experienced some disproportionate losses in activity over the last few years, though not to a more marked extent than in past recessionary periods. In contrast, highly indebted firms may well have been more severely affected than in past periods, a finding that is certainly consistent with the hypothesis of significant credit supply effects.[29]

VI. Summary and Conclusions

We have found only tentative evidence of an association between credit market tightness and weakness in the small firm sector. Credit conditions probably tightened more for small firms than for large firms over the last few years. We have not, however, been able to establish that small firm performance has been greatly at variance with historic experience.

The small firm sector did not experience an unusually steep decline in employment in the 1990-91 recession, but did it recover unusually slowly from the recession. The divergence from the large firm sector was not large, however. Stratification of manufacturing industries by establishment size uncovers at most very modest evidence that size was inversely related to job loss, weakness in capital spending, or contractions in inventories in the last few years—whether the weakness in activity is measured absolutely or scaled, using regression analysis, to cyclical factors or longer term trends. Thus, the relatively greater weakness in bank lending to small manufacturers was not associated with pronounced relative weakness in activity among these firms. Of course, it is plausible that different factors were at work in the small and large firm sectors: a bank credit crunch depressing small firm activity, and the restructuring movement weighing on large corporations. However, if both of these factors had been significant, the decline in *overall* business activity probably would have been larger than observed.

Nevertheless, our results suggest that industry and firm financial debt levels *were* associated with unusual developments in activity over the last few years. Given demand conditions, manufacturing industries that ended the 1980s with high ratios of net interest payments to cash flow tended to contract employment in the 1989-91 period to an unusually large degree, given demand conditions, though they were not necessarily the

[29] As indicated in the text, a much smaller sample of firms had meaningful data on capital spending. The set of firms with usable data on employment, inventories, net plant, R&D spending, and capital spending was approximately half the size of that using the first four variables as screens. Repeating the regressions shown in Tables 8-11 with the smaller sample gave generally similar results, except that the coefficient on debt in the net plant model in the 1988-91 periods was positive (though not significantly different from zero and smaller in magnitude than in the earlier periods). For capital spending (the dependent variable was the ratio of capital spending to sales) the coefficient on initial employment was uniformly negative and that on the debt-to-asset ratio was positive.

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leaders in paring jobs in an absolute sense. The Compustat data suggest that R&D spending and the growth of net plant (but not employment growth) in the last few years were unusually weak, given sales growth, for firms starting the period with high ratios of debt to assets.

The evidence can be interpreted to mean that indebted businesses tended to achieve unusually strong productivity gains (weakness in employment relative to production) and cut back their acquisition of capital and their R&D budgets. However, these phenomena are not necessarily unusual; earlier periods of economic weakness saw somewhat similar events. Thus, there is little or no clear-cut evidence of an unusually strong association of debt with retrenchment in activity over the last few years. Our final conclusion, then, is that credit supply problems, to the extent that they manifested themselves in changes in activity at indebted firms, probably played a somewhat more significant role in the weakness in business activity over the last few years than in past recessionary periods, but were not the predominant forces at work in the business cycle.

Appendix 1. Impediments to Small Business Lending (by Paul Ludwig)

Among the factors contributing to the recent slowdown in small business lending are significant changes in bank lending practices. These changes – arising from legislative, regulatory, and internal industry responses to the weakening of the banking sector in the late 1980s – have raised the costs of extending and applying for business credit. In general, these costs represent a larger fraction of a small dollar credit; as many businessmen and bankers have noted,[1] small business lending has as a consequence been particularly affected by the changes. This appendix deals with some of the major structural impediments that have hampered small business lending in recent years.

Increased Use of Real Estate Appraisals

One of the major provisions of the 1989 savings and loan bill, the Financial Institutions Reform, Recovery and Enforcement Act, requires that a real estate appraisal be conducted for any property involved in a commercial loan transaction exceeding $100,000. For many of these loans, a detailed, fourteen-point evaluation must be completed by an approved, certified appraiser, whether or not the real estate is used as a primary source of collateral. The net effect of this requirement is to increase the time and expense involved in processing the loan. The requirements are especially burdensome for small business owners, who typically use real estate to collateralize their loans. With prices ranging from $2,500 to $10,000,[2] the appraisals represent a significant increase in the costs of a small business loan.

Increased Loan Documentation Requirements

The amount of documentation required to secure a loan has increased significantly. In addition to arranging the appraisals mentioned above, borrowers must file several years of financial statements and tax returns, a business plan, and a set of business projections within thirty days of applying for the loan. While this requirement is a minor burden for

[1] For a collection of such opinions, see "The Credit Cruch For Small- and Medium-Sized Businesses", Field Hearing before the Committee on Banking, Finance, and Urban Affairs, House of Representatives. March 20, 1993.

[2] "Regulatory and Supervisory Impediments to Small Business and Middle Market Lending", Mellon Bank Corporation, in "The Credit Crunch For Small- and Medium-Sized Businesses", p. 190.

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larger firms, small businesses often do not have the sophistication to produce such documents in a timely manner. To meet the requirements, borrowers often need to spend a significant amount of time preparing the paperwork, or they must pay to get outside help. Although lending officers can extend the credit without complete documentation, they would then run the risk of having the loan classified by the bank examiners.

Higher Bank Capital Standards

To improve the industry's ability to absorb losses, regulators have required banks to increase their capital holdings. These new risk-based capital requirements force banks to set aside more capital per dollar of commercial loan than is the case for consumer loans or security holdings. As a result, banks have an incentive to shift their portfolios away from commercial loans. Moreover, new capital requirements may have especially constrained the growth in small business credit because small firms generally have few alternatives to commercial banks as sources of credit. Larger firms have greater access to funds raised in securities markets, which are not affected by the capital requirements.

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Appendix 2 Table 1: Dependent Variable: Employment Growth

	Coefficient			
Industry	Constant	Production Growth	R^2	Durbin-Watson
Nonelectric machinery	-0.859 (0.457)	0.296 (0.066)	0.727	1.375
Fabricated metals	-0.503 (0.283)	0.528 (0.049)	0.842	1.755
Electrical machinery	-0.671 (0.303)	0.317 (0.059)	0.746	1.732
Furniture	-0.238 (0.299)	0.388 (0.063)	0.680	1.889
Instruments	-0.275 (0.291)	0.147 (0.067)	0.633	1.431
Lumber	-0.387 (0.388)	0.342 (0.047)	0.660	1.832
Miscellaneous durables	-0.433 (0.235)	0.232 (0.069)	0.485	1.861
Primary metals	-1.058 (0.493)	0.234 (0.023)	0.786	1.775
Stone, clay, and glass	-0.475 (0.209)	0.282 (0.055)	0.544	1.934
Other transportation equipment	-0.454 (0.334)	0.314 (0.037)	0.726	1.882
Motor vehicles	-0.585 (0.527)	0.307 (0.030)	0.745	1.818
Apparel	-0.513 (0.212)	0.421 (0.063)	0.680	1.918
Petroleum[a]				
Food	-0.139 (0.088)	0.110 (0.075)	0.055	2.048
Chemicals	-0.057 (0.194)	0.047 (0.034)	0.556	1.843
Printing	0.348 (0.286)	0.014 (0.027)	0.764	1.284
Leather	-1.083 (0.353)	0.296 (0.060)	0.604	1.890
Paper	-0.082 (0.163)	0.105 (0.034)	0.525	1.998
Rubber	-0.297 (0.233)	0.454 (0.054)	0.712	1.885
Tobacco	-0.635 (0.287)	0.062 (0.053)	0.055	2.016
Textiles	-0.557 (0.282)	0.231 (0.037)	0.701	1.850

Notes: Standard errors in parentheses. Estimation period: 1980-I to 1992-II.

[a.] Negative coefficient on both current and lagged production variables.

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Appendix 2 Table 2: Dependent Variable: Log of Real Gross Investment

	Coefficient			
Industry	Constant	Log Production	R^2	Durbin-Watson
Nonelectric machinery[a]				
Fabricated metals	8.229 (1.665)	0.801 (0.365)	0.305	0.401
Electrical machinery	12.084 (0.195)	0.681 (0.043)	0.957	1.580
Furniture	-5.190 (2.201)	3.542 (0.489)	0.826	0.819
Instruments	3.699 (0.423)	1.666 (0.093)	0.967	1.366
Lumber	6.351 (1.239)	1.040 (0.277)	0.562	0.638
Miscellaneous durables	-6.894 (5.455)	2.272 (1.186)	0.250	0.287
Primary metals[a]				
Stone, clay, and glass	4.333 (3.530)	1.590 (0.773)	0.278	0.360
Motor vehicles	9.780 (0.822)	0.558 (0.184)	0.455	0.492
Other transportation	11.220 (0.153)	0.144 (0.153)	0.617	0.566
Apparel	-19.309 (6.707)	5.244 (1.472)	0.536	0.668
Petroleum	-1.277 (5.301)	2.421 (1.154)	0.286	0.188
Food[a]				
Chemicals	-3.343 (2.233)	3.201 (0.511)	0.781	0.717
Printing	8.290 (0.480)	0.795 (0.107)	0.834	0.639
Leather[a]				
Paper	-2.027 (1.424)	3.135 (0.314)	0.901	1.226
Rubber	7.200 (0.359)	0.555 (0.081)	0.811	0.788
Tobacco[a]				
Textiles[a]				

Notes: Standard errors in parentheses. Estimation period: 1980-91.

a. Negative coefficient on both current and lagged production variables.

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Appendix 2 Table 3: Dependent Variable: Real Inventory/Sales Ratio

	Coefficient			
Industry	Constant	Time	R^2	Durbin-Watson
Primary metals	11.673 (1.724)	-0.017 (0.003)	0.378	0.198
Fabricated metals	7.621 (0.573)	-0.01 (0.001)	0.658	0.524
Nonelectrical machinery	24.418 (1.339)	-0.041 (0.002)	0.85	0.17
Electrical machinery	8.309 (0.613)	-0.011 (0.001)	0.666	0.249
Motor vehicles	6.169 (0.649)	-0.01 (0.001)	0.584	0.617
Other transportation equipment	-3.611 (1.836)	0.014 (0.003)	0.247	0.211
Other durable goods	6.746 (0.476)	-0.009 (0.001)	0.682	0.38
Food	4.109 (0.088)	-0.006 (0.0002)	0.964	0.6
Paper	2.277 (0.387)	-0.002 (0.001)	0.114	0.246
Chemicals	3.814 (0.387)	-0.004 (0.001)	0.403	0.478
Petroleum	2.233 (0.454)	-0.003 (0.001)	0.164	0.23
Rubber	8.312 (0.618)	-0.013 (0.001)	0.721	0.304

Notes: Standard errors in parentheses. Estimation period: 1980-I to 1992-II.

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The Credit Slowdown and the Monetary Aggregates

by R.S. Hilton and C.S. Lown[1]

Over the past three years, a sharp decline in credit growth has been accompanied by extreme weakness in the broad monetary aggregates. The behavior of these measures is not unusual insofar as money and credit—especially credit at depository institutions—have generally moved together during the past thirty years (Charts 1 and 2). However, the very sharp deceleration in money and credit growth over the last few years raises the question of how these aggregates have been affected by special factors during this most recent business cycle.

In this study, we assess the recent slowdown in the broad measures of money by analyzing several factors that are believed to have affected the supply of and demand for both money and credit, including weakened bank balance sheets, a reduced willingness to lend, shifts in consumers' preferences for money, and shifts in borrowers' demand for loans. In the first section of the paper, we lay out a framework for discussing the various channels connecting credit and money and describe how the principal forces behind the slowdown in credit formation may have affected the monetary aggregates. In the second section, we estimate the impact of the credit slowdown during the past few years on M2, controlling for business cycle influences. An econometric analysis of the links between the credit and money slowdown is undertaken in the final section. In that section, the predictive performance of M2 demand equations over the past few years is evaluated, the causal relation between money and credit is examined, and the ability of various bank balance sheet measures to explain deposit formation is studied in a cross-sectional framework.

The evidence reviewed in this study suggests that recent growth in the monetary aggregates has been weakened by several factors that have slowed credit formation—factors operating in addition to the direct effects associated with the 1990-91 recession and subsequent recovery period. These factors include a supply-side credit crunch in the depository sector and a retrenchment in credit demand by heavily indebted borrowers. A shift in consumer preferences towards holding more nonmonetary assets also has led di-

[1] We thank Joe Abate and Joe LaVorgna for their research assistance and Akbar Akhtar for helpful comments.

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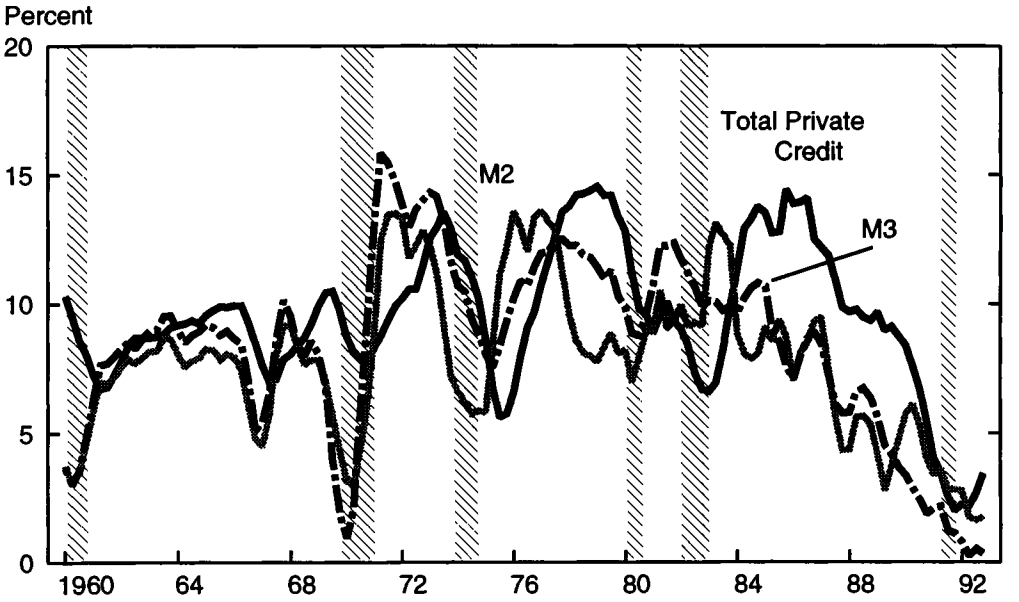
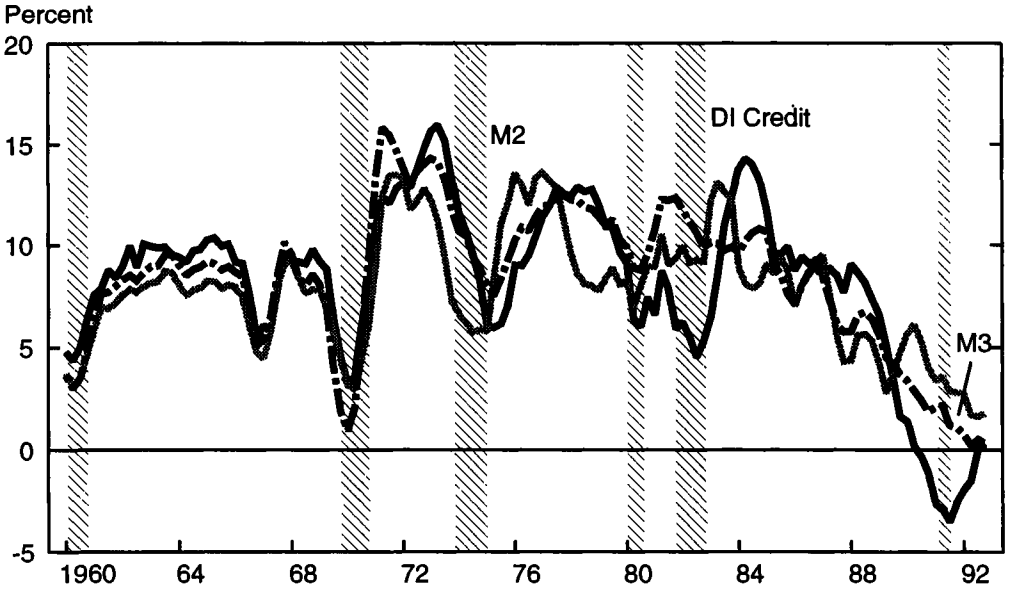
Chart 1: Total Nonfinancial Private Credit, M2, and M3
Four Quarter Growth Rates



Note: Shaded areas represent recessions.

Chart 2: Depository Credit, M2, and M3
Four Quarter Growth Rates



Note: Shaded areas represent recessions.

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rectly to some weakness in the broader monetary aggregates and indirectly may have contributed to slower bank credit formation. The behavior of interest rates, with bank loan rates rising relative to market yields and deposit rates falling relative to alternative yields, suggests that a contraction in the supply of bank loans has been an important force weakening both credit formation and the broader monetary aggregates. Simple calculations suggest that, combined, all the factors cited above could have depressed the level of M2 by roughly $300 billion, or nearly 10 percent, by the third quarter of 1992, two years after the onset of the most recent economic downturn.

An evaluation of the forecast performance of a standard M2 demand equation yields a similar-sized value for the cumulative prediction error for this aggregate in the third quarter of 1992. Including various measures of credit creation and alternative measures of the opportunity cost of holding M2 deposits significantly improves the statistical fit of the estimated M2 equation for recent years. Results from Granger-causality tests provide some weak support for the view that the causal link running from credit to M2 money creation has strengthened in recent years, a finding consistent with the widespread view that depositories have increased their use of smaller deposits (a component of M2) as a managed liability to fund loans. Meanwhile, little evidence is found of a statistically significant causal link running from money to credit for the recent period. Finally, a number of cross-section results performed using state-level and bank-level data show that measures of bank balance sheet distress account for at least a modest portion of the weakness in deposit formation in recent years.

Overall, the empirical work undertaken in this study shows that factors that have shifted credit demand and supply, and money demand—apart from direct business cycle influences associated with the 1990-91 economic downturn—account for a considerable portion of the weakness in M2 seen in recent years. We are not able to isolate fully the effect of credit supply problems on the monetary aggregates in our empirical analysis. However, much of the evidence found—from examining the behavior of key interest rate spreads, by including credit supply measures in the estimation of M2, and the cross-section estimation results—supports the view that credit supply constraints played a significant role in weakening the broader monetary aggregates.

I. Credit Formation and the Monetary Aggregates

In this section, we begin by outlining the linkages between credit formation and the monetary aggregates, and then turn to the specific reasons commonly cited for the slowdown in these aggregates.

Links Between Credit Formation and the Monetary Aggregates

The channels between credit formation and the monetary aggregates are multiple and complex. Nonetheless, the key linkages between credit and money may be summarized in the framework of supply and demand schedules for depository lending and deposit creation. Depository institutions, including banks, act as a principal source of credit for many businesses and most households. Depositories also supply a large fraction of the liabilities that are included in the M2 and M3 monetary aggregates.

Stylized representations of the supply and demand for bank lending and money deposits are presented in Chart 3. In the top panel, bank loan supply and demand are drawn as a function of the spread between the bank loan rate (rp) and the market yield associated with investment or borrowing alternatives (r), represented by a single rate that is held exogenous in this simple framework. Similarly, the supply and demand for

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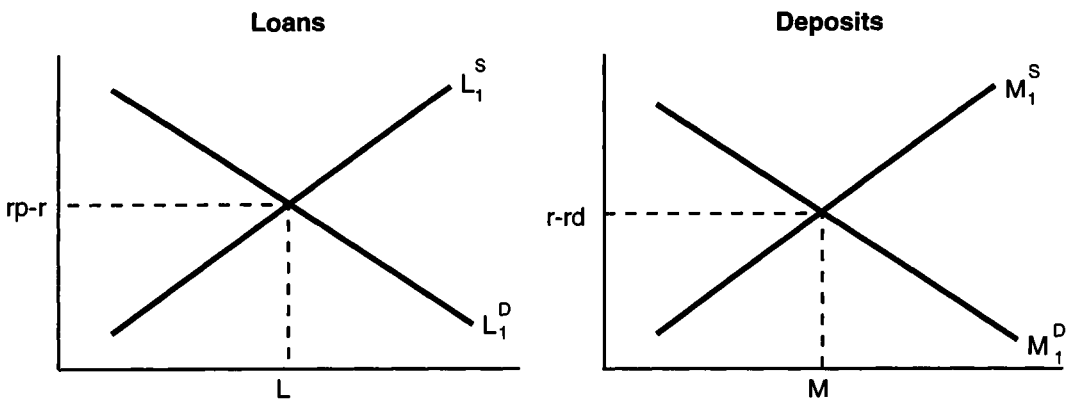
money deposits at banking institutions are determined in part by the opportunity cost of holding or creating these deposits, represented in the bottom panel by the spread between the deposit rate (rd) and the alternative market yield.[2]

Factors other than lending and deposit rates can also affect the supply and demand for either bank lending or monetary liabilities. For example, lower aggregate income would decrease the demand for both bank credit and deposits, moving their respective demand schedules to the left. Furthermore, some developments that bear directly on aggregate measures included in the consolidated balance sheet of depository institutions may spark a response by banks designed to keep their assets and liabilities in overall balance and at desired levels. Such responses may appear as shifts in the bank lending or deposit supply schedules. For instance, developments that reduce the willingness of depositories to extend credit, moving the supply schedule of loans to the left, would also reduce banks' funding needs, shifting the money supply schedule to the left as well.

The degree to which a change in the supply or demand for bank lending might translate into a shift in the money supply schedule depends importantly on several factors, including (1) how extensively the managed liabilities in the monetary aggregate under consideration are used to finance lending, and (2) how the investment portfolios of banks are managed. These two factors are discussed in more detail below. Also discussed below is how total credit responds to factors that affect bank lending.

[2] The alternative market rates used to measure the opportunity costs of borrowing and lending and of holding or creating money deposits are exogenous in this framework, so a single rate can be used in the graphical treatment to represent all market rates with no loss of generality.

Chart 3: Bank Lending and Money



L^S = supply schedule of depository loans.
L^D = demand schedule for depository loans.
M^S = supply schedule of monetary deposits.
M^D = demand schedule for monetary deposits.
(rp-r) = spread between the bank lending rate (rp) and the market rate (r).
(r-rd) = spread between the market rate (r) and the bank offering rate (rd).
L = level of depository loans.
M = level of deposit balances.

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Managed liabilities in the monetary aggregates

One factor that influences the degree to which a change in bank lending affects money is the extent to which the monetary aggregate under consideration is used to fund lending activities. For many years, large certificates of deposits—those worth $100,000 or more and included in the current definition of M3—had been used as the primary tool by banks to finance their lending on the margin. Banks would adjust yields offered on these deposits (in effect, shifting the supply schedule for M3) to attract the funding needed to support their desired lending. As a result of financial deregulation that has removed most deposit-rate ceilings, during the past several years depositories have increasingly relied on small time deposits—those under $100,000 in value and included in the current definition of M2—to help meet their funding needs. This shift in bank practices has broadened the link between bank lending and M2; thus, shifts in bank credit supply or demand are now more likely to lead to significant changes in the M2 deposit supply function than was previously the case.[3]

Holdings of government securities

The degree to which depositories offset changes in lending supply or demand by shifting their other asset holdings will also partly determine the response of the money supply schedule to lending changes.[4] The top panel of Chart 4 indicates that a significant portion of the slowdown in depository lending in the past few years has been partly offset by more rapid accumulation of investment securities.[5] Nonetheless, overall depository credit, which includes these securities, has fallen considerably in recent years (bottom panel). Thus, the overall balance sheet constraint suggests that a substantial part of the reduction in depository lending has been met with a decline in bank deposits.

Reliance on banks as a source of credit

This study focuses primarily on the association between depository credit formation and the monetary aggregates, which are used to finance a major portion of bank lending. Some general observations about the relation between changes in bank credit formation and the behavior of total credit should be made. A decline in depository credit that is accompanied by a reduction in money may not be reflected in a similar change in total credit formation because businesses and households have some ability to raise credit outside of banking channels. Many of the financial innovations of the past decade have made it easier for larger corporations to borrow directly in credit markets or through nondepository institutions. Consequently, a shift in the supply of depository credit will not necessarily be fully reflected in changes in total credit.[6] Nonetheless, many small and medium-sized firms remain heavily reliant on depository institutions to meet their

[3] Wenninger and Partlan (1992) found that the contemporaneous correlation between interest rates on small and large time deposits, and between the growth of these two types of deposits, was significantly higher over the sample period running from the late-1970s to the present than it was over the preceding twenty years. The increased correlation in the behavior of these deposit categories suggests that banks now use some M2 deposits as they traditionally have used M3 deposits to fund credit expansion.

[4] The rate of return on these alternative assets is captured in the market interest rate presented in the graphs. Thus, the sensitivity of lending or deposit creation to changes in security holdings is reflected in the supply elasticities.

[5] In fact, some anecdotal evidence suggests that stricter capital requirements have encouraged banks to substitute government securities in place of loans.

[6] The effects of a slowing in depository lending on economic activity, which are not treated explicitly in this study, may depend in part on how readily nonbank credit can be substituted for bank lending.

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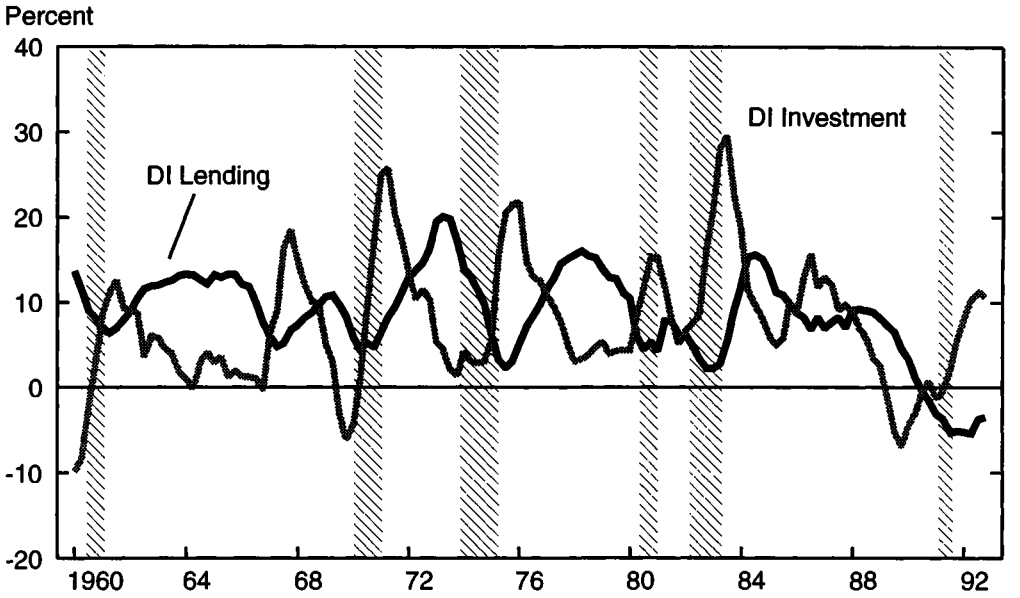
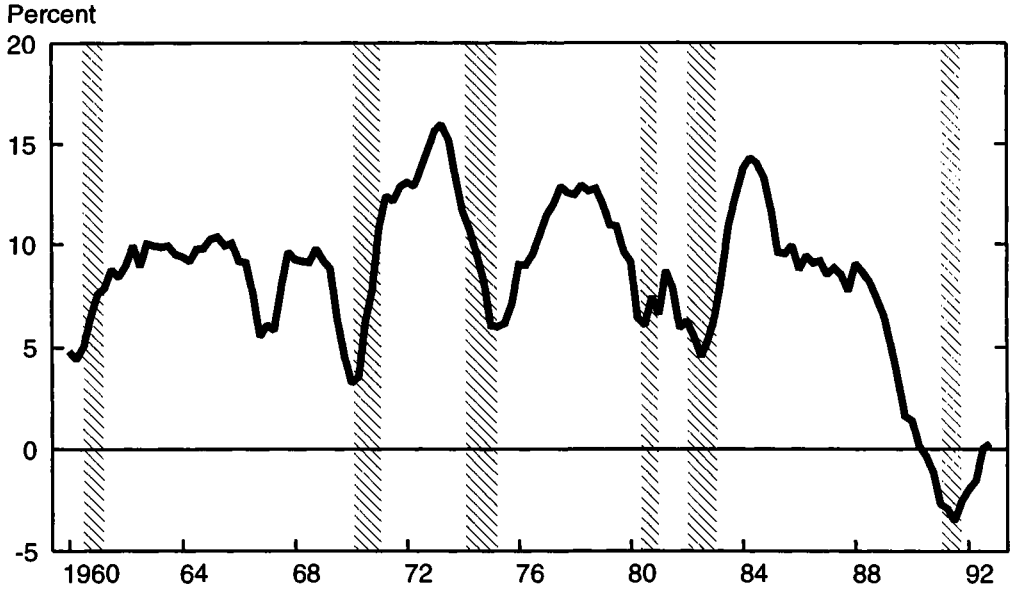
Chart 4A: Depository Lending and Investments
Four Quarter Growth Rates



Note: Shaded areas represent recessions.

Chart 4B: Total Credit of Depository Institutions
Four Quarter Growth Rates



Note: Shaded areas represent recessions.

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credit demands, so a fall in depository credit supply, and the associated drop in money supply, will at least be partly reflected in a decline in overall credit formation.

Factors Behind the Credit Slowdown and Implications for Money Growth

The simple framework presented above can be used to illustrate the consequences of a credit slowdown for the monetary aggregates. A decreased willingness on the part of depository institutions to lend is widely regarded as a principal cause of the slowdown in depository credit formation.[7] A "supply-side" credit crunch has been tied to several related developments. Reduced depository credit supply has been attributed to a shrinking capital base that directly impedes the ability of depositories to lend, and to loan losses accumulated over the past several years.[8] Stricter capital requirements and more stringent lending guidelines imposed by banking regulators in response to these same factors have reinforced banks' reluctance to lend. The widespread distress experienced in the savings and loan industry and the associated collapse in the capital base of thrifts is one part—albeit a substantial one—of this credit crunch phenomenon.

All these developments would shift the supply schedule for bank loans, as portrayed in Chart 5A, placing upward pressure on bank lending rates measured relative to market interest rates. At the same time, after allowing for any substitution of investment securities in place of direct lending, the decreased loan supply would contribute to a leftward shift in the money supply schedule as the funding needs of depositories fell, also shown in Chart 5A. As a result, the money supply would be reduced, and bank offering rates would fall relative to competing market yields. In this scenario, bank lending rates rise relative to market rates while deposit rates fall, and the amount of outstanding bank loans and deposits falls.

Considerable anecdotal evidence suggests that banks have relied in part on nonprice mechanisms to allocate credit supplies. To ration credit, depositories can adjust a variety of qualifying standards. Certain forms of collateral may be revalued to reflect revised perceptions about underlying risk, or credit may be restricted to customers with established, long-term relationships. In recent years, many borrowers in the real estate sector in particular have reported being effectively shut out of the bank credit market. In terms of the graphical framework presented in Chart 5A, under credit rationing, lending rates are held below market clearing levels, where loan demand outstrips supply, and banks cut back on desired lending through nonprice means. While potentially significant, large reductions in desired lending are difficult to achieve entirely through nonprice means, and some combination of higher lending rates and more stringent lending criteria are likely to have been used.

The credit slowdown has also arisen partly from "demand-side" factors not directly linked to the aggregate level of economic activity as businesses and households have voluntarily scaled back their borrowing. In many cases, the high levels of debt incurred in the 1980s and depressed values of asset holdings, particularly real estate, have left borrowers reluctant or financially unable to take on additional debt. A falloff in credit demand would tend to reduce bank lending rates, as shown in Chart 5B. This decline in demand would also contribute to a leftward shift in the money supply, also portrayed in Chart 5B, because the funding needs of depositories would be reduced. In this case,

[7] Explanations for the weakness in lending by depository institutions are discussed in greater detail by Lown and Wenninger (1993).

[8] Peek and Rosengren (1992) have argued that a capital shrinkage has constrained bank lending in the New England region. Johnson (1992) makes a similar case at the national level.

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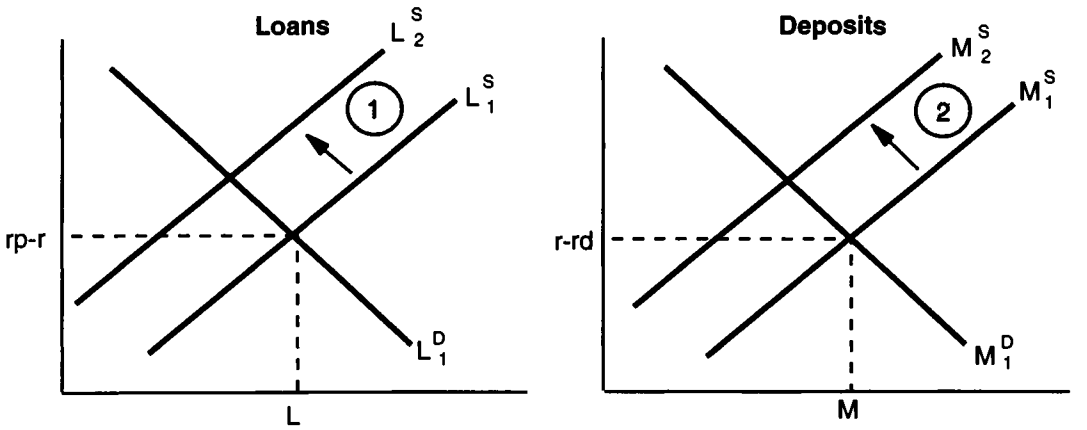
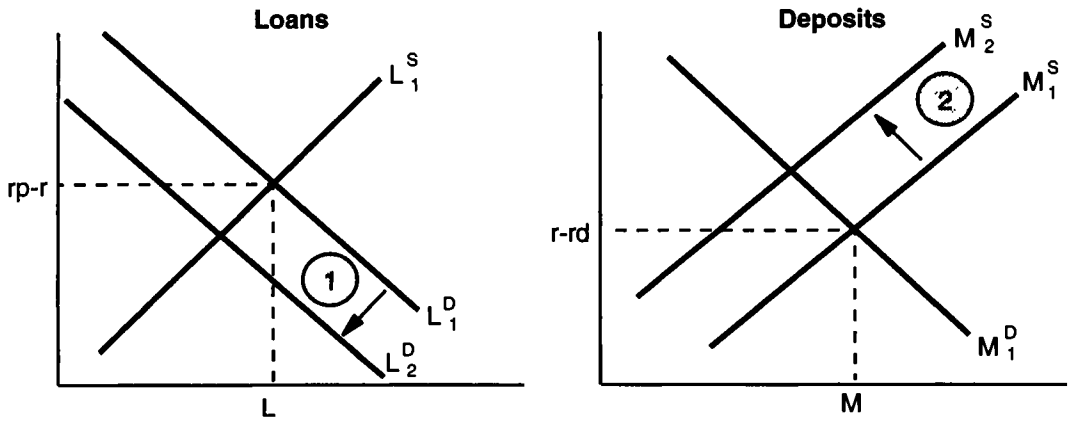
Chart 5: Shifts in Bank Lending and Money*

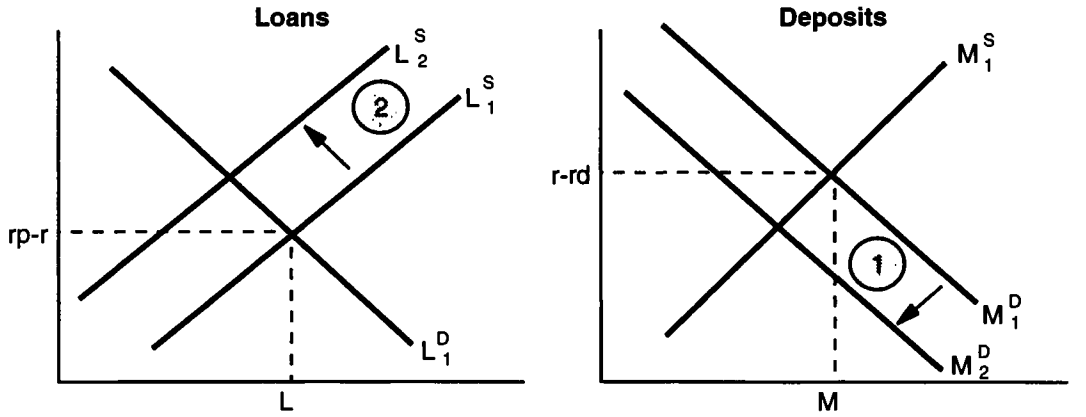
A: Decline in Bank Lending Supply



B: Decline in Credit Demand



C: Decline in Money Demand



* See notes after Chart 3.

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both bank lending and money decline, and both bank lending rates and offering rates on deposits fall relative to competing market yields.

Factors other than a slowing in bank credit demand and supply have been linked to recent weakness in money growth. In particular, a shift in consumer preferences for holding money balances has been tied to the introduction of alternative investment vehicles offered by nondepository institutions and may have been a separate source of weakness in money demand. Bond and stock mutual funds have found increasing acceptance among smaller investors in recent years. These accounts often carry market-based returns and offer a degree of liquidity similar to competing deposits included in the broader monetary aggregates. Their introduction would contribute to a leftward shift in the money demand schedule as consumer preferences change, as represented in Chart 5C, putting upward pressure on deposit rates.[9] The massive closing of thrifts by official regulators also reportedly has encouraged a reallocation of funds into accounts not included in the monetary aggregates that might not otherwise have taken place, prompting a shift in money demand. A fall in money demand impairs the ability of depositories to attract funds without raising offering rates, causing credit supply to be cut back, also shown in Chart 5C.[10] In this case, money and credit decline, while both bank lending and offering rates rise relative to competing market rates.

Finally, the broad decline in aggregate economic activity associated with the 1990-91 recession, as well as the sluggish pace of growth that marked the early stages of the subsequent recovery, have undoubtedly exerted a major influence on the behavior of credit and money.[11] A decline in economic growth typically weakens credit demand, including demand for depository lending, and at the same time directly reduces money demand. Meanwhile, the capital positions of depositories and the value of their collateral holdings normally deteriorate in the face of a slowing economy, reducing the willingness of banks to lend and producing leftward shifts in the supply of loans and money.[12] The net result is reductions in the supply and demand for money and in bank lending, with an uncertain impact on interest rate spreads.

The impact of the factors cited in this section on interest rate spreads and the level of bank lending and the money supply are summarized in Table 1. It may be difficult to establish with any certainty which of these developments have been most responsible for the sustained weakness in depository credit formation and the monetary aggregates over the past few years because all of these factors would tend to work in the direction

[9] A heightened consumer awareness of the availability of alternative investment opportunities would also increase the elasticity of demand for money to movements in competing market interest rates.

[10] Viewed from a longer term perspective, the growth in money market mutual funds and alternative investment accounts may be seen as part of the ongoing trend toward greater disintermediation in credit markets, which has included an expanded role for nondepository institutions. This process would be associated with a decline in the demand for bank lending as well as a shift in money demand, exerting pressure on bank profit margins measured by the spread between bank lending and offering rates. Over time, this pressure on bank earning spreads would force some depositories to fail, shrinking the entire sector and causing the supply schedules for bank credit and deposits to shift leftward (thereby restoring bank earning spreads to original levels).

[11] To an uncertain degree, recent economic weakness may have been brought on, or at least been reinforced by, some of the interruptions to credit supply and demand described above; however, the weakness in economic activity over this period is treated as having had an independent effect on money and credit in this analysis.

[12] In terms of the graphical framework of Chart 3, ultimately, the supply and demand schedules in both the bank lending and deposit markets would shift to the left, reducing the quantities of lending and money, but with uncertain implications for interest rate spreads.

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of weakening credit formation and the monetary aggregates. However, these factors hold different implications for the behavior of interest rates spreads, so an examination of these yields might provide some idea of which forces have been dominant.

Bank lending rates (measured by the prime rate) have not declined as much as other borrowing rates (represented by the commercial paper rate) since the onset of the last recession (Chart 6). This behavior suggests that constraints on bank credit supply may have been a more important factor in the slowing of depository credit formation—and therefore of the monetary aggregates—than a slowing in business and household credit demand tied to balance sheet restructuring efforts. To be sure, a widening in this spread could also be associated with a leftward shift in money demand, as portrayed in Chart 5C. However, the simultaneous widening in the spread between six-month bank CD rates and Treasury yields of comparable maturity, shown in Chart 7, suggests that a drop in credit supply rather than a decline in money demand better explains the recent behavior of these aggregates and related interest rate spreads.

These general inferences must be treated cautiously on the basis of the circumstantial evidence presented. All of the economic developments described above, as well as others, have undoubtedly affected the supply and demand schedules for credit and money in recent years. In the face of so many simultaneous influences, simple observations of interest rate spreads could give an incomplete picture of the primary forces affecting the behavior of the monetary aggregates and credit.[13]

In the remainder of this paper, we attempt to quantify how much of the recent weakness in the broader aggregates can be directly linked to the slowing in credit formation. Rough measures of the effects of all factors other than direct business cycle influences on M2 are made in the following section. No attempt is made to sort out the relative contributions that supply versus demand influences on credit formation have had on money. Further work in the subsequent section, however, effectively controls for some of the demand-side factors that may have weakened credit formation, providing a better sense of the importance of supply-side lending constraints for the monetary aggregates.

[13] Feinman and Porter (1992) suggest that the standard measures of bank offering rates may be flawed. Their work indicates that better measures of yields on nontransactions deposits in M2 show an even more marked decline relative to other market interest rates than is shown in Chart 7.

Table 1: Effects of Exogenous Shocks on Interest Rate Spreads, Money and Depository Lending

	Spread Between:			
Exogenous Shocks	Bank Lending Rate and Market Rate rp-r	Market Rate and Deposit Rate r-rd	Money M	Depository Loans L
Decreased loan supply	+	+	-	-
Decreased loan demand	-	+	-	-
Decreased money demand	+	-	-	-

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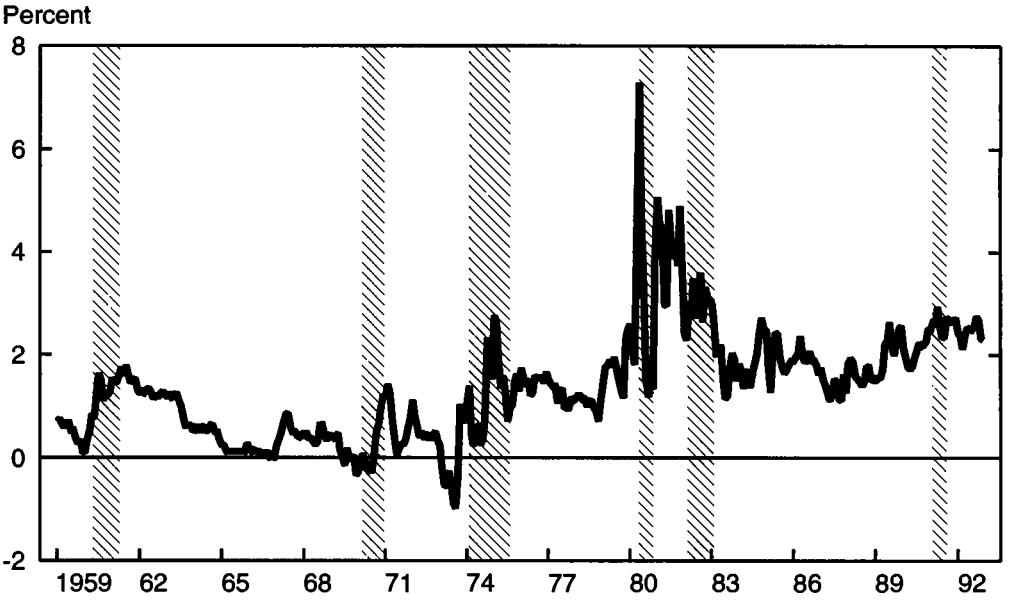
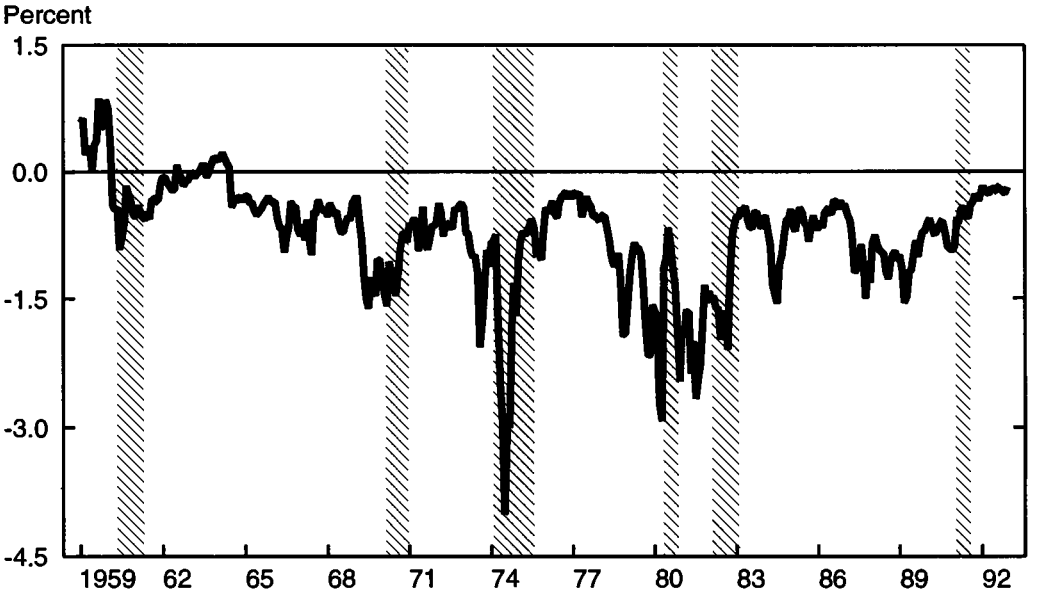
Chart 6: Prime Rate less Six-Month Commercial Paper Rate



Note: Shaded areas represent recessions.

Chart 7: Spread between the Six-Month Treasury Bill Rate and the Six-Month CD Rate



Note: Shaded areas represent recessions.

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II. Measuring the Effects of the Recent Credit Slowdown on M2

In the previous section, we considered how changes in loan supply and demand, money demand shifts, and cyclical factors may have affected bank credit and deposits. Over the last few years, all of these factors have reinforced one another and slowed the growth of bank credit and the broader monetary aggregates. In this section, two independently derived measures are taken of the net impact that factors apart from the business cycle have had on M2 since the onset of the last recession. An alternative calculation attempts to control for the effect that the secular contraction of the depository sector has had on money.

By comparing the recent behavior of credit and the monetary aggregates to their historical patterns around previous business cycles, some measure can be made of the effects that all noncyclical forces have had on M2 in the past few years, including reductions in the supply and demand for bank credit.[14] Of course, this approach is imprecise, and does not allow for the indirect effects some of the sources of weakness in credit could have had on the money and credit aggregates by depressing economic activity. This method also may not fully control for how the behavior of credit and money responds to economic downturns of different intensity.

The behavior of credit and money relative to the level of nominal income since the onset of the last recession (1990-III) demonstrates that extraordinary economic forces have operated to weaken these aggregates, even allowing for the direct effects of the economic downturn (Chart 8).[15] Depository credit measured relative to GDP began edging down in the quarters leading up to the onset of the most recent recession, but compared to past business cycles it weakened markedly only after the recession was underway. At the same time, the broader monetary aggregates measured relative to nominal income also began to weaken measurably using past experience as a benchmark. Many of the factors cited in the previous section—a depository credit crunch, a retrenchment in credit demand not directly related to the recession, and a shift in preferences for holding nonmonetary liabilities—were believed to have been operating at this time to weaken money and credit.

Recent values of key measures of credit and money are presented in Table 2. In the two years since the start of the last economic downturn—from 1990-III through 1992-III—the value of M2 as a percentage of nominal GDP, on balance, fell by nearly 3 percentage points. This behavior stands in contrast to past experiences around business cycles. As shown in Chart 8C, M2 relative to nominal GDP rose, on average, about 4 1/2 percentage points in the two years following the onset of previous recessions. Had M2 conformed to this pattern during the latest business cycle, its value would have been about $270 billion higher in 1992-III than it was.[16]

An alternative estimate is derived by calculating the dollar value of depository credit,

[14] The behavior of bank credit rather than bank lending is examined in this section because some of the weakness in lending has been met with an increase in holding securities rather than a decline in deposit creation.

[15] Wenninger and Partlan show that the weakness in M2 and M3 over this time was concentrated in the small and large time deposit components. A weakening in the monetary aggregates associated with a broad decline in demand stemming from an economic slowdown might be expected to have been more evenly distributed across the components of the monetary aggregates.

[16] This calculation simply raises the level of M2 in the eighth quarter following the beginning of the last recession--1992-III--by enough to bring the dashed line in the bottom right panel of Chart 10 to the level of the solid line.

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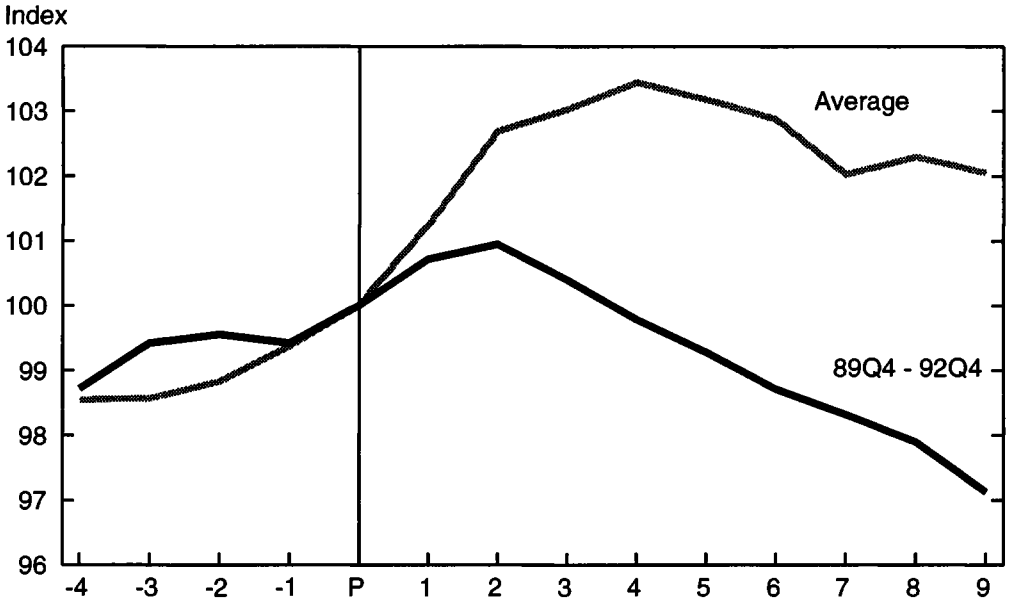
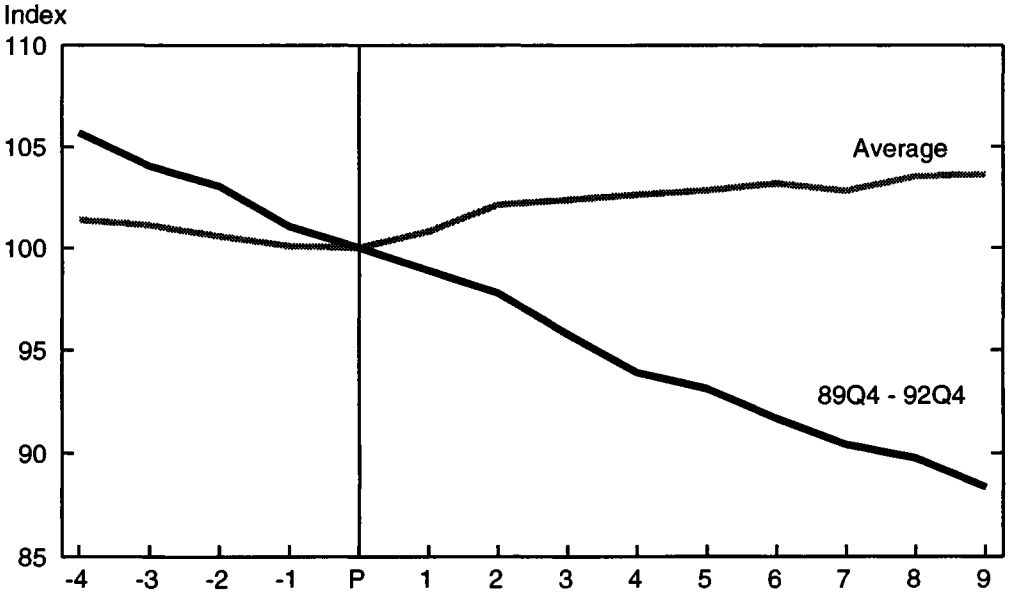
Chart 8A: Ratio of Total Private Credit to GDP
Indexed to Recession Expansion



Note: Average is the average of the 1960, 1969, 1973, 1nd 1981 recessions.

Chart 8B: Ratio of Depository Credit to GDP
Indexed to Recession Expansion



Note: Average is the average of the 1960, 1969, 1973, 1nd 1981 recessions.

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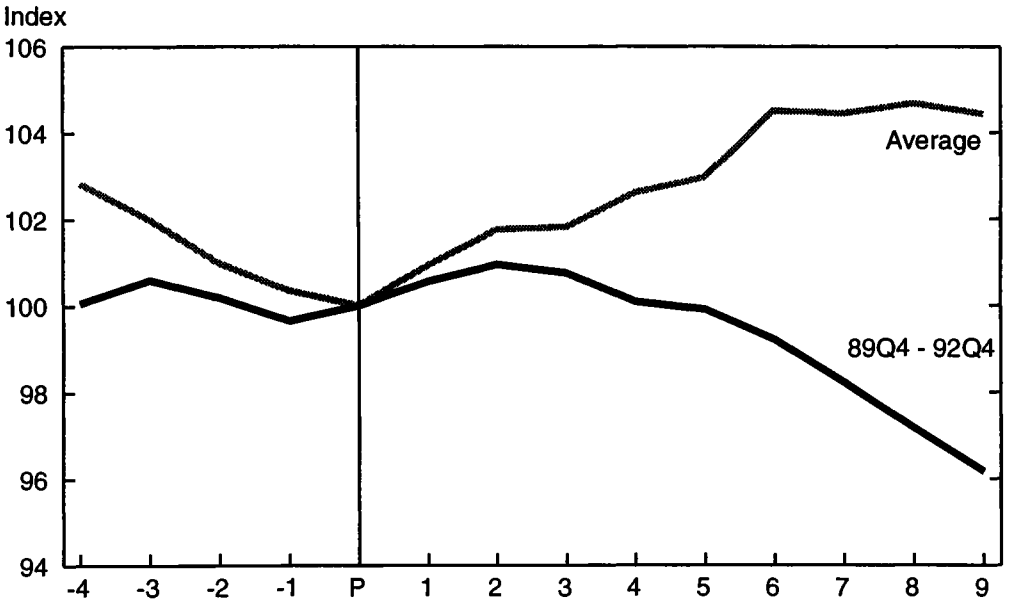
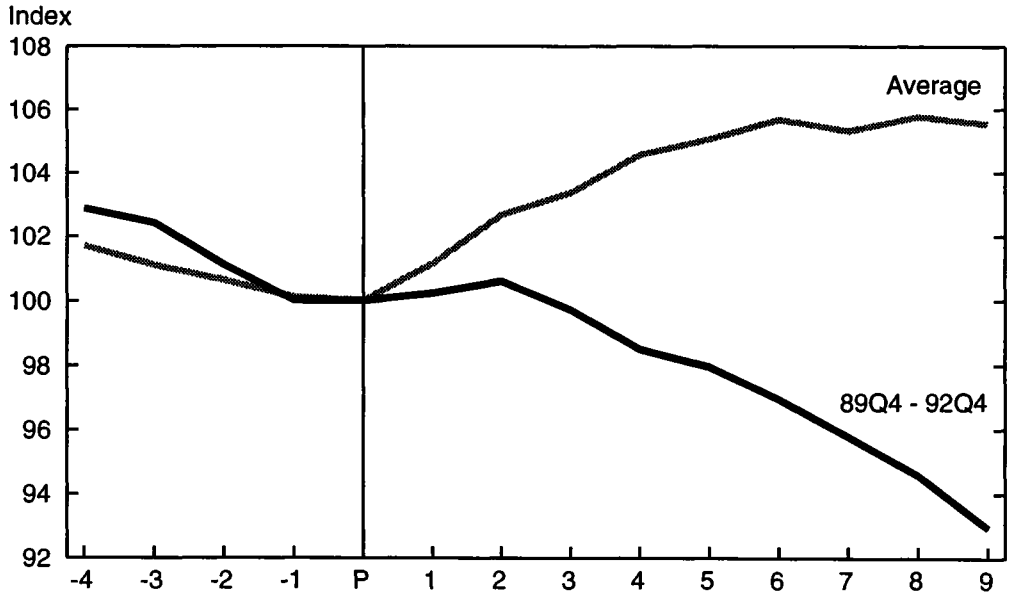
Chart 8C: Ratio of M2 to GDP
Indexed to Recession Expansion



Note: Average is the average of the 1960, 1969, 1973, and 1981 recessions.

Chart 8D: Ratio of M3 to GDP
Indexed to Recession Expansion



Note: Average is the average of the 1960, 1969, 1973, and 1981 recessions.

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and associated amount of funding with M2 deposits, that would have been necessary to keep the ratio of depository credit to nominal GDP in this recession at its average level during past recessions (taking the level of nominal income as given). In the first eight quarters after the start of the last economic downturn, depository credit relative to income fell roughly 10 percentage points, whereas in past episodes this ratio rose by about 3 1/2 percentage points in the same length of time, as shown in Chart 8B. If a higher, counterfactual ratio of depository credit to income in line with past experience had been financed with a "typical" mix of monetary and nonmonetary depository liabilities, then the nontransactions components of M2 at depository institutions would have been about $320 billion (i.e., about 15 percent) higher as of 1992-III.

Each of the above calculations attempts to measure the effect that all factors not directly related to the economic recession have had on M2, but by different means. The estimates obtained, although diverse, are of a similar order of magnitude and suggest that extraordinary factors—including shifts in credit supply and demand and in money demand—had depressed the level of M2 between 7 1/2 to 9 1/4 percent as of 1992-III.[17]

An alternative approach attempts to control for the secular downsizing of the depository sector as well as for the economic recession in measuring the consequences of the credit slowdown for M2. Depositories' share of total private credit creation has been on

[17] The values obtained here are similar in magnitude to the total prediction error for M2 found using a standard econometric model for that aggregate reported in section III.

Table 2: Values of Credit and Money
In Billions of Dollars

	1989-IV	1990-III	1992-III
M1	783	812	969
Currency	222	240	283
Demand deposits	278	280	323
Other checkable deposits	283	292	363
Savings deposits and MMDAs	885	920	1146
Small time deposits	1146	1155	927
Nontransaction M2 at depositories	2031	2075	2073
Actual M2	3207	3322	3476
Estimated impact on M2 of:			
Restoring the ratio of M2 to GDP to "normal" levels			+268
Restoring the ratio of depository credit to GDP to "normal" levels			+317
Restoring the ratio of private credit to GDP to "normal" levels			+93
Nominal GDP	5340	5560	5979

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a gradual, but steady, downtrend for almost two decades. The recent expansion of nonmonetary consumer investment funds described in the previous section is partly the byproduct of the growth of nondepository credit intermediaries, which has contributed to the shrinkage of the depository sector as a source of credit formation. To control for this additional factor, movements in the ratio of total private credit to nominal GDP around past business cycles are used as the benchmark for calculating alternative levels of depository credit formation and M2 deposit creation.

As shown in Figure 8A, in the first two years since the beginning of the last recession, total credit relative to income fell roughly 2 percentage points, underperforming by about 4 1/2 percentage points its usual behavior in the same time frame in past business cycles. Under the assumption that this discrepancy measures the weakness in depository credit that can be explained either by the recession directly or by the secular contraction of the depository sector, we raise the nontransactions components of M2 by this same percentage amount. This adjustment adds nearly $100 billion to the value of M2 in 1992-III.

This last calculation must be viewed very tentatively, as it could misstate the effects on M2 growth of factors not related to the recession and the shrinkage of the depository sector for several reasons. On the one hand, the effects of a supply-side slowing in depository credit formation on M2 would not be captured to the extent that borrowers were able to raise credit outside of the depository sector.[18] On the other hand, the effects of a decline in consumer demand for M2 balances, which might be viewed as a part of the ongoing downsizing of the depository sector, would be captured in the calculation to the extent that borrowers could not secure alternative sources of funding outside the depository sector.[19]

The calculations presented in this section are only intended to provide crude approximations of the impact that the credit slowdown has had on the broader monetary aggregates. The methods used were simple, and alternative calculations obtained using different techniques or assumptions could well yield different results. To examine in greater detail the relations between depository credit and the broader monetary aggregates, we employ several econometric methods, described in the following section.

III. Empirical Analysis of the Link Between the Credit and Money Slowdown

In this section, we use econometric techniques to study several aspects of the relation between depository credit and the broad monetary aggregates. We first consider the extent to which the recent performance of the M2 aggregate has been unusual by examining its behavior using the money demand model developed at the Board of Governors. Next, using Granger "causality" tests, we explore whether the slowdown in credit growth occurred prior to that of money growth. (Finding such a result does not imply that the lending slowdown caused the money growth slowdown, but it does imply that the data is at least consistent with this view.) The causality tests will provide some insight into whether the relation between credit and the broader monetary aggregates has undergone any shift over the past decade as a result of innovations in the financial sector. Therefore, these tests will suggest whether shifts in credit supply or demand now have a larger effect on the monetary aggregates in recent years than previously. Finally, using

[18] In this case, measured total credit would not have fallen, even though depository credit, and presumably the level of M2 funding, would have declined.

[19] In this situation, total credit would fall along with depository credit and M2.

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state- and bank-level data, we conduct a cross-sectional regression analysis to determine whether banking sector difficulties, proxied by bank balance sheet measures, can explain the money growth slowdown.

M2 Demand Equation

In order to determine how much of the weakness in M2 has been "unusual," we estimate the Board of Governors' M2 demand model and examine the residuals from the estimated equation. Large residuals over the past few years would indicate that the behavior of M2 has been unusual relative to its past behavior. These errors capture deviations in money demand, but because supply factors are not explicitly controlled for, the errors may also reflect money supply disturbances linked to shifts in credit demand and supply.

The Board's M2 equation is specified in an error-correction framework, which takes into account the long-run relationship between M2, its opportunity cost, and economic activity. The dependent variable in the equation is the growth rate of nominal M2. In addition to the variables included in the error-correction specification, the independent variables include a lagged dependent variable, a time trend, and four dummy variables to take into account the introduction of nationwide super NOW and MMDA accounts. We estimate the equation using quarterly data over the period 1964-IV to 1992-III. The results appear in Table 3.

The lagged levels of the (logarithm) opportunity cost and of velocity, along with the time trend, represent the difference between the actual and long-run demand for M2. As the table shows, these variables all are significant in explaining the growth in M2. The change in consumption, the opportunity cost measure and the lagged dependent variable capture the short-run dynamics and are all significant in explaining M2 growth.

To determine whether this equation accurately represents the behavior of money demand over the entire time period, we examined the estimated equation for structural breaks. We considered whether the equation estimated prior to the third quarter of 1976 was significantly different from the equation estimated since then and repeated this same exercise breaking at 1979-III and at 1982-IV. We found no significant break in the equation at any of these points. Finally, we estimated the equation through 1989-IV and tested whether the M2 prediction errors from 1990-I through 1992-III were large, which would suggest that a break occurred more recently. Such a break did occur in 1990, which coincided with the sharp slowdown in bank credit.

A rough sense of the size of this recent change in the behavior of M2 can be seen in Chart 9. The figure plots the actual growth rate of M2 over the 1964-92 time period, along with the out-of-sample dynamic forecast for the 1990-I to 1992-III period based on the equation estimated through 1989. The predicted values over the forecast period are much larger than the actual data, indicating that the previous relationship among M2, economic activity, and the opportunity cost of holding M2 broke down over the last few years.

A complementary way to explore the recent behavior of M2 is to examine the in-sample residuals from the M2 equation estimated over the entire time period. As Chart 10 shows, beginning in 1990, the actual minus predicted values of M2 growth became negative and relatively large. There were other periods in earlier years when M2 growth was weaker than the equation predicted, but to a lesser degree than over the last few years. Moreover, the recent weakness occurred at a time when monetary policy was considered expansionary. During or following each of the earlier recessions, when the Federal Reserve eased policy to boost economic growth, growth in M2 was generally stronger than estimated by the equation.

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To determine whether the unexplained weakness in M2 growth could be accounted for by the credit growth slowdown, we extended the independent variables in the money demand equation to include variables which reflect credit market conditions. The variables we chose are of two types: bank balance sheet variables, such as credit aggregates and the capital stock, and interest rates on competing financial instruments. The inclusion of credit variables in the money demand specification, because of the obvious endogeneity issue, should not be considered an attempt to improve upon the equation's specification. Nevertheless, such an extension allows us to determine in a rough way whether the credit growth slowdown directly contributed to the unexplained weakness in M2 growth. The inclusion of alternative interest rates is not subject to the same criticism. However, the importance of these rates could be explained by developments other than the credit slowdown.

The bank balance sheet variables we consider are depository credit and loans, and commercial bank credit and loans. These variables allow us to consider whether the explanatory power of commercial banks differs from that of thrifts, and whether the role

Table 3: M2 Demand Equation

$$\begin{aligned}\Delta\ln(M2) = {} & C + \beta_0{*}\text{Time} + \beta_1{*}\text{DMMDA} + \beta_2{*}\ln(\text{Opportunity Cost}(-1)) \\ & + \beta_3{*}\ln(\text{Velocity}(-1)) + \beta_4{*}\Delta\ln(\text{Consumption}) + \beta_5{*}\Delta\ln(\text{Consumption}(-1)) \\ & + \beta_6{*}\Delta\ln(\text{Consumption}(-2)) + \beta_7{*}\Delta\ln(\text{Opportunity Cost}) + \beta_8{*}\text{DCON} \\ & + \beta_9{*}\text{DUM1} + \beta_{10}{*}\text{DUM2} + \beta_{11}{*}\Delta\ln(M2(-1))\end{aligned}$$

Estimation Period: 1964-IV to 1992-III

Coefficient	Estimate	S.E.	t-stat.
Constant	-.050	0.12	4.27
β_0	-.000	.000	2.57
β_1	.002	.002	.90
β_2	-.006	.001	4.25
β_3	-.117	.026	4.43
β_4	.262	.070	3.73
β_5	.060	.071	.84

Coefficient	Estimate	S.E.	t-stat.
β_6	.063	.064	.99
β_7	-.007	.002	4.10
β_8	-.006	.006	1.11
β_9	.029	.005	5.61
β_{10}	-.010	.006	1.65
β_{11}	.615	.077	7.96

Adj. R^2 .68
Durbin-h .86
St. Er. .005

Notes: M2 = nominal M2 money aggregate. DMMDA = dummy variable for the introduction of MMDAs, 0 through 1982-IV and 1 thereafter. Opp. Cost = the three-month Treasury bill rate minus a weighted average of the interest rates on the M2 deposit categories. Velocity = GDP/M2, Consumption = personal consumption expenditures. DCON = dummy variable for credit controls, 1 in 1980-II and 0 otherwise. DUM1, DUM2 = short-run dummies for the introduction of MMDAs, 1 in 1983-I, 0 otherwise, and 1 in 1983-II and 0 otherwise, respectively.

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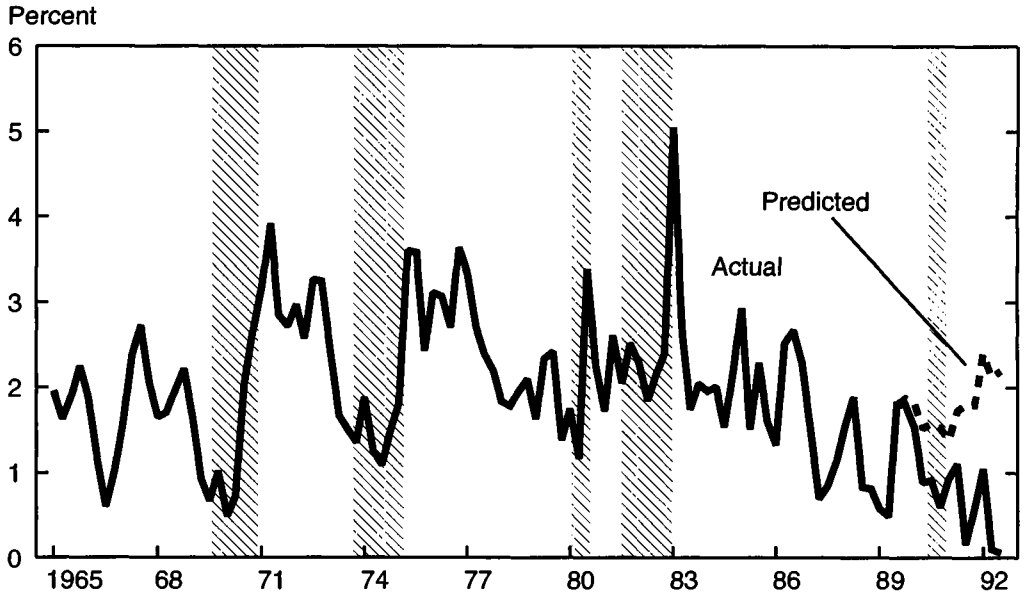
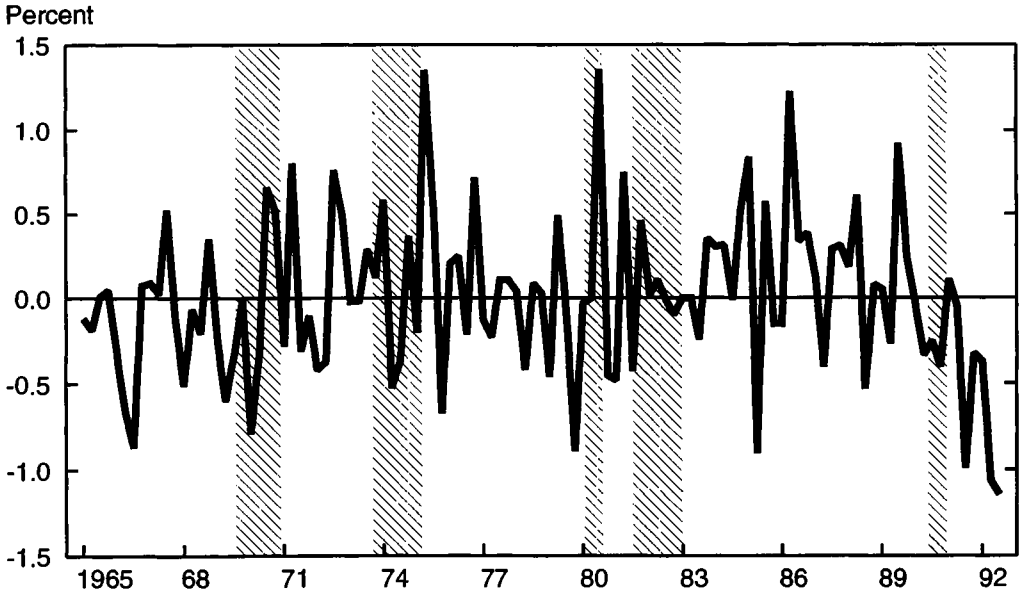
Chart 9: Actual and Predicted Growth Rates of M2



Source: Board of Governor's Model.
Note: Shaded areas represent recessions.

Chart 10: M2 Demand Residuals



Source: Board of Governor's Model.
Note: Shaded areas represent recessions.

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of loans is different from that of security holdings. We also include the capital-asset ratio of the commercial banking system to more directly test the role of banking sector difficulties.

We consider whether the increased popularity of stock and bond funds has contributed to the weakness in the broader monetary aggregates by including the five-year Treasury security rate as a proxy for interest rates on these alternative assets. We also consider whether the spread between the five-year rate and a short-term rate, the three-month Treasury bill rate, is significant. Finally, we consider whether the scaling back of household borrowing had an impact on the demand for money, by including the rate on automobile loans as a representative consumer loan rate.[20]

Each of the loan and interest rate variables is added one at a time to the money demand equation. The equation is reestimated over the entire time period, first with each variable included over the entire sample period, and then with the variable beginning in 1982-IV. These two specifications allow us to consider whether each variable only became significant, or became increasingly significant, during the 1980s.[21]

As Table 4 indicates, all of the credit aggregates are significant over both time periods, with their significance increasing during the 1980s.[22] The positive coefficients indicate that credit growth and money growth move in the same direction. As growth in all of these credit measures has been weaker than expected over the last few years, these

[20] The interest rates we consider are similar to the rates examined by Feinman and Porter (1992).

[21] Although we might also want to consider the importance of these variables over the 1989-92 period, this time period is too short to generate statistically meaningful parameter estimates.

[22] The addition of each variable alters the coefficients of the remaining variables slightly, but the changes are quite small. Hence, we report only the coefficients and standard errors of each additional variable

Table 4: Importance of Credit Variables in M2 Demand Equation

Additional Explanatory Variable	1964-IV to 1992-III		1982-IV to 1992-III	
Total DI credit	.20	(.04) **	.25	(.07) ***
Bank credit	.10	(.03) ***	.19	(.08) **
DI loans	.12	(.04) ***	.24	(.06) ***
Bank loans	.08	(.04) **	.27	(.07) ***
Capital asset[a]	.04	(.04)	-1.38	(.41) ***
Five year Treasury rate	-.14	(.09)	-.02	(.05)
Five year minus 3 month Treasury rate	.08	(.06)	-.10	(.10)
Auto loan rate[b]	-.50	(.16) ***	-.14	(.28)

Notes: Standard errors are in parentheses.

a. The capital-asset ratio is only available beginning in 1980-I.
b. The auto loan rate is only available beginning in 1972-I.

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

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findings are consistent with weak credit growth slowing the growth in M2.[23]

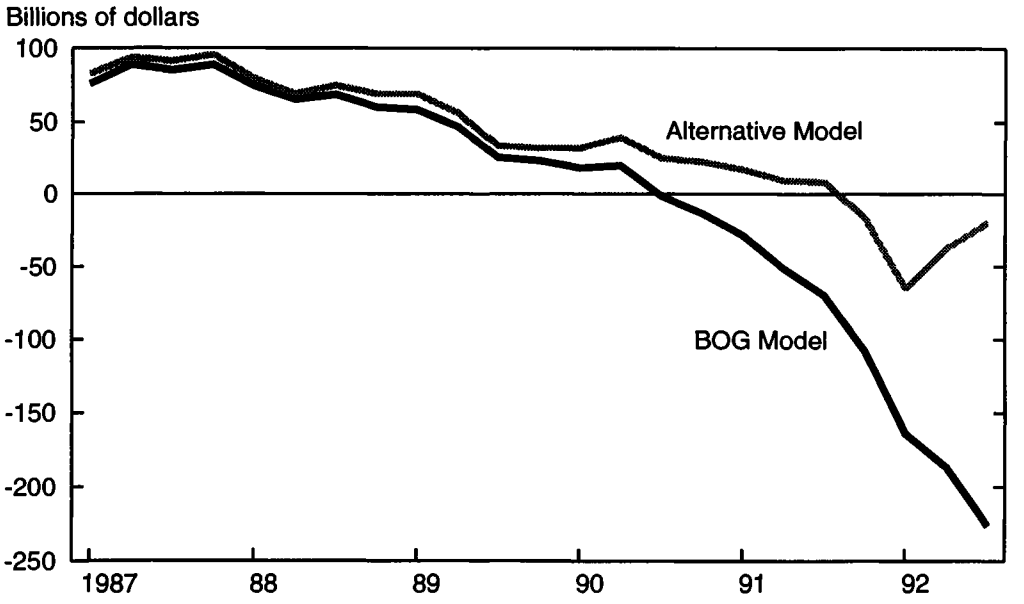
Bank loan growth is the weakest over the entire period, having both the smallest coefficient and the lowest significance level (5 percent). But the bank loan variable has the highest coefficient during the 1980s. Somewhat surprisingly, the capital-asset ratio is negatively related to the demand for M2 during the 1980s. But this finding can be explained by the fact that this variable has been rising for the banking sector as a whole, despite regional banking problems where this ratio has fallen. This finding suggests that a more disaggregate analysis is likely needed to uncover a link between deposit growth and measures reflecting the strength of banks' balance sheets.

The table also indicates that although the coefficients generally have the expected negative sign, the interest rates are for the most part not significant. Their insignificance likely reflects the fact that only over the last few years have interest rates on alternative financial assets strongly affected the demand for M2. This recent time period is too short to obtain meaningful statistics for these variables.

We conducted one further exercise to obtain a better sense of how much of the weakness in the demand for M2 can be accounted for by these credit variables. We examined the cumulative errors in the predicted values of M2 estimated with and without both a credit variable (bank loans) and an interest rate variable (the five-year Treasury bond rate). The results appear in Chart 11. As the chart shows, the original Board of Governors model has a cumulative error in predicting M2 of roughly $250 billion by the third quarter of 1992. This amount is similar to the measures of "unusual" weakness in M2 reported in the previous section. When the additional variables are added this error falls to roughly $25 billion.

[23] Loan variables were also found to be significant in non-M2 M3 and term deposit demand equations in Motley (1988).

Chart 11: Cumulative Errors from M2 Demand Equations



Note: Alternative Model includes growth in commercial bank loans, and the five-year bond rate.

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To summarize this section, both the forecasting exercise and the plots of residuals indicate that the behavior of M2 changed after 1989. Additional work suggests that the weakness in credit growth could account for much of the weak M2 growth. However, this last conclusion must be viewed tentatively. The improvement in the money demand residuals obtained by including various credit proxies largely results from the high correlation between credit and money growth, which need not imply causation. In the next sections, we use alternative approaches to determine whether and to what degree the recent slowdown in the broad monetary aggregates can be attributed to the 1990 credit slowdown.

Causality Tests

We now consider whether or not credit growth "Granger causes" money growth. Such a finding would be consistent with the view that the recent slowdown in credit growth "led" to the slowdown in the monetary aggregates. However, such a result would not necessarily mean that the credit growth slowdown caused the money growth slowdown: a third factor could be responsible for both. Nevertheless, to better understand the importance of the credit growth slowdown for the weakness in the monetary aggregates, we consider whether a causal relationship exists between the two measures, and whether the relationship may have changed in recent years.

To examine whether lagged credit measures can "explain" movements in the monetary aggregates, we look at quarterly data from 1959-I to 1992-I. We first examine whether the two variables were linked prior to the deregulation of the 1980s. We then examine their relationship during the 1980s. We also examine whether money growth "causes" credit growth because the possibility that causality is bidirectional can not be ruled out. Therefore, we also consider whether lagged values of growth in the monetary aggregates are significant in explaining credit growth.

Four credit aggregates are used in our analysis, total credit and total lending, for both commercial banks and for all depository institutions. The two measures of money used, M2 and M3, include either deposits held at the commercial banks or at all financial institutions, depending upon whether a bank credit or a total depository credit measure was used in the regression. Including and then excluding the thrift institutions allows us to investigate whether the link between the credit and money slowdown has operated through the thrift institutions. This breakdown also allows us to consider whether the large number of recent thrift failures distorted the money-credit relationship.

Because the series are nonstationary in their level form, the data are all transformed to growth rates. The same number of lagged values of the independent and dependent variables are included as explanatory variables. A test for the joint significance of the lags of the independent variable is then calculated to determine whether movements in this variable are significant in explaining movements in the dependent variable, after lagged values of the dependent variable have been taken into account. The tests are performed for each credit variable relative to each money measure, and then the causal link from money to credit is considered. The marginal significance level of each test is reported in Table 5.

As the table indicates, we conduct the tests using lag-lengths of four and eight quarters. The top half of the table presents the credit variables' predictive power for the monetary aggregates. The results indicate that, generally speaking, the link between the bank credit variables and the monetary aggregates strengthened during the 1980s, while the link between lending at all institutions and the similarly measured monetary aggre-

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Table 5: Time Series Analysis

A. Bivariate Tests of the Predictive Power of Depository Credit

	Lag-Length	Independent Variables			
		Marginal Significance Levels			
		TC	TBC	TL	TBL
1959-I to 1982-IV					
M2	4	.70	.09	.00	.00
	8	.36	.14	.00	.01
M3 [a]	4	.83	.03	.16	.34
	8	.94	.31	.13	.61
1982-IV to 1992-I					
M2	4	.59	.00	.71	.00
	8	.87	.01	.72	.00
M3	4	.50	.05	.88	.04
	8	.13	.09	.43	.30

B. Bivariate Tests of the Predictive Power of Money

	Lag-Length	Dependent Variables			
		Marginal Significance Levels			
		TC	TBC	TL	TBL
1959-I to 1982-IV					
M2	4	.07	.55	.01	.20
	8	.04	.35	.03	.32
M3 [a]	4	.00	.80	.05	.41
	8	.00	.19	.06	.29
1982-IV to 1992-I					
M2	4	.25	.47	.50	.26
	8	.75	.62	.30	.37
M3	4	.16	.98	.27	.33
	8	.23	.92	.41	.75

Notes: TC, TL = total credit and total loans at all domestically chartered depository institutions, respectively. TBC, TBL = total credit and total loans at all domestically chartered commercial banks. M2 = the M2 monetary aggregate, M3 = the M3 money aggregate. For the tests with TC and TL, the monetary aggregates include deposits at all depository institutions. For the tests with TBC and TBL, the monetary aggregates include deposits at all commercial banks.

[a] The tests involving M3 at commercial banks begin in 1970-I.

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gates weakened.[24] In the earlier part of the sample period, total bank credit (TBC) and both loan variables (TL and TBL) are significant in predicting M2. Total loans lose their significance in predicting M2 in the 1980s, but the link between bank credit and M2 increases. Bank credit is also significant in predicting M3 over both time periods, and the link between bank loans and M3 becomes significant during the 1980s.

The bottom half of the table presents the results for the causal link running from the monetary aggregates to the credit variables. The tests indicate that the aggregates are significant in explaining total credit (TC) and loans (TL) of all financial institutions over the earlier period, but not during the 1980s. Thus, prior to 1983 there was a bidirectional relationship only between M2 and total loans. Since that time there has been a unidirectional relationship running from bank credit and bank loans to the monetary aggregates.

Overall, the results seem to support the hypothesis suggested by the earlier discussion, that the link running from bank credit to the monetary aggregates increased following deposit deregulation. This finding is consistent with the view that banks increasingly made use of managed liabilities to fund their desired levels of credit extensions. This finding also suggests that the slowdown in money growth could have followed from the slowdown in credit growth, and that such a directional link is more likely to have occurred in the recent credit slowdown than in prior episodes. However, this conclusion generally holds for the bank credit measures, and not the total depository credit measures.

Cross-Section Analysis

We now attempt to determine more precisely how much of the weakness in the monetary aggregates can be explained by the recent problems in the banking sector that have constrained credit supply by conducting a cross-sectional analysis of deposit data.[25] Because of the regional nature of many of the banking difficulties, more aggregated data obscures the links between bank balance sheet problems and deposit growth. We begin by providing an overall picture of deposit growth according to regions of the country. We then present a more detailed analysis.

Deposit growth by region

Table 6 presents deposit growth by region for the four main categories of deposits—checking, savings, small time deposits, and large time deposits—at all domestically chartered U.S. banks. Growth rates for each of these categories and for their total are shown for 1987-89 and 1989-91 for the nine census regions in order to examine regional deposit growth both prior to and during the deposit growth slowdown. As the table shows, growth in total deposits was generally much stronger during the earlier time period than in the more recent period, although there is some variation across types of deposits. The differences in growth rates across the two time periods were relatively small for checkable deposits: in some cases, growth in checkable deposits picked up and in some cases it slowed. Growth in total savings accounts rose in every region in the country, while growth in both small and large time deposits plummeted.

The regions of the country which had the most banking sector difficulties also experienced the largest slowdown in deposit growth. For example, New England and the Mid-Atlantic regions recorded the largest drops in total deposit growth. These two re-

[24] The results were similar when we split the sample at 1979-III.

[25] This section parallels the cross-sectional work found in Lown and Wenninger.

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gions had the smallest increases in savings deposit growth, the largest declines in small time deposits and, with the exception of the East North Central region, the largest declines in large time deposit growth as well. As discussed in Bernanke and Lown and in Lown and Wenninger, New England and the Mid-Atlantic states experienced the largest slowdown in lending growth as well. Thus, the table clearly suggests that the slowdown in credit growth played a role in the deposit growth slowdown.

Table 6: Commercial Bank Deposits by Region
Annualized Fourth Quarter to Fourth Quarter Growth Rates

	New England	Mid-Atlantic	E.N. Central	W.N. Central	S. Atlantic	E.S. Central	W.S. Central	Mountain	Pacific
Total checking									
1987-89	4.5	1.7	4.8	4.2	4.8	3.7	11.5	3.2	9.3
1989-92	8.7	4.3	9.9	9.5	12.0	11.8	10.8	11.8	12.1
Total savings									
1987-89	6.0	4.3	-1.7	0.5	1.2	3.6	4.1	-1.6	4.5
1989-92	15.5	12.9	13.8	13.1	13.2	16.0	9.5	14.2	19.9
Total small									
1987-89	28.0	21.6	15.5	15.0	22.3	14.9	17.2	13.1	18.6
1989-92	-2.0	0.2	2.3	3.8	2.3	1.9	1.9	-2.6	4.1
Total large									
1987-89	16.7	12.1	23.4	3.8	20.4	10.6	1.9	2.1	20.7
1989-92	-25.0	-24.2	-11.4	-15.3	-11.9	-6.8	-10.0	-15.2	-10.6
Total deposits									
1987-89	12.8	8.4	8.8	7.4	10.9	8.9	9.6	4.2	11.3
1989-92	2.7	1.1	5.4	5.3	5.9	6.3	4.2	5.8	9.7
Percentage of deposits as a national total									
1987-89	0.03	0.22	0.17	0.10	0.16	0.06	0.09	0.05	0.13
1989-92	0.03	0.20	0.17	0.10	0.17	0.06	0.09	0.05	0.14

New England = Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
Mid-Atlantic = New Jersey, New York, Pennsylvania
East North Central = Illinois, Indiana, Michigan, Ohio, Wisconsin
West North Central = Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
South Atlantic = Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia
East South Central = Alabama, Kentucky, Mississippi, Tennessee
West South Central = Arkansas, Louisiana, Oklahoma, Texas
Mountain = Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming
Pacific = Alaska, California, Hawaii, Oregon, Washington

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State- and bank-level regressions

To better determine how important banking sector difficulties were in the money growth slowdown, we estimate cross-sectional regressions to examine the link between proxies for banking sector difficulties and deposit growth. We first estimate the regressions using state-level data and subsequently make use of bank-level data. We examine the link between growth in all four categories of deposits and three different measures of bank balance sheet health. Deposit changes are measured over three years, 1988-89, 1989-90 and 1990-91, allowing us to consider whether growth in the monetary aggregates became increasingly tied to the health of banks as financial sector conditions deteriorated. The three bank balance sheet measures we consider are the capital-asset ratio, loan-loss reserves as a percentage of total loans, and lagged total loan growth. This last variable allows us to test for a direct link between credit growth and money growth. The other two variables focus explicitly on factors that affect the willingness or ability of banks to supply loans and that thereby could have indirectly affected deposit growth. We also include in all the regressions employment growth by state to control for the impact of economic activity on money growth.[26]

Our expectations are that bank balance sheet measures and lagged loan growth may matter less for the 1988-89 regressions than for the 1990-91 regressions. This asymmetric expectation is based on the view that a bank's balance sheet might impose a constraint on credit formation when the bank is in poor financial health, but when the bank is in good financial health the pace of credit formation might not be closely linked to the same balance sheet measures. We also expect that the balance sheet measures would be more important in explaining small and large time deposits than in explaining checkable deposits because, as we discussed earlier, banks typically use time deposits as managed liabilities.

There are, however, limitations to the use of state-level data for an analysis of deposit growth. The asymmetric effect of balance sheet constraints on deposit formation described above could be obscured when bank data is aggregated to the state level. Moreover, deposits are not necessarily limited by state borders, especially in the case of brokered small and large time deposits. Forcing such an aggregation might produce unexpected or counterintuitive results. Nevertheless, we begin with an analysis of state-level data and later conduct a similar examination of bank balance sheet health and deposit growth with bank-level data.

State level results

The state-level regression results are reported in Table 7 and indicate that the relations among the variables are roughly in line with expectations. Checkable deposits are explained only by employment growth, with lagged loan growth and the bank balance sheet measures having no significant explanatory power. This finding is consistent with the notion that checkable deposits are largely demand determined. The capital-asset ratio and loan-loss reserves are significant in explaining savings deposits over the 1989-90 period, although loan losses have a positive rather than a negative sign. Neither variable is significant in the 1990-91 period.

The results for the two time deposit categories are consistent with the notion that banks treat these accounts as managed liabilities. Time deposits are fairly consistently explained by lagged loan growth, while the capital-asset ratio also is significant in ex-

[26] Lown and Wenninger found a link between these explanatory variables (excluding loan growth) and loan growth; here we are considering whether the same bank balance sheet variables can explain the weakness in deposit growth.

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plaining large time deposits. Finally, as is the case for savings deposits, small time deposits are unexpectedly positively related to loan losses over the 1989-90 period.

In general, the bank variables are not significant in explaining growth in checkable deposits, while these variables matter in varying degrees for the other three deposit categories. The capital-asset ratio becomes increasingly significant in explaining large time deposits, while lagged loan growth fairly consistently explains growth in both small and large time deposits. These findings are consistent with the observed behavior of the aggregates which shows the term components of M2 and M3 to be unusually weak, suggesting that a credit crunch, or a capital crunch, likely played a role in their sluggish growth.[27]

[27] We also considered lagged loan growth as an instrument for contemporaneous loan growth. These regressions fit quite poorly, indicating that lagged, but not current, loan growth plays a role in explaining deposit growth.

Table 7: Cross-sectional Regressions

Fourth Quarter to Fourth Quarter	Empl.		K/A		LL		LG(-1)		R^2
1988-89									
(1) Checkables	1.17 (.24)***	[.33]***	.16 (.45)	[.67]	.82 (.65)	[1.1]	.02 (.06)	[.09]	.42
(2) Savings	.28 (.67)	[.65]	-2.26 (1.2)*	[1.3]*	.59 (1.8)	[1.9]	.30 (.17)*	[.17]*	.08
(2') Savings[a]	.25 (.63)	[.66]	-.94 (1.3)	[1.0]	-.08 (1.7)	[1.4]	.45 (.17)***	[.16]***	.15
(3) Small time	-.18 (.50)	[.76]	-1.01 (.94)	[1.7]	-1.58 (1.4)	[f2.4]	.50 (.13)***	[.20]**	.38
(4) Large time	2.59 (.99)***	[1.0]**	-1.70 (1.8)	[1.4]	4.03 (2.7)	[2.4]	2.06 (.25)***	[.34]***	.67
1989-90									
(1) Checkables	1.37 (.22)***	[.18]***	.13 (.53)	[.61]	-.08 (.58)	[.70]	.02 (.07)	[.08]	.46
(2) Savings	1.47 (.45)***	[.52]***	1.92 (1.1)*	[.83]**	3.92 (1.2)***	[1.2]***	.17 (.14)	[.15]	.27
(3) Small time	.72 (.55)	[.71]	.21 (1.4)	[1.3]	4.07 (1.5)***	[2.3]**	-.03 (.17)	[.18]	.15
(4) Large time	-.25 (.75)	[.84]	3.74 (1.8)**	[2.2]*	.86 (2.0)	[2.6]	1.00 (.24)***	[.21]***	.29
1990-91									
(1) Checkables	.26 (.40)	[.48]	1.02 (.60)*	[.63]	-.52 (.94)	[1.3]	-.09 (1.3)	[.14]	.08
(1') Checkables[b]	.69 (.32)*	[.32]**	.80 (.54)	[.65]	-.25 (.84)	[1.1]	-.01 (.12)	[.11]	.20
(2) Savings	.34 (.69)	[1.1]	1.17 (1.0)	[1.4]	-.69 (1.6)	[2.0]	.02 (.23)	[.29]	.04
(3) Small time	-.16 (.86)	[.77]	2.20 (1.3)*	[2.8]	.83 (2.1)	[2.4]	.56 (.29)*	[.27]**	.19
(4) Large time	.48 (.81)	[.79]	3.6 (1.2)***	[1.4]***	1.18 (1.9)	[1.6]	.51 (.27)*	[.27]*	.36

Notes: Dependent variable is the fourth quarter to fourth quarter growth rate of the specified category of deposits aggregated to the state level. Empl. is the December to December growth rate of unemployment. K/A is equity capital relative to total assets at the beginning of the period. LL is the level of loan loss reserves relative to total loans at the beginning of the period. LG(-1) is total loan growth fourth quarter to fourth quarter lagged one year. Conventional OLS standard errors are in parenthesis. Standard errors based on White's correction for heteroskedasticity are in brackets.

a. This regression excludes the outlier Texas, which experienced large growth in savings accounts, despite a low K/A ratio and exerted a large influence on the K/A coefficient.

b. This regression excludes Rhode Island which experienced huge growth in checkables despite a large decline in unemployment.

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

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The one unexpected result is the positive and significant coefficient on loan-loss reserves in explaining savings and small time deposit growth during 1989-90. A possible explanation for this finding is that banks with large loan losses moved away from issuing large, uninsured time deposits towards insured savings and small time deposits during this period. But a negative relationship between large time deposits and loan losses should then have emerged, and did not. Alternatively, loan-loss reserves could be serving as a proxy for some omitted variable. For example, banks that moved away from loan issuance and into security holdings in the face of large loan losses might have continued to issue savings deposits. Loan-loss reserves would be positively correlated with growth in security holdings and, because we did not include security holdings in the regressions, loan losses could be capturing this relationship.

Bank level results

We next examined the link between bank balance sheet variables and deposit growth at the bank level. We again examined each of the four categories of deposit growth, but only over the 1990-91 period. In this case, we are assuming that all banks behave identically, but we are not forcing deposits to be limited by state boundaries.

The results from the bank-level regressions, reported in Table 8, indicate that the capital-asset variable is highly significant in explaining each of the deposit categories. The loan-loss variable is significant only in the checkables equation and has the expected negative sign. In no case is lagged loan growth significant (These results are not reported.) Thus, the significant relationship between loan losses and deposit growth found in the state-level analysis is not found using bank level data, although the coefficient on loan losses is still positive for both savings and small time deposits. Moreover, the loan-loss coefficient is negative for large time deposits. While the insignificance of these coefficients makes one hesitant to attach much weight to them, they do suggest that banks moved away from large time deposits and towards savings and small time deposits in response to weakening balance sheets.

Table 8: Cross-sectional Bank Regressions
1990-IV to 1991-IV; 10,700 Observations

Dependent Variable	Const.	K/A	LL	R^2
(1) Checkables	-0.18 (.12)	4.96 (.13)***	1.42 (0.42)***	.13
(2) Savings	-0.14 (.67)	5.97 (.73)***	3.59 (2.26)	.05
(3) Small time	-0.52 (.60)	8.53 (.65)***	1.14 (2.01)	.03
(4) Large time	-0.78 (.14)***	5.97 (.16)***	-0.63 (0.49)	.13

Notes: Dependent variable is the fourth quarter to fourth quarter growth rate of the specified category of bank deposits. K/A is equity capital relative to total assets at the beginning of the period. LL is the level of loan loss reserves relative to total loans at the beginning of the period. OLS standard errors are in parenthesis. Dummy variables by state were also included in the regressions to control for region specific variation.

*** Significant at the 1 percent level.

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Explaining slow money growth

Finally, we use the bank-level regression estimates to determine how much of the slowdown in money growth can be attributed to the bank balance sheet variables. Using the 1990-IV to 1991-IV bank level regression results, we calculate how much of the slowdown in time deposit growth can be explained by the bank balance sheet variables. To do so, we determine the changes in the regional capital-asset ratios and loan-loss variables from 1988-IV to 1990-IV when the banking system experienced the most distress. We then compute to what degree these changes can account for the slowdown in regional deposit growth from the period 1988-IV through 1989-IV to 1990-IV through 1991-IV.

Large time deposits in the New England and the Mid-Atlantic regions grew 16 percent and 8 percent, respectively, from 1988-IV to 1989-IV, and declined 27 percent over the 1990-IV to 1991-IV period in both regions. Hence these regions recorded net swings in large time deposit growth rates of negative 43 and 35 percentage points, respectively. Changes in the balance sheet variables account for 6.0 percentage points and 3.3 percentage points of these declines, or 14 and 10 percent of the total decline in large time deposit growth rates in New England and the Mid-Atlantic regions, respectively. A similar calculation finds that, over the same time period, small time deposit growth fell 34 and 24 percentage points in these two regions. The balance sheet variables account for roughly 8 percent of these declines (2.8 and 2.0 percentage points, respectively). In the remaining regions, which experienced much smaller deteriorations in their balance sheet variables, the balance sheet variables explain a smaller amount of the declines in time deposits or even serve to partly offset declines.

The low explanatory power of the balance sheet variables must be viewed with caution, however, because of the drawbacks of this exercise. We assumed that the coefficients on the independent variables estimated across banks could be used in a rough way to explain the deposit slowdown over time in each region. This required moving from cross-sectional estimates to time series data, and from bank-level to regional data. More to the point, regional growth in small and large time deposits fell by large amounts over the last few years, but the regional deterioration in capital-asset ratios and increases in loan losses are not big enough to account for such large declines. Presumably, if we could conduct this exercise using bank-level balance sheet data, we could account for the large drops in time deposits. But, even still, the regression coefficients are based on the unrealistic assumption that all banks behave identically. Hence, even if a bank-level accounting exercise were feasible, it still might not be able to explain the large declines in deposit growth.[28]

Overall, the data indicate that the regions experiencing the most severe financial sector difficulties also experienced the largest declines in deposit growth. The regression analysis indicates that the bank balance sheet variables, and in particular the capital-asset ratios, are highly significant in explaining weak deposit growth. But calculations using regional data do not indicate that these variables can account for much of the weakness in regional deposit growth. This latter finding most likely results from the assumption behind the regression analysis that all banks behave identically and from the use of these bank-level regressions to interpret regional deposit growth.

[28] See Boyd and Gertler (1993) for a discussion of how bank behavior differs by asset size.

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IV. Conclusion

In this study, we have assessed the degree to which the unusual weakness in the broad monetary aggregates, particularly M2, over the past few years has been associated with factors that have constrained credit formation. Using a variety of methods, we find that factors that have shifted credit demand and supply and money demand—apart from direct business cycle influences associated with the 1990-91 economic downturn—account for a considerable portion of the recent weakness in M2. A decreased willingness on the part of depository institutions to lend, retrenchment in loan demand stemming from efforts of businesses and households to reduce their debt exposure, and shifts in consumer preferences for holding depository liabilities are among the factors that have simultaneously weakened bank credit formation and deposit creation. Further work also suggests that changes in bank balance sheet behavior over the past decade may have increased the impact of the credit slowdown on the M2 aggregate. Overall, the totality of the evidence found in this study supports the view that the slowdown in lending at depository institutions played a significant role in weakening the broad monetary aggregates. Moreover, while the effects of supply-side credit constraints cannot be fully separated from other factors, the available evidence points to these supply-side forces as playing a significant role in slowing credit formation and weakening monetary growth.

As a first approximation, we simply compare the recent behavior of M2 and depository credit measured relative to nominal income since the onset of the 1990-91 recession to their behavior around past business cycles. These comparisons suggest that by the middle of 1992 the level of M2 may have been reduced by around 8 to 9 percent as a result of noncyclical developments that have reduced depository credit formation. This methodology makes no attempt to discriminate between the different possible causes of credit or money restraint.

Alternatively, an evaluation of the predictive performance of a conventional econometric equation of M2 also indicates that by the middle of 1992, M2 was about 10 percent below levels that would have been expected, given the actual behavior of the equation's explanatory variables during the past few years. The prediction errors of the M2 model reflect a combination of deviations in money demand and disturbances linked to shifts in credit demand and supply. Additional econometric work also shows that the predictive performance of the M2 demand equation improves when direct measures of credit or other factors that capture cutbacks in lending are included.

Econometric tests were performed to examine how the channels between bank credit and deposit creation may have changed in recent years. The results from Granger causality tests indicate that the links running from depository credit formation to money creation have strengthened amid the financial innovations of the past decade. This finding is consistent with the observation that banks have come to rely more heavily on many nontransactions deposits included in the M2 aggregate to fund their credit formation and suggests that M2 has become more sensitive to developments affecting bank credit formation.

Finally, using cross-section data, we find that direct measures of bank balance sheet distress, such as capital-asset ratios, can account for at least a modest portion of the observed weakness in several components of the broader monetary aggregates. A deterioration in the financial well-being of the depository sector is felt to have impeded deposit growth by making banks less willing to lend. Deposits used as managed liabilities have been most affected. Direct measures of loan growth included in these regressions are also found to help explain slow deposit growth.

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The Credit Slowdown Abroad

by S. Hickok and C. Osler[1]

Introduction

Over the last few years credit growth has slowed sharply in most industrialized countries. This paper examines the factors behind this credit slowdown. We concentrate on the recent behavior of credit in Japan, the United Kingdom, and France. These countries are chosen because of their prominence and the broad range of their credit experiences. We put these countries' experiences into an historical perspective and then undertake an econ-ometric examination of the factors lying behind them. In addition, we discuss the similarities among credit developments in these and other major foreign industrial economies.

We find that the slowdowns in credit growth in Japan, the United Kingdom, and France reflect in large part the return of credit growth rates to more normal levels after exceptionally rapid growth in the 1980s. Cyclical factors—the rapid rise and then slowdown in GDP growth—played a role in these credit dynamics, particularly in France, but noncyclical factors were generally more important. The financial market deregulation and innovations that took place in most industrial countries during the 1980s were the most significant noncyclical factors. Deregulation, most notably the end of credit controls, was generally followed by a period of fast growth in credit as previously rationed sectors gained improved access to credit markets. This source of growth would naturally have tapered off as such agents, typically consumers, began to reach their desired borrowing positions. We find that this deregulation-induced swing in credit growth was most important in France, where deregulation was most recent, but was important elsewhere as well. Other financial market developments, such as the introduction of commercial paper markets in all three countries and the sharply increased issuance of equity-linked bonds in Japan, led to temporary surges and declines in individual categories of credit as agents shifted their portfolios to take advantage of new opportunities. More generally, financial innovation led to a deepening in financial intermediation and permanently higher credit/GDP ratios.

[1] Our thanks to R.G. Davis, M.A. Akhtar, C. Pigott, A. Rodrigues, and R. Seth for comments. Michael Hansen provided extensive assistance with this paper.

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Financial market deregulation and innovations were primary forces behind rapidly rising equity and real estate prices in the 1980s, and these asset price dynamics in turn contributed significantly to the surge and subsequent slowdown in credit growth. Agents' wealth and their ability to borrow increased along with asset prices, as did the amount agents needed to borrow to purchase any individual asset, providing impetus to credit growth. Asset prices eventually began to slow, which reduced growth in agents' borrowing capacity and lending. This wealth-related effect of asset prices on credit seems to have been important in all three countries. Fast asset price increases also attracted speculative borrowing during the late 1980s, and then declining prices discouraged such borrowing. This relatively transitory speculative element is estimated to have been most important in shaping credit developments in Japan and least important in France.

The recent slowdown in credit growth abroad was also influenced in some countries by increased attention to capital adequacy levels in the late 1980s and early 1990s, in response to the announcement by the Bank for International Settlements (BIS) of new bank capital standards. This source appears to have contributed significantly to the credit slowdown in Japan but not to the credit slowdowns in the United Kingdom and France.

The pattern we observe in our three focus countries appears in most other industrialized economies. Germany, Italy, Spain, Sweden, Switzerland, and Australia generally experienced rising credit growth which peaked at levels much higher than GDP growth and subsided thereafter. As in our focus countries the rise and fall in credit growth generally followed deregulation and other financial market changes and was accompanied by rapidly rising and then falling asset prices, particularly in real estate. Credit adjustment problems tied to speculative asset market dynamics, in particular, appear to have been substantial in many countries where credit surged markedly. Germany stands out as having little deregulation, no burst of credit growth, and no major developments in asset prices; Sweden stands out as being relatively extreme in all these dimensions.

Section I of our study provides an historical perspective on credit market developments in Japan, the United Kingdom, and France. In Section II we support these narrative observations with econometric analysis of credit behavior in each country. Section III summarizes credit developments in the other foreign countries and in Section IV we conclude.

I: Historical Perspective on Credit Developments in Japan, the United Kingdom, and France

Nominal credit growth slowed markedly after 1989 in Japan, the United Kingdom, and France (Charts 1-3), and by 1991 it had generally fallen to half or less than half of the rates of growth registered during the late 1980s. The U.K. credit slowdown was particularly dramatic: bank credit grew only 2 1/2 percent in 1991, down from 30 percent in 1988. The credit slowdown in each of the countries was widespread as well as severe, affecting most types of loans and most categories of borrowers and lenders.

In this section we present these credit developments in an historical perspective. For each of the three focus countries we provide first an overview of credit developments since 1980 and then an in-depth discussion of the factors behind those developments, particularly the recent credit slowdown. We highlight the contributions of financial market deregulation and innovation, asset market developments, cyclical factors, and credit supply constraints.

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Chart 1: Credit and GDP: Japan

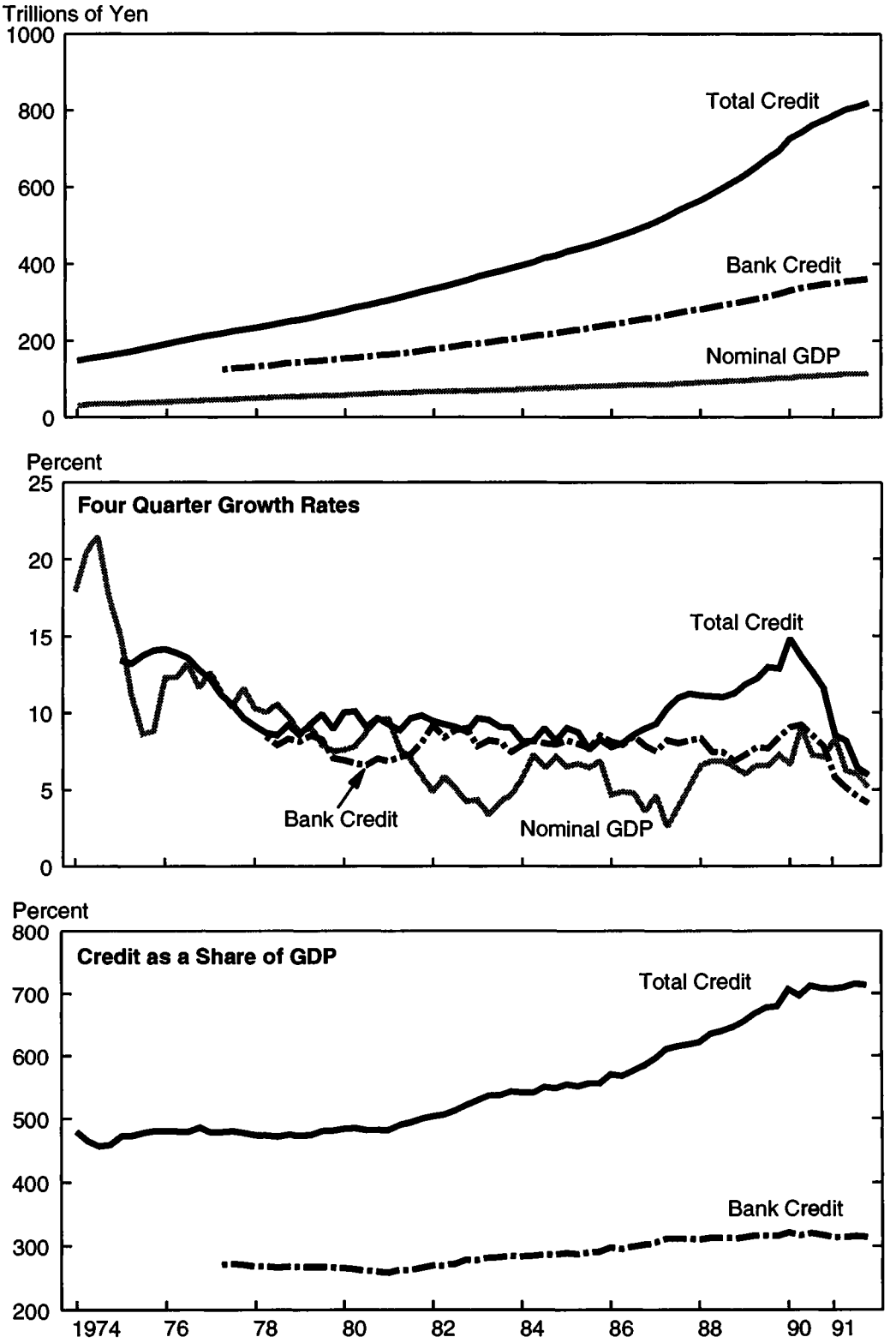

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Chart 2: Credit and GDP: United Kingdom

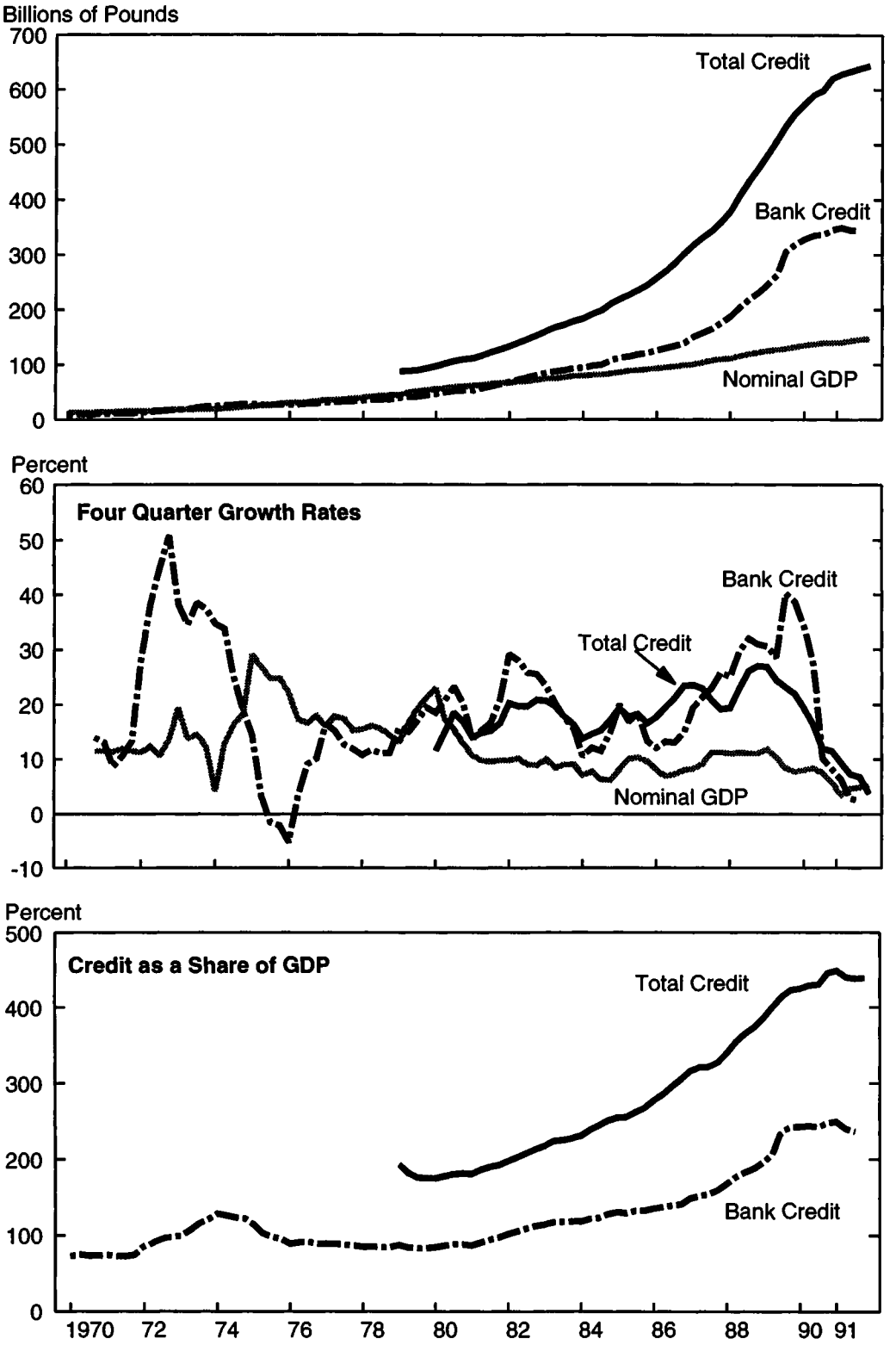

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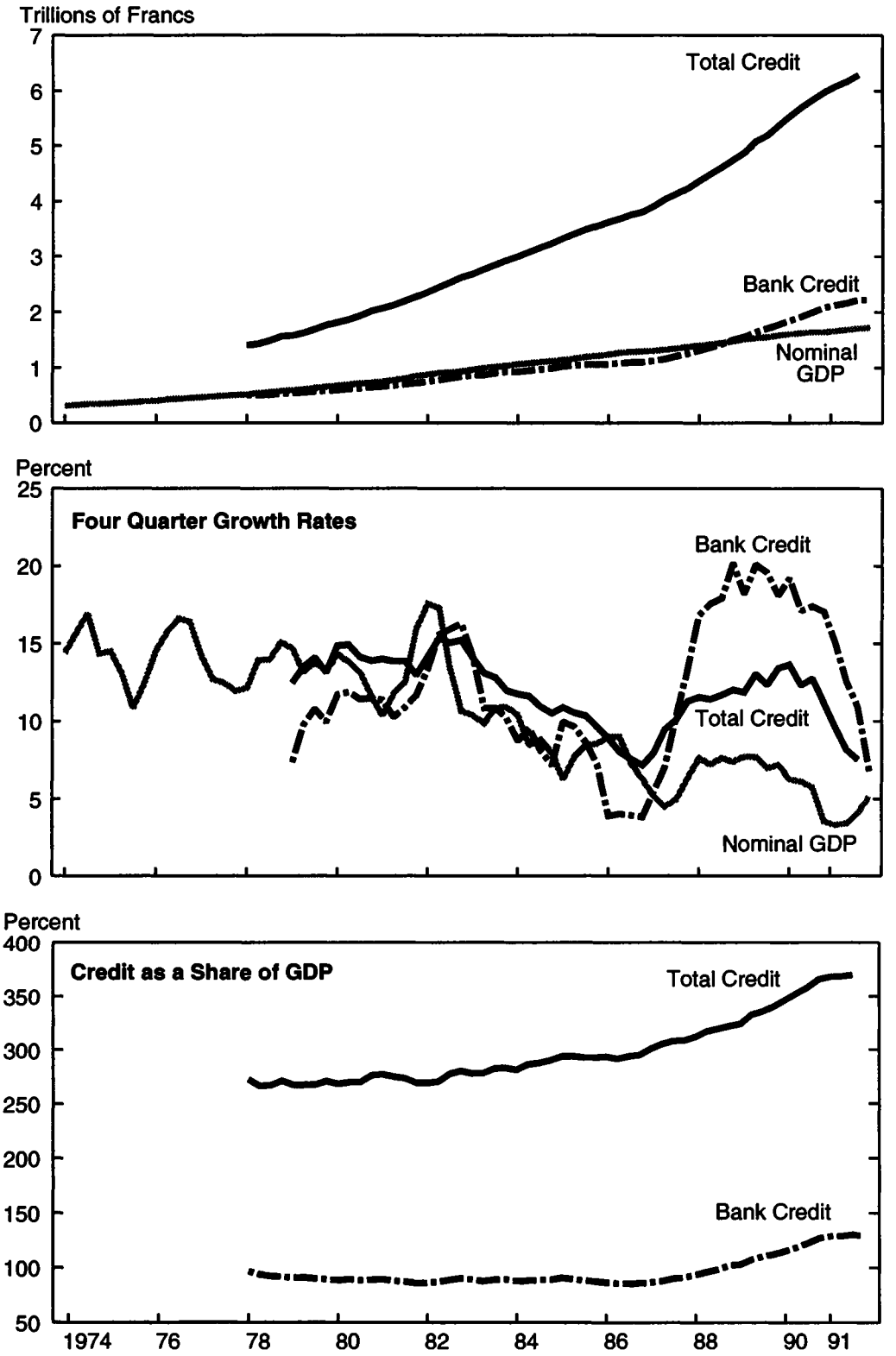
Chart 3: Credit and GDP: France



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We focus on credit to the private nonfinancial sector and use two measures of credit, "bank credit" and "total credit." "Bank credit," which includes loans to commercial and industrial firms, consumer loans, and mortgages, is of primary interest to those concerned with the banking sector *per se*. "Total credit," which includes bonds issued by nonfinancial companies, commercial paper, and mortgages issued by non-bank financial firms, as well as bank credit itself, is of greatest relevance to those interested in economic growth.

Japan

As shown in Chart 1, credit growth in Japan slowed dramatically in 1991. This slowdown must be evaluated in light of the extremely rapid growth which preceded it, also shown in Chart 1. A brief historical and cyclical perspective on Japanese credit will be helpful before we turn to analyze the underlying determinants of recent credit developments.

Table 1 presents a disaggregated view of recent Japanese credit developments. Growth in credit and GDP were fairly comparable during the 1970s but diverged sharply thereafter. Despite the slowdown in nominal GDP growth in the early 1980s, growth in

Table 1: Japan: Outstanding Growth in Private Nonfinancial Credit
Average Annual Growth Rate

	1974-IV to 1977-IV	1977-IV to 1981-IV	1981-IV to 1982-IV	1982-IV to 1985-IV	1985-IV to 1986-IV	1986-IV to 1989-IV	1989-IV to 1990-IV	1990-IV to 1991-IV
Nominal GDP	10.7	8.2	4.2	6.2	3.6	6.3	7.1	5.1
Real GDP	4.4	4.2	3.9	4.2	2.5	5.3	4.7	3.2
CPI	8.0	5.1	2.2	1.8	-0.7	1.5	3.3	2.8
Total credit	12.2	9.4	8.8	9.8	8.9	13.5	11.5	5.9
Bank credit of which to:	n.a.	7.6	9.0	7.9	7.8	7.8	7.8	4.1
Corporations	n.a.	7.0	9.5	8.3	7.1	5.6	6.4	3.5
Consumers and unincorporated businesses	n.a.	7.1	8.9	16.0	25.8	30.1	22.8	7.2
Mortgages		13.4	4.9	2.9	9.3	17.1	10.2	6.0
Nonbank credit of which:	n.a	11.7	8.6	11.8	10.0	18.6	14.3	7.2
Bonds	14.1	9.0	5.6	29.1[a]	13.9	26.9	18.3	11.9
Commercial paper	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	24.7	-22.9

[a] Foreign currency bonds are included in bond values outstanding from 1985-IV on; growth in domestic bonds alone averaged 15.7 percent over the 1982-IV to 1985-IV period.

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almost all types of credit was quite robust.[2] Credit to consumers and small (unincorporated) businesses rose particularly rapidly.

The 1986 economic slowdown in Japan had no apparent effect on the rate of credit growth. Mortgage credit growth increased and credit to consumers and small businesses accelerated even further. The sharp divergence of GDP and credit growth continued during the rapid economic growth period of 1987-89. Nonbank credit growth surged to a 19 percent annual rate, triple the rate of GDP growth, an acceleration which was spurred in part by the introduction of a commercial paper market. Bank credit growth, on the other hand, remained high during the recovery but did not accelerate. The banks' traditional corporate customers increasingly met their credit needs in the nonbank securities market, a force which offset soaring growth of bank lending for mortgages, consumers loans, and small businesses.

Credit growth remained strong through 1990, then abruptly fell off. The deceleration was pronounced in all types of credit instruments and to all credit borrowers. The sharpest decline, however, was in the commercial paper market, where credit outstanding actually fell by 23 percent. The slowdown in bank credit growth to consumers and small business was also acute.

Viewed over the entire 1980s, Japanese credit growth clearly exhibited a sharp rise relative to economic activity (GDP). This rise was especially evident in 1982 and 1986 when credit growth picked up and then maintained its momentum despite slowdowns in the Japanese economy. Only in 1991 did the rising trend in Japanese credit growth appear to have waned. We will now investigate the primary factors—financial deregulation coupled with financial innovation, asset price developments, and monetary and capital adequacy policies—shaping this credit behavior. During our investigation we will distinguish between those factors likely to have had a fundamental (that is, sustained) impact on the credit-GDP relationship and those factors that probably only temporarily altered this relationship during the last decade.

Sources of Rapid Credit Growth in the 1980

A key factor leading to a sustained rise in credit relative to GDP was the deregulation of Japanese credit markets in the early 1980s. Of particular note, Bank of Japan "window guidance" credit controls on banks, occasionally binding in the 1970s, were employed much less restrictively in the 1980s.[3] One result of the loosening in credit controls was that loans to individuals and small business, to a large extent rationed out in the 1970s, rose sharply in proportion to loans to manufacturing corporations (in Table 1 this can be inferred from the much higher growth rates of loans to individuals and small businesses than loans to manufacturing corporations). Much of the *growth* in consumer and small business loans represented a credit stock adjustment as previously unsatisfied credit demand was met and the *stock* of credit outstanding permanently rose relative to the level of GDP.

A shift in corporate borrowing to nonbank sources, reflecting both deregulation and financial innovation, facilitated bank lending to consumers and small businesses. The introduction of commercial paper in 1987 was a salient example of deregulation and innovation spurring nonbank credit growth. Newly sanctioned Japanese borrowing in the

[2] Only mortgage growth slowed along with GDP growth in the early 1980s. However, mortgage credit had grown very rapidly in the 1970s due to government incentives.

[3] *OECD Economic Survey on Japan*, July 1984, discusses the declining importance of window guidance as a policy instrument. See also Cargill and Royama (1992).

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Euromarkets was another example. Technological advances in financial services along with new hedging and other financing options further promoted growth in corporate borrowing, especially outside of traditional "main bank" channels.[4] Again, here was a fundamental shift in credit dynamics that affected the credit-GDP relationship during the 1980s.

The mid-1980s increase in the spread of bank lending rates over government bond yields was, surprisingly, clear evidence of the significant impact of financial market deregulation and liberalization. Financial opening to foreign investors tended to push government bond yields down. At the same time the lifting of interest rate ceilings tended to raise private borrowing rates.[5] In consequence, by the mid-1980s the mortgage spread over government bonds was well over 100 basis points, compared to a negligible or negative spread in the early 1980s (Chart 4).

Another important factor promoting, as well as being promoted by, the rise in credit growth was a rapid rise in stock and real estate prices (Chart 5).[6] Land prices almost doubled in the 1980s while equity prices increased fivefold. These sharply escalating prices were in part a result of rapid credit growth but the rising asset prices, in turn, spurred credit growth even further.[7] Specifically, rapidly rising stock prices drastically

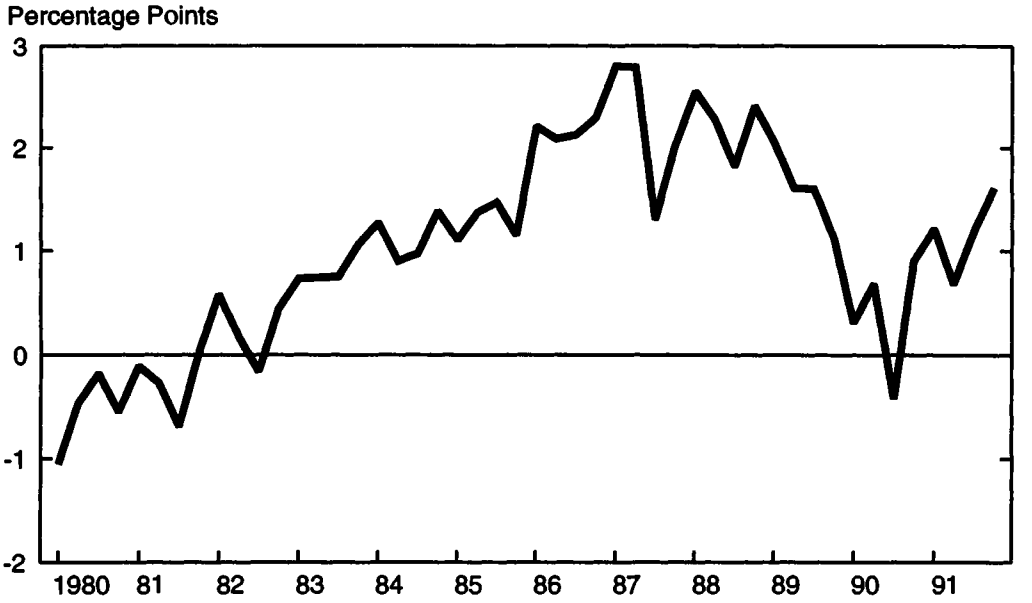
[4] Japanese corporations have traditionally had a "main bank" that looked after their financial needs. Ogusi (1990) discusses the role of swaps and other new financing options in diversifying the sources of corporate funding.

[5] Bank of Japan (1990) discusses the impact of interest rate liberalization.

[6] Stock price developments shown on Chart 5 are based on index of all share issues listed on the Tokyo Exchange, published in the International Monetary Fund's *International Finance Statistics*. Urban land price developments are based on an index reported in the Nikkei Macro Economic Statistics Data Bank.

[7] Japan's strong economic performance relative to other industrial countries also fueled the asset price rise.

Chart 4: Housing vs Government Bonds Yields: Japan



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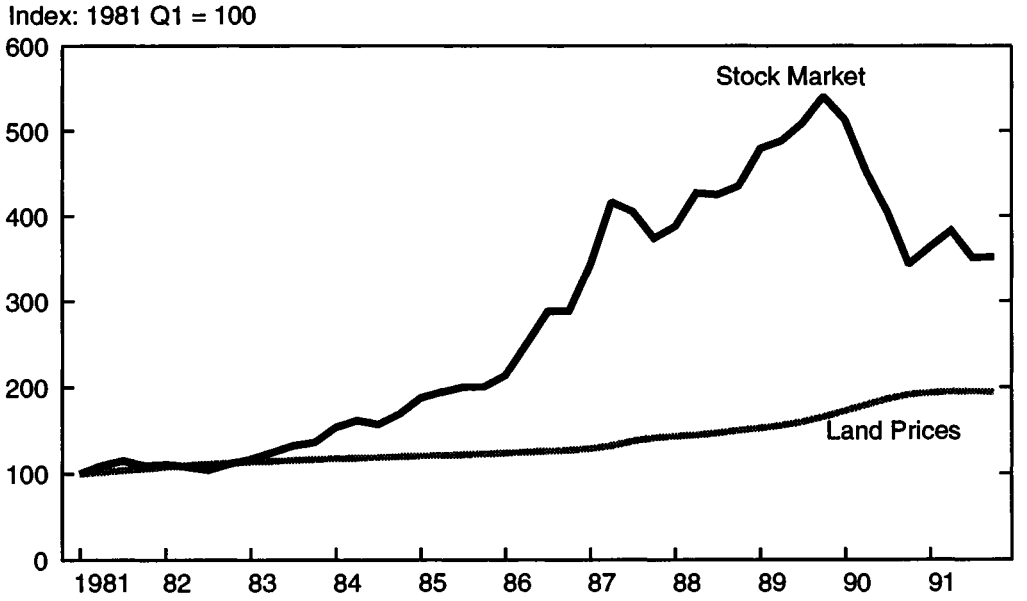
reduced the price of corporate convertible and warrant bonds and, hence, led to an explosion in the corporate issuance of these securities in the second half of the 1980s.[8] A sharp drop in bank interest rate spreads over government bonds in the latter 1980s was in part a result of the emergence of this alternative cheap source of credit. On the real estate side, rapidly rising land prices provided a growing source of collateral for bank loans. Soaring asset prices also raised the demand for borrowed funds to support both speculative and nonspeculative stock and real estate purchases.

These asset price developments clearly had both sustained and temporary effects on the credit-GDP relationship. Permanently *higher* asset prices meant permanently higher credit demand to cover the cost of asset purchases and permanently higher credit supply in response to permanently higher collateral value. Sharply *rising* asset prices temporarily raised credit demand for speculative purchases and temporarily raised credit supply in response to the attractiveness of potential gains on warrant and convertible bonds. Both factors pushed up the credit/GDP ratio in the 1980s.

Monetary easing following the sharp appreciation of the yen in the mid-1980s further fueled credit growth. The Bank of Japan's discount rate was lowered to a historically low (in nominal terms) 2 1/2 percent in 1987 while the monetary base grew on average 11 1/2 percent per year between 1986 and 1989, up from 7 percent per year in the preceding four year period. The slowing Japanese economy in 1986 was partly responsible for the monetary easing, but the easing was greater (measured in terms of monetary base growth) than that following the two previous Japanese slowdowns. In consequence, credit growth was further promoted relative to GDP growth in the late 1980s. Monetary ease also contributed to the 1988-89 drop in bank lending spreads over government bond yields since bank rates were more closely tied to Bank of Japan policy.

8. The outstanding level of convertible bonds rose at an average annual rate of 39 percent between the end of 1985 and the end of 1989.

Chart 5: Asset Prices: Japan



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The Credit Slowdown of the 1990s

The catalyst for the slowdown in credit growth in 1991, in turn, was a tightening in monetary policy. Partly in response to concern about the asset price boom, the Bank of Japan raised the discount rate to 6 percent by 1990 and loan spreads widened. Both GDP and credit growth slowed. The 1991 credit/GDP slowdown was notable in that for the first time in a decade credit growth fell back to the pace of nominal GDP growth, suggesting that the noncyclical factors pushing credit growth during the 1980s had dissipated as the 1990s began.

One factor that contributed to the declining credit growth rate in 1991 was a sharp drop in credit growth to the areas that were earlier promoted by financial market deregulation. Growth in credit to consumers and nonincorporated businesses slowed markedly while commercial paper issuance dropped precipitously. Some slowing in credit growth to consumers and nonincorporated business was to be expected; the surging credit growth rates of the 1980s would eventually decline as actual credit levels began to meet previously rationed out (unsatisfied) credit demand. Indeed, the ratio of household debt to household disposable income had roughly doubled during the 1980s, suggesting substantial stock adjustment had occurred by the end of the 1980s in response to the earlier financial opening to this sector. Both borrowers and lenders, viewing the consequent rise in debt service obligations, would not likely be willing to sustain the previous pace of debt accumulation. Overall, the stock adjustment dynamics suggest that credit growth would naturally slow eventually but the level of credit outstanding relative to GDP would be permanently higher at the end of the decade in response to early 1980s deregulation.

Growth in commercial paper issuance would have *slowed* for the same stock adjustment reason. The outright *decline* in commercial paper was attributable, in part, to loan problems (to be discussed shortly) at financial firms, the prime purchasers of commercial paper. This decline helped generate a rise in commercial paper rates which further depressed commercial paper sales since it eliminated the profitable arbitrage opportunity corporations had found in selling commercial paper to fund large time deposits.[9]

A second factor affecting credit growth that clearly changed at the end of the 1980s was the bursting of the asset price bubble. After an earlier dramatic ascent, Japanese stock prices fell 25 percent during 1989-91. Japanese land prices levelled off and in some areas (most notably in Tokyo) tumbled substantially. Tightened monetary policy, a sense that asset prices had moved to an unsustainably high level, and Ministry of Finance restrictions on real estate lending (banks were only allowed to increase real estate loans at the same rate as they increased their total loan portfolio during 1990 and 1991) all contributed to the turn-around in asset prices.[10]

The turnaround in asset prices affected credit growth in a variety of ways. Some bank borrowing may actually have been promoted as equity-related funding decreased. However, desired borrowing for speculative purchases was discouraged by the end of the asset price rise while borrowing needs to finance actual asset transactions declined. Turnover on the Tokyo stock exchange fell 58 percent measured by the number of shares sold (67 percent measured by the yen value of transactions) between 1989 and 1991. The volume of real estate transactions also sank.

[9] The outstanding level of convertible bonds rose at an average annual rate of 39 percent between the end of 1985 and the end of 1989.

[10] Bank of Japan (1992a) emphasizes the role of real estate lending restrictions. It is of note that real estate lending did not pick up with the ending of restrictions, as discussed in Bank of Japan (1992b).

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A more significant impact of declining asset prices, particularly in real estate, was erosion of the value of collateral held against many loans. Real estate lending based on liberal loan/value ratios during the real estate boom exacerbated this problem. Problems with credit losses from 1989 on, many associated with real estate loans, badly hurt bank balance sheets and, therefore, bank credit availability. Estimates of the magnitude of problem loans eventually ranged as high as ¥60 trillion, or 16 percent of total bank credit outstanding to the private sector.[11] These estimates, even if overstated, raised deep concerns about the financial health of the banking sector, further freezing up financial transactions and, thereby, limiting loan growth.

The effect of the turn-around in asset prices on bank credit availability was amplified by the BIS capital adequacy rules introduced in major industrial countries in 1988.[12] These rules specified what level of bank capital was necessary, in relation to a bank's asset portfolio, for a bank to be considered adequately capitalized. In Japan, corporate equities form a significant part of the bank capital base. The sharp decline in Japanese stock prices, consequently, made meeting the new BIS capital adequacy ratios much more difficult. In order to attain the BIS capital adequacy ratios banks slowed credit growth as the equity component of their capital base declined.

The bursting of the asset price bubble clearly ended the temporary, speculative factors pushing up credit growth in the 1980s. In fact, to the extent that it contributed to financial problems, the bursting of the bubble actually temporarily pushed credit growth down. Asset price developments had a more sustained impact on Japanese credit levels as well. Asset prices and therefore wealth had, on net, risen much more rapidly than nominal GDP over the whole 1980-91 period. Consequently, asset price developments during the 1980s were partially accountable for a sustained rise in the credit/GDP ratio over the last dozen years.

Overall, the recent slowdown in Japanese credit growth appears to reflect to a large extent an unwinding of developments that spurred a dramatic credit surge during the 1980s. With the unwinding of these developments, credit growth appears to have returned to its more normal relationship with GDP growth, although the credit/GDP ratio has been left permanently higher by the 1980s developments. To be sure, the unwinding of the developments that had spurred the 1980s credit surge has now temporarily slowed both GDP growth and credit growth, with the slowdown in each reinforcing the slowdown in the other. Despite this current role played by weak GDP growth, noncyclical factors (some fundamental and some temporary) appear to have been the prime determinants of the credit slowdown in Japan, just as they were the prime determinants of the earlier credit surge.

United Kingdom

The United Kingdom has had a quite varied credit growth picture over the last two decades. The early 1970s started with a credit boom (Table 2). Nominal credit growth then slowed markedly in the mid-1970s as recession hit the U.K. economy. With recovery in the later 1970s, nominal credit grew apace with GDP. As in Japan, however, a

[11] *The Economist* (4/11/92); *Financial Times*, (11/27/92).

[12] In 1988 the BIS member countries agreed upon minimum risk-weighted capital/asset ratios that banks would be required to meet by 1993. Interim targets were set to be met by the end of 1990. Banks responded to these requirements prior to 1990 and 1993 because an adjustment in capital/asset ratios takes time and because financial markets began to measure the strength of banks in terms of these risk-weighted values.

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notable change occurred in the relationship between credit and GDP at the turn of the decade. Credit began to significantly outpace nominal GDP as the U.K. economy again entered recession. In fact, during the early 1980s recession consumer credit from banks grew at an average annual rate of 27 percent, in sharp contrast to its 5 percent average annual decline during the mid 1970s recession.

Mortgage credit growth, along with still relatively buoyant consumer credit growth, led strong total credit growth in the subsequent recovery. During the 1982-89 period total credit growth averaged about 20 percent a year, with business borrowing eventually outpacing still strong mortgage and consumer credit growth rates in the second half of the decade. A sharp pick-up in business borrowing from banks (to an annual average growth rate of 32 percent) also offset some tapering off of nonbank credit growth in the second half of the decade.

The fact that U.K. credit grew at roughly twice the pace of U.K. nominal GDP from 1982 on means that there has been a sharp rise in the U.K. credit/GDP ratio over the past decade, similar to the rise that occurred in Japan. As was also the case in Japan, this rise ended abruptly as the 1990s began. By 1991, nominal U.K. credit growth was slower than nominal GDP growth (4 percent versus 5 percent), with actual declines registered in business and consumer credit.

Sources of Rapid Credit Growth in the 1980s

Again as was true with Japan, regulatory changes played a major role in the rise in British credit outstanding during the 1980s. Regulatory changes, in fact, played an impor-

Table 2: United Kingdom: Outstanding Growth in Private Nonfinancial Credit
Average Annual Growth Rate

	1970-IV to 1973-IV	1973-IV to 1976-IV	1976-IV to 1979-IV	1979-IV to 1981-IV	1981-IV to 1986-IV	1986-IV to 1989-IV	1989-IV to 1990-IV	1990-IV to 1991-IV
Nominal GDP	12.5	20.2	16.9	11.3	8.4	10.0	5.2	5.4
Real GDP	3.6	0.9	2.5	-1.7	3.3	3.4	-1.4	-1.1
CPI	9.1	19.4	12.8	13.6	5.0	6.1	10.0	4.2
Total credit	n.a.	n.a.	n.a.	16.7	18.8	22.3	11.5	3.7
Bank credit of which to:	32.9	8.7	14.1	20.5	16.7	27.4	8.2	2.4[a]
Corporations	28.3	11.3	10.9	15.5	11.5	32.2	7.7	-3.7
Consumers and unincorporated businesses	46.1	-4.9	23.3	27.0	19.0	21.4	9.3	-0.3
Nonbank credit	n.a.	n.a.	n.a.	13.2	20.8	17.6	15.0	11.5[a]
Residential mortgages, all private lenders	18.0	17.5	14.2	17.4	21.3	19.3	14.6	9.3

a. 1990-III to 1991-III.

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tant role in British credit developments in the 1970s as well. The early 1970s credit boom followed measures of financial market deregulation; the boom ended in the mid-1970s when the Bank of England introduced the "corset" mechanism to control credit growth. The corset required banks expanding credit beyond specified limits to hold noninterest-bearing deposits (in excess of their ordinary reserves) at the Bank of England.[13] The corset, along with the mid 1970s recession, explains the sharp slowdown in credit growth in the mid 1970s.

The abolition of the corset mechanism at the beginning of the 1980s was a major factor contributing to the rapid rise in British credit outstanding over the last decade. One of the most important ramifications of the end of the corset was commercial banks' entrance into the mortgage arena. Corset lending ceilings had led commercial banks to avoid this financial area in the 1970s, allowing building societies (institutions analogous to savings-and-loans in the United States) to run the mortgage market in an informal cartel-like manner.[14] The government had helped deter commercial banks, and thus solidify the cartel, by putting pressure on building societies to hold mortgage rates down. The result was mortgage rationing, mortgage queues, and little price competition in the mortgage market prior to lifting of the corset. With the end of the corset, commercial banks began a decade-long trend of increased penetration in the mortgage arena.

The initial stock adjustment of banks to the new lending environment took place during 1981-82. This period coincided with the surge in council-house sales, as the Thatcher policy of encouraging home-ownership took hold. Around 630,000 dwellings were transferred from the public to the private sector during 1980-84,[15] representing roughly 5 percent of the 1980 privately-owned housing stock and 40 percent of the total increase in owner-occupied housing during the period.[16] Together these forces led to an unprecedented increase in mortgage lending during the early 1980s (Table 2). The sharp rise in mortgage lending initially represented a permanent stock adjustment to the end of the mortgage rationing and mortgage queues that had marked the 1970s. This trend weakened during the mid-1980s, and then accelerated once again during the late 1980s, spurred in part by the end of government discouragement of borrowing against house values for purposes unrelated to housing.[17]

It is notable that the spread between mortgage rates and Treasury bill rates actually widened in the early 1980s (Chart 6) despite the sharp rise in mortgage lending competition. The widening spread was evidence that government pressure on building societies to hold mortgage rates down eventually gave way to market forces in the face of intense commercial bank competition. As was the case in Japan, this widening in the mortgage spread may be viewed as a signal of significant financial market deregulation.

Another contributor to the sustained rise in British credit outstanding relative to GDP during the 1980s was financial innovation, notably the introduction of new financial instruments. The commercial paper market opened in Britain in 1986. Note issuance facilities, swaps, and options were further significant innovations making credit more

[13] For a detailed discussion of the corset, see Bank of England (1982).

[14] See Coles (1992), and Davis and Saville, (1982).

[15] Bank of England (1985): 80-91.

[16] Table 1, p. 32, "Housing Tenure," in the Council of Mortgage Lenders' (1992).

[17] *Ibid.*, p. 226.

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attractive to business.[18] These innovations were promoted by 1986 changes in financial market rules (primarily the end of restrictive practices such as fixed commissions and rigid demarcations between brokers and jobbers), known as the Big Bang, which led to a huge expansion in the financial services sector as financial firms jockeyed to gain market share in financial areas previously closed to them.[19]

Also contributing to business credit growth in the 1980s, but to a much more transitory extent, was an enhanced feeling of confidence in the British economy beyond that which would normally be associated with the U.K.'s actual GDP growth in any given year of the decade. Real GDP growth in Britain had been very strong from 1982 through the end of the decade. Averaging over 3 percent a year, British growth was substantially higher than that in the rest of Europe. This strong growth, coupled with sharp productivity increases and expected gains from the Europe 1992 program, temporarily raised the level of business confidence and investment beyond what it normally would have been.[20] The resulting investment boom contributed significantly to the sharp increase in business credit growth.

A dramatic increase in mergers and acquisitions (M&A) activity starting in 1985, partly related to increased confidence, further fueled the rise in business credit growth.[21] Running at roughly £20 billion a year, M&A activity in the second half of the 1980s was almost five times the level it had been in the first half of the decade. Although primarily financed by equity issuance, the credit-financed portion of the M&A boom was large enough to affect credit growth rates while the boom lasted.

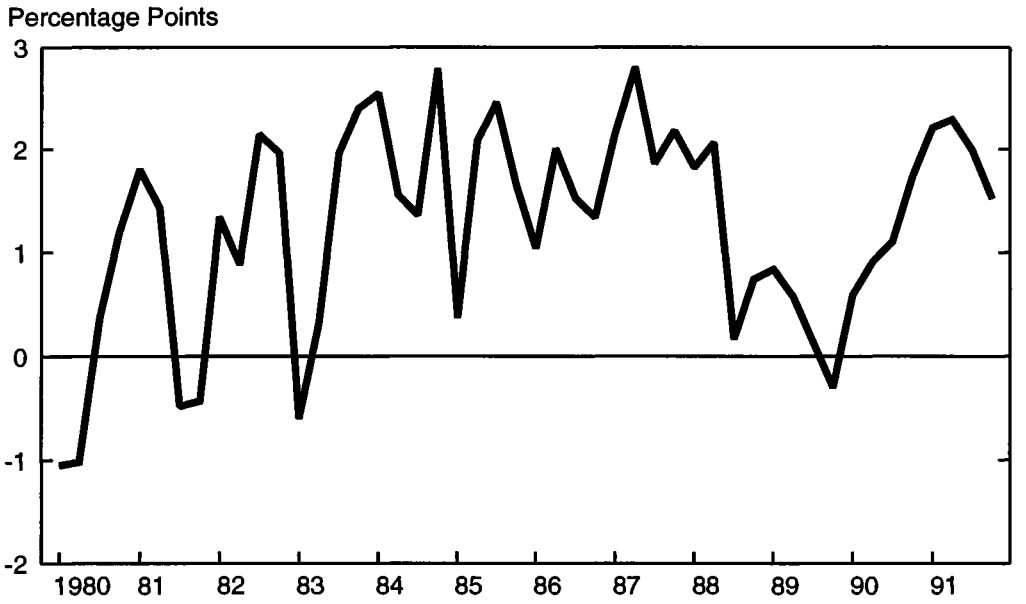
[18] See Benzie (1988).

[19] *The Economist* (1986).

[20] The surge in foreign direct investment in Britain in the late 1980s reflected the same forces.

[21] Benzie (1989) states that improving corporate financial positions were a major factor behind the British takeover boom.

Chart 6: Housing vs Government Bill Yields—United Kingdom



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Strong British economic growth in the 1980s, buttressed by rising business confidence and the rapidly expanding British financial industry, led to a sharp rise in commercial real estate purchases, particularly in the London area. This real estate boom put further upward pressure on credit demand. The sharp rise in commercial real estate purchases, coupled with strong growth in the residential mortgage market, sent real estate prices soaring (Chart 7).[22] The ensuing large capital gains drew speculators deeper into the real estate market, temporarily pushing credit demand and real estate prices up even higher. Meanwhile, greater competition in real estate lending was accompanied by a loosening in credit quality standards: loan-to-value ratios rose significantly.[23] This loosening exacerbated the real estate bubble and eventually led to credit problems.

The Credit Slowdown of the 1990s

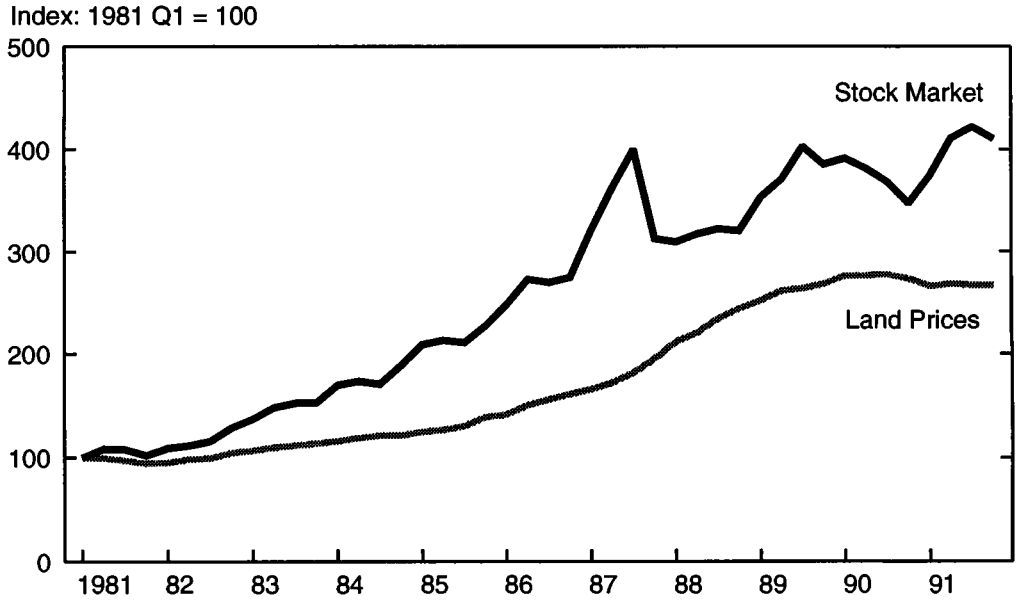
The slowdown in U.K. credit growth at the beginning of the 1990s had several significant elements in common with the slowdown in credit growth in Japan. The catalyst for the U.K. slowdown was tightened monetary policy. The Bank of England raised U.K. base rates by roughly 6 1/2 percentage points, to 15 percent, between the beginning of 1988 and the end of 1989. Monetary tightening precipitated an economic slowdown in the United Kingdom and the accompanied unwinding of the special factors that had led to the rise in British credit during the 1980s.

The U.K. economy fell into recession in the summer of 1990. The recession brought with it a great fall in business confidence and a bursting of the U.K. real estate bubble.

[22] Stock price developments shown on Chart 7 are based on the Financial Times Index of 750 stock issues. New dwelling price developments are based on an index published in the Central Statistical Office's *Economic Trends*.

[23] Bank of England (1992).

Chart 7: Asset Prices: United Kingdom



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It also coincided with the natural tapering off of adjustment to earlier market deregulation. This natural tapering off can be seen in the slowing, albeit still fast, growth for residential mortgage lending in the second half of the 1980s.

A particularly salient aspect of the U.K. slowdown was an actual decline in house prices beginning in late 1990. This decline in house prices contributed to already surging mortgage foreclosures and personal insolvencies. The volume of house sales and of mortgage lending declined dramatically for the same fundamental and transitory reasons discussed in relation to Japanese real estate developments. Mortgage repayment problems and concern about the ability of borrowers to make scheduled payments in the high interest rate environment also explain why U.K. mortgage lenders let spreads over government bond rates narrow significantly in 1991.[24]

Housing market problems were not the only source of credit losses for the British financial system. The M&A boom had left the corporate sector more highly leveraged than it had been in previous recessions—net corporate interest payments rose to 19 percent of post-tax income in 1990 versus only 9 percent in 1980. Not surprisingly, the rate of business insolvencies has been quite high during the recent recession. Aside from raising bank concern about corporate credit quality, rising insolvencies chipped away at bank capital. Although British banks remained strongly capitalized, with BIS risk-adjusted capital adequacy ratios generally above 10 percent, credit losses had to slow the rate of growth of loans if banks were to retain their capital positions.

All of these developments sapped the confidence that had supported Britain's credit boom in the late 1980s. Indeed, investment has been unusually weak during the current recession while consumers have clearly retrenched with personal savings rates sharply rising. Business and consumer credit have fallen accordingly.

Overall, slowing credit demand due to cyclical factors appears to explain some but not all of the recent slowdown in British credit growth. The slowdown also reflects the natural tailing off of credit growth from its unsustainably rapid levels of the 1980s. This tailing off resulted as previously rationed mortgage demand became satisfied and credit levels reached their new, higher equilibrium levels relative to GDP. Credit quality problems that developed in both residential real estate and the corporate sector, problems which were in part due to unusually high debt burdens accumulated during the 1980s, temporarily exacerbated the credit slowdowns just as speculative and overconfident credit demand had temporarily exacerbated the credit surge in the previous period.

France

A sharp slowdown in French credit growth occurred in 1991. As in the other countries, the slowdown came after over a decade of double-digit credit growth, and it was widespread. As was also the case with the other countries, much of the French credit slowdown had its roots in the unwinding of the special factors accounting for the earlier rise in credit outstanding relative to the level of nominal GDP.

The history of French credit growth is so closely entwined with the use and then the termination of credit controls that it can best be chronicled in reference to credit control policies.[25] During the 1970s credit growth in France generally kept pace with nominal GDP growth (Table 3). During 1975, a year with some recessionary quarters, credit growth was just slightly above GDP growth. During the subsequent relatively strong

[24] Mortgage rates are flexible and adjusted annually in Britain.

[25] For a discussion of credit control policies, see Melitz (1991). For an analysis of their impact in the 1980s, see Quintyn (1991).

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growth period of 1976-79, credit growth was just slightly below GDP growth. Credit to consumers and unincorporated business grew most rapidly but from a small base. This base was constrained by credit control measures known as the *encadrement du crédit*. The *encadrement* set individual bank ceilings on credit growth and punitive reserve requirements on banks breaching their ceilings.[26] Much of the credit extended during this period was granted at government subsidized interest rates.

The pattern of comparable French credit and GDP growth rates held through the oil shock period at the turn of the decade, although adjustments in the *encadrement* tightened allowable consumer credit growth. From 1982 on, however, French credit started to grow considerably faster than nominal GDP. Nonbank credit led the way, spurred by government incentives designed to develop the French capital market.[27]

There were further significant changes in mid-decade. During the 1985-86 period the *encadrement du crédit* was dismantled in a series of steps. Interest rate subsidies were also largely eliminated. Bank credit growth to consumers and unincorporated business soared. Banks competed to gain market share in the newly deregulated areas,

[26] Certain types of credit were exempted from the ceilings.

[27] Individuals were given tax concessions in return for investing in the French capital market. Banks were also encouraged to develop mutual funds.

Table 3: France: Outstanding Growth in Private Nonfinancial Credit
Average Annual Growth Rate

	1974-IV to 1975-IV	1975-IV to 1979-IV	1979-IV to 1981-IV	1981-IV to 1984-IV	1984-IV to 1986-IV	1986-IV to 1989-IV	1989-IV to 1990-IV	1990-IV to 1991-IV
Nominal GDP	12.5	14.1	13.7	9.8	7.4	7.0	3.5	5.2
Real GDP	1.5	3.5	1.4	1.3	2.4	3.6	1.5	1.8
CPI	10.0	10.0	13.9	8.7	3.5	3.3	3.6	2.9
Total credit	14.0	12.9	13.4	12.5	11.6	12.2	11.1	2.9
Bank credit	n.a.	n.a.	11.6	11.1	5.5	17.2	17.0	6.7
Nonbank credit of which:	n.a.	n.a.	14.3	13.2	14.2	10.2	8.5	1.0
Bonds	n.a.	n.a.	n.a.	n.a.	n.a.	10.2	12.5	12.8
Commercial paper	n.a.	n.a.	n.a.	n.a.	n.a.	75.3	23.3	0.2
All loans[a] of which to:	13.9	15.8	13.5	12.0	7.5	11.0	10.0	5.1
Business	12.3	15.3	13.0	11.4	5.7	11.4	12.9	6.4
Consumers	23.0	18.3	9.4	17.1	30.9	25.0	5.7	-2.3
Residential mortgages	15.4	16.4	14.8	12.5	7.9	8.3	6.2	4.4

[a] Loans granted by all financial institutions.

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driving the quoted interest rate spread between mortgage credit and government bonds down to negligible levels by 1987 (Chart 8; interest rate subsidies had kept the quoted spread negative before 1985). Total bank credit growth, however, did not accelerate during this period, as corporations flocked to the commercial paper market which opened in the second half of 1985. Increased reserve requirements also held bank credit in check. Total credit growth, both bank and nonbank, continued to be significantly faster than nominal GDP growth.[28]

In the late 1980s bank credit picked up speed relative to both total credit and nominal GDP. This change can partly be explained by reduced reserve requirements and by changes in bank policy in response to nonbank competition, such as increasing the number of bank loans offered at close to money market interest rates as opposed to the higher prime rate.[29] Also important was a sharp increase in business trade credit borrowed from banks in light of the booming French economy. Overall, in the late 1980s total French credit growth was much stronger relative to nominal GDP growth than it had been in the late 1970s, the previous period of strong French economic growth.

Rapid French credit growth eventually came to an end. Although the slowing French economy in 1990 did not significantly slow overall credit growth that year, credit growth to consumers and unincorporated businesses did slacken substantially. In 1991, growth in total credit itself weakened dramatically, falling to only 3 percent from 11 percent in 1990. Bank credit growth slowed to 7 percent from 17 percent. Credit outstanding to consumers and unincorporated business actually declined, while the commercial paper market grew at only one-eighth its 1990 pace. Bonds were the only credit instrument whose growth held up.

[28] Bruneel (1987), discusses French financial market liberalization and innovation during this period.

[29] Melitz (1991).

Chart 8: Housing vs Government Bond Yields: France

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The 1980s rise in credit relative to nominal GDP in France, consequently, appears to be in large part the permanent result of the ending of quantitative credit controls as well as other financial market deregulation. Although these factors also played a role in the Japanese and U.K. credit slowdowns, they appear to have been quantitatively much more important in France.

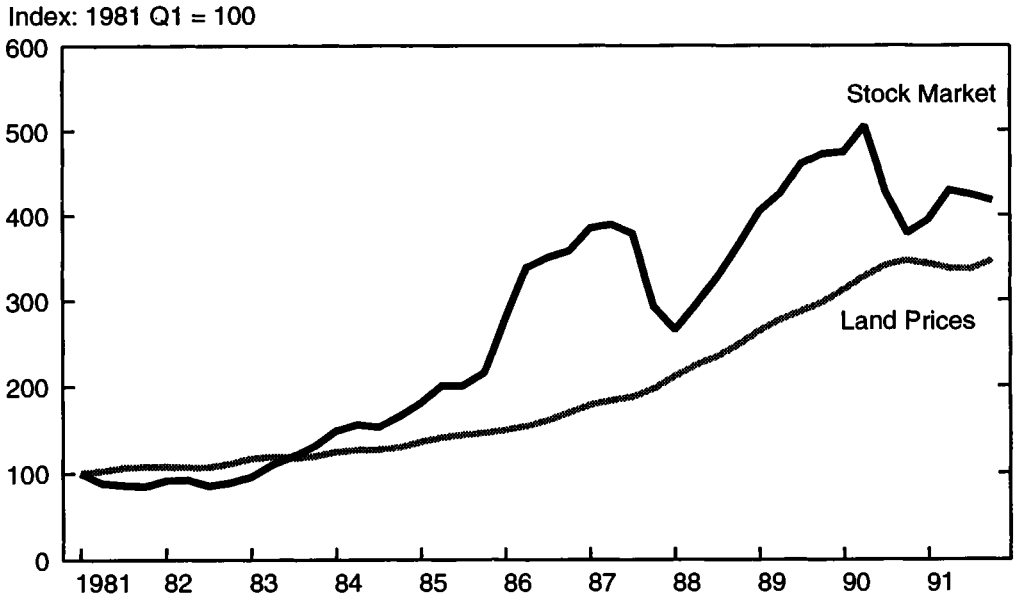
The contribution of asset price developments to credit growth in France is only partially similar to asset price effects in Japan and the United Kingdom (Chart 9).[30] As in those two countries, real estate prices in France rose rapidly, more than tripling over the decade. Equity prices increased even more, although at a very uneven pace. However, the impact of asset price rises on French credit growth was less than the corresponding impacts of asset price rises in Japan or the United Kingdom. French lending for real estate development was more highly regulated than in the other two countries, limiting the growth of credit to finance real estate speculation although not the growth of credit to finance nonspeculative real estate purchases.[31] A lower level of real estate speculation explains in part why the downturn in French urban commercial real estate prices since the beginning of 1990 has been much milder than that in either Japan or the United Kingdom. Stock price changes would likely have had a smaller impact on credit growth in France than in Japan or the United Kingdom because the share of equities in total corporate capital in France is far smaller than corresponding shares in Japan and the United Kingdom.

The recent deceleration in French credit growth accompanied a tightening in French monetary policy, as was the case with Japan and the United Kingdom. The Banque de France intervention rate rose from 7.75 percent in 1987 and 1988 to 10.0 percent by the

[30] Stock price developments shown on Chart 9 are based on an index published in the Banque de France's *Quarterly Bulletin*. Paris house price developments are based on an index published in the Bank for International Settlements' *Annual Reports*.

[31] For a detailed discussion of this point, see Sahling (1991).

Chart 9: Asset Prices: France



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end of 1989. Yet the French situation again differed from that of Japan and the United Kingdom. On the consumer side the slowdown in French credit growth actually started before the monetary tightening. Consumer credit growth peaked in 1987 at 36 percent. There was some natural tapering off from this extraordinarily rapid pace in 1988 and 1989 as previously rationed out demand was finally satisfied.

The slowdown in consumer credit growth was also a response to the 1990 implementation of the *Loi Neiertz*, a bankruptcy law which limited the ability of banks to recoup credit losses.[32] This law, coupled with some increase in consumer loan problems as the economy slowed, reduced the willingness of banks to make consumer loans. Indeed the spread between mortgage loan rates and government bond rates rose from earlier negligible levels to about 100 basis points in the early 1990s.

Tightened monetary policy, together with a concomitant decline in economic activity, appears to have been the direct catalyst for the slowdown in French corporate business borrowing. However, other factors played a role here as well. Corporate profits, at over 9 percent of sales revenue, remained much higher than in previous periods of slack French growth (the average profit rate in the first half of the 1980s was 7.5 percent). Consequently, firms were able to finance a high proportion of their capital needs through retained earnings, further slowing credit growth. A second factor slowing business credit demand was a change in tax laws which made it less profitable for businesses to borrow money to invest in mutual funds. That corporate bond growth held up in 1991, while other forms of business borrowing slowed, probably reflected a shift from equity to bond financing of investment projects in view of the weakening in the French stock market in the early 1990s.

The financial situation of French banks appears to have contributed only modestly to the slowdown in French credit growth. At 8.7 percent in 1990, the average French bank BIS risk-weighted capital adequacy ratio was already above the 8 percent level required for 1993.[33] Moreover, since equity is a significantly smaller share of bank capital in France than Japan or the United Kingdom, the fall in French share prices since 1990 would have had a much more limited negative impact on bank credit growth. It should be noted, however, that since some French banks are nationalized, their lack of ability to raise new capital in the stock market may have made the BIS requirements somewhat more onerous than the requirements would be for private banks.[34] In general, the BIS requirements were not viewed as a major constraint to lending. Although problem loans did lead to increased bank provisioning and decreased profits in 1992, bank profit levels had been substantially higher in the late 1980s than in the early 1980s (30 percent of after-tax income in the late 1980s versus 20 percent in the early 1980s), suggesting substantial room for banks to adjust.

Overall, the slowdown in French credit growth appears to reflect to some degree the cyclical slowdown in the French economy in conjunction with tight monetary policy. But it also appears to reflect, to a very large degree, stock adjustment to regulatory changes in the form of some natural slowing from the extremely rapid credit growth

[32] Jacolin and Odonnat (1992).

[33] *Ibid.*

[34] The BIS risk-adjusted capital adequacy ratios come in two tiers. The Tier 1 requirement states that primary capital, which includes equity, must equal at least 4 percent of a bank's risk-weighted cumulative asset level. The inability of nationalized banks to raise new equity capital may make meeting the Tier 1 requirement more difficult. (The Tier 2 requirement states that a broader definition of capital must equal 8 percent of risk-weighted cumulative assets.)

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rates that followed earlier credit market deregulation. Other important factors were adjustment to new financing opportunities (such as the opening of the commercial paper market) and more recent changes in tax and bankruptcy regulations. These adjustments have slowed credit growth, while still leaving France with a permanently higher credit/GDP ratio than it had at the beginning of the 1980s. Unlike Japan and the United Kingdom, asset price developments and bank loan problems seem to have played only a minor role in tempering French credit growth. Perhaps for these reasons, the French credit slowdown has not been as dramatic nor as troubling for underlying economic growth as have been the credit slowdowns in Japan and the United Kingdom.

II: Econometric Analysis of Recent Credit Behavior in Japan, the United Kingdom, and France

To test the conclusions suggested by the previous analysis regarding the sources of the recent credit slowdowns we conducted an econometric examination of credit behavior in Japan, the United Kingdom, and France. We paid particular attention to the fundamental versus transitory nature of the factors affecting credit growth since our regression framework lent itself naturally to this disaggregation. Our analysis used quarterly data covering 1980 through 1991.[35] Similar regressions were run with bank credit and total credit, both to the private nonfinancial sector, as dependent variables. Because the period was one of tumultuous financial market change, and because the data were not of a consistently high quality, we feel that our econometric results should be interpreted with care. We view them as providing no more than qualitative support for our earlier conclusions regarding forces behind the credit slowdowns, rather than accurate point estimates of the effects of particular contributors to the slowdowns.

Estimating Equations

Our dependent variable in each estimating equation was the quarterly growth rate of credit (represented as the change in the log of credit). We try to explain the behavior of this growth rate using a standard stock adjustment model, for which the estimating equation can be schematically represented as follows:

$$\mathbf{C}_t - \mathbf{C}_{t-1} = X_t\beta - \theta\mathbf{C}_{t-1} + \varepsilon_t \qquad (1)$$

$\mathbf{C}_t$ is the log of nominal credit outstanding; $\mathbf{X}_t$ is a matrix of variables which affect credit demand and supply other than the lagged level of credit; β represents the coefficients on the variables in X_t; and θ is the coefficient on lagged credit.

Our version of Equation (1) can be derived from simple theoretical foundations. Using bank credit for purposes of illustration, suppose that private sector demand for bank credit is determined as follows:

$$\mathbf{C}^d = \mathbf{D}\alpha^d - \mathbf{r}\gamma^d .$$

Time subscripts have been dropped for notational convenience. $\mathbf{C}^d$ represents desired bank credit of the private sector, $\mathbf{D}$ represents the factors which determine desired credit excluding the loan rate (which can be thought of as a weighted average of individual loan rates),[36] and α^d represents their coefficients. The letter $\mathbf{r}$ represents the loan rate and γ^d is its coefficient. $\mathbf{D}$ can be further broken down into $\mathbf{D}^f$ representing the funda-

[35] The period was chosen to provide maximum degrees of freedom while trying to minimize statistical difficulties associated with substantial financial deregulation in these three economies.

[36] These variables will be discussed in detail later in this section.

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mental factors such as GDP, which, when altered, have a sustained effect on the desired credit level, and $\mathbf{D}^t$ representing the transitory factors such as asset market speculation, which may temporarily raise or lower desired credit relative to its fundamental value.

Suppose further that the amount of private sector loans which the banking sector in aggregate wishes to have outstanding in any period is determined as:

$$\mathbf{C}^s = \mathbf{S}\alpha^s + \mathbf{r}\gamma^s .$$

$\mathbf{C}^s$ represents the desired supply of bank credit to the private sector, $\mathbf{S}$ represents the factors which determine it excluding the loan rate, α^s represents their coefficients, and γ^s represents the supply coefficient on $\mathbf{r}$. Again, $\mathbf{S}$ can be broken down into $\mathbf{S}^f$ representing fundamental supply determinants such as capital regulatory requirements, which, when altered, have a sustained effect on the desired supply of credit, and $\mathbf{S}^t$ representing transitory supply considerations. Changes in the Central Bank intervention rate (as distinct from the weighted average lending rate $\mathbf{r}$) could arguably be included in this latter category.[37]

The market-clearing value of credit outstanding as well as the market-clearing loan rate, $\mathbf{r}$, will be determined simultaneously as the values at which demand equals supply, and the market-clearing stock of such credit can be expressed as a function of all its non-interest-rate determinants: $\mathbf{C}^{mc} = \mathbf{C}^{mc}(\mathbf{D}^f,\mathbf{D}^t,\mathbf{S}^f,\mathbf{S}^t)$.[38] This expression can be broken into a fundamental component, $\mathbf{C}^f = \mathbf{C}^f(\mathbf{D}^f,\mathbf{S}^f)$, plus a transitory adjustment, $\mathbf{C}^t = \mathbf{C}^t(\mathbf{D}^t,\mathbf{S}^t)$, for the purpose of analyzing whether market-clearing credit changes are likely to be sustained.

Since it takes time for agents to achieve credit goals,[39] we do not assume that actual credit outstanding always equals the instantaneous market-clearing quantity. Instead we assume that any difference between the two is eliminated over time by credit growth. The assumption that credit approaches its market-clearing level over time is consistent with the standard stock adjustment model, in which current credit growth is modeled as proportional to the lagged discrepancy between market-clearing and actual credit outstanding:

$$\mathbf{C}_t - \mathbf{C}_{t-1} = \theta[\mathbf{C}^{mc}(\mathbf{D}_t,\mathbf{S}_t) - \mathbf{C}_{t-1})] + \varepsilon_t \qquad (2)$$

The speed of adjustment term, θ, measures the rate at which credit growth will close any gap between the two. At $\theta = 0.5$, 50 percent of any gap would be eliminated within one quarter. At $\theta = 0.3$, by contrast, the same 50 percent would be eliminated in two quarters.

Note that we are using a relatively simple stock adjustment representation where credit growth depends only on the difference between the lagged market-clearing level of credit and the lagged actual level of credit.[40] One implication of this specification is that, in a growing economy, market-clearing credit will generally be greater than actual

[37] The argument would be that intervention rates do not affect real long-term interest rates. See Howe and Pigott (1991-92).

[38] Explicitly, the market clearing interest rate and market clearing value of credit derived from these simultaneous equations are:

$$r^{mc} = \frac{D\alpha^d - S\alpha^s}{\gamma^d + \gamma^s}$$

$$C^{mc} = D\alpha^d\left(\frac{\gamma^s}{\gamma^s + \gamma^d}\right) + S\alpha^s\left(\frac{\gamma^d}{\gamma^s + \gamma^d}\right)$$

[39] Time is required to collect information, to coordinate the activities of many agents, and to adjust to deregulation by choosing new business strategies and establishing new markets.

[40] There are a number of alternative approaches to modeling credit growth that could have been chosen, the most salient of which is the familiar two-step approach to assessing theoretically cointegrated relationships (Engle and Granger (1987): 251-76). The stock-adjustment approach should provide the same insights as the two-step procedure, and uses fewer degrees of freedom.

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current credit in order to induce positive credit growth. A second implication is that the gap between market-clearing and actual credit declines monotonically over time. For simplicity, we have not made credit growth a function of future expectations of credit supply or demand except to the extent that they affect the underlying determinants of the current market-clearing credit level.

This specification implicitly includes two different equilibrium credit concepts: market-clearing credit and the subset of it determined by fundamental factors, which we will label the "fundamental component" of market-clearing credit. In a model without stock adjustment dynamics the former concept would be analogous to a "temporary equilibrium" and the latter would be analogous to a "long run equilibrium." The specification also assumes that the response of credit growth to gaps between market-clearing and actual credit levels does not depend on whether these gaps are due to changes in fundamental or transitory factors.

Alternative specifications could have allowed credit growth to respond differently to the two types of factors. For example, credit growth could have been treated as partly related to the gap between fundamental and actual credit levels, and partly related to transitory influences included in a second equation capturing short-run dynamics. This specification, which has only one equilibrium concept for credit, has its own set of problems, however. Distinguishing fundamental from transitory determinants of credit is often difficult, because some determinants have both sustained and transitory effects (as will be noted when these determinants are discussed in more detail below). Given this difficulty and the more general caveats we have made about the imprecision in our regression results, the simple approach of combining fundamental and transitory factors appears appropriate for our purposes. We now turn to specifying these fundamental and transitory factors.

The factors which determine credit growth include economic activity, monetary policy, asset market factors, bank capital, and regulatory changes in financial markets. As we discuss each of these factors, we will note if they are likely to have a fundamental or only a transitory effect on credit growth. This distinction between fundamental and transitory effects will, however, be only suggestive at best as certain factors will clearly have both a fundamental and a transitory component. We will not try to classify the various factors as either "supply" or "demand" since this distinction is even harder to draw for some factors.

1. **Activity variables** include GDP (or personal disposable income (PDI) for the United Kingdom) and business expectations. We expect that, in a stable economic environment, the fundamental component of credit and hence actual credit will rise roughly proportionately with GDP in the long run. When business expectations are included in addition to GDP, they are likely to capture transitory shifts in confidence, such as occurred in the United Kingdom in the mid-1980s. The coefficients on GDP and business expectations are all expected to be positive.

2. **Monetary policy** is measured here by the intervention rate of each country. This differs from the loan rate, which is not included in the regressions because it is determined endogenously. The intervention rate may be thought of as measuring the lenders' own cost of funds. This interpretation would suggest that the coefficient on the intervention rate would be negative. Alternatively, the intervention rate could be thought to be a proxy for financial market rates which move more freely than the weighted average lending rate to private nonfinancial borrowers. This interpretation would suggest that a rise in the intervention rate could be signalling a strengthening in credit demand relative to credit supply and could be positively correlated with credit growth. In either case, in keeping with economic theory we will assume that the intervention rate does not permanently affect the level of credit and will therefore classify it as a transitory factor.

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3. **Asset market variables** include house or land prices, share prices, mergers-and-acquisitions activity, and business and personal insolvencies. House or land prices are included for two reasons, both of which suggest positive coefficients on these variables. First, real estate prices affect wealth and, hence, agents' ability to take on additional debt. Second, they affect the size of a loan required to purchase a given piece of real estate. A sustained change in house or land prices is likely to have a permanent effect on the level of credit for both reasons and, hence, will be categorized as a fundamental influence. Stock prices affect wealth but, since they also affect corporations' interest in credit relative to equity as a source of capital (higher share prices reduce the relative cost of equity), the coefficient on this variable could theoretically be either positive or negative. In either event, a sustained change in stock prices is also likely to have a permanent effect on credit and will be categorized as an fundamental influence.

Our regressions include not just the level but recent percent changes in asset prices. Asset price *changes* are intended to capture the effect of reportedly heavy speculative activity in some countries in the late 1980s. Speculative activity should be strongly affected by expected asset price appreciation. Since evidence exists suggesting that expectations are determined to a substantial degree in a backward-looking manner,[41] we have included past price changes in our list of regressors. If individuals expected rises in prices to be followed by further rises, the coefficient on this variable would be positive. If individuals expected prices to return to some central value, then the coefficient on this variable would be negative. Because we have defined the fundamental component of credit as not being affected by speculative asset market behavior, the asset price change variables will be listed as transitory credit factors.

Mergers and acquisitions activity in the United Kingdom is included for obvious reasons and is expected to have a positive sign. We also included business and personal insolvencies, expecting them to have a negative sign since they would reduce lenders' interest in extending credit to the private sector relative to the public sector. They would also, presumably, reduce loan demand. These variables are mentioned here, rather than under the "economic activity" subheading, since econometric evidence indicates that developments in these variables during the past few years have been more closely related to asset price changes than to economic activity (although not perfectly correlated with either). In this sense, these variables may be categorized as transitory credit factors. However, since they do reflect to some extent normal economic activity, the component of their movement correlated to GDP growth may be separated and classified as an fundamental factor.

4. **Bank capital**, measured as the log of Tier 1 capital wherever possible, was included in several forms. Most simply, the level of bank capital was entered. We expect this variable to have a positive coefficient, assuming that the higher the level of bank capital, the greater would be the willingness of banks to lend. Also included in the regressions is a variable measuring the growth rate of bank capital. We postulate that bank lending may be positively related to the growth in bank capital because this growth may be positively associated with banks' expectated future capital levels.[42]

[41] For inflation expectations, see Figlewski and Wachtel (1981): 1-10 and references listed therein. For exchange rate expectations, see Frankel and Froot (1987), 133-53.

[42] The growth rate of bank capital may also be positively associated with our dependent variable, credit growth, for reasons outside of the stock adjustment framework. If bank capital is a strictly binding constraint, then credit growth may be strictly determined by bank capital growth rather than the gap between equilibrium and actual credit. A switching regression would be the ideal framework to capture periods when bank capital was a binding constraint, but data limitations prohibit its use.

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We expect that the relationship between bank capital and banks' willingness to lend would have changed with the introduction of the BIS risk-adjusted capital requirements in 1988. Theoretically, any change in the banks' supply function (Equation (3)) in response to the BIS requirements could change all the coefficients in our estimating equation and by using dummy variables we could estimate these changes. To conserve degrees of freedom we allow only the constant term and the coefficient on variables explicitly related to bank capital to change, effective in 1988-II. Since the BIS capital ratios were announced some banks have become very sensitive to these levels, for which reason we expect a positive coefficient on the slope dummy for bank capital and a negative coefficient on the intercept dummy.[43] We expect that the dummy on bank capital growth post-BIS-announcement to have a positive sign. Since they permanently affect the supply of credit, all bank capital related variables are assumed to be fundamental factors.

5. **Financial market deregulation and innovation** occurred in all of our focus countries throughout the sample period, as discussed earlier. In theory this could affect the coefficients on all our variables and could introduce kinks and other nonlinearities, but we have insufficient data to capture these with any precision. Further, the frequency of such regulatory shifts means that the associated adjustments can not be isolated. For example, the effects of regulatory shifts after 1987 are unavoidably captured to some extent by the "BIS Dummies."

Despite these difficulties we attempt to capture some of the consequences of deregulation in two ways. First, we use the stock adjustment framework, which (as mentioned above) assumes that credit takes time to reach its market-clearing level, and that the adjustment is proportional to the size of the difference between the two. This econometric specification allows credit growth to be a function of the gap between market-clearing and actual levels, a gap which may be due to deregulation as well as to other factors. Note, however, that the stock adjustment framework does not capture periods of quantitative credit control very satisfactorily, since during these periods actual credit growth is inhibited from adjusting toward market-clearing levels. For Japan and the United Kingdom, this problem is not important since our regression periods start after the end of quantitative credit controls. For France, regression results during the early 1980s, when the *encadrement* was still in place, are more difficult to interpret.

Our second approach to capturing the effects of deregulation is to include some carefully chosen proxies and dummy variables. As a proxy for the effects of deregulation on mortgage markets we have included in each regression the mortgage interest spread, which is the difference between rates on mortgage loans and rates on government securities of comparable maturity. The reasons why these spreads have been affected by deregulation as well as by other factors have been discussed in the earlier country sections.[44]

In addition to mortgage spreads we have been able to capture some of the effects of the end of the *encadrement* and other financial deregulation in France by including dummies beginning in 1985-I and 1988-II. These will be discussed in detail when we present the regression results for France. Overall, we treat the deregulation proxy variables as permanently affecting credit levels, with the caveat that these variables are par-

[43] If the BIS ratio made bank capital a greater consideration, any given level of bank capital would support a lower level of credit supply (our negative constant dummy), but changes in bank capital would have a greater impact on credit growth as measured by a positive sign on this slope dummy.

[44] Corporate spreads (that is the spread of corporate lending rates over government securities of comparable maturity) were subject to multiple influences, such as increasing competition from bond markets, that make them less meaningful as a measure of deregulation.

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ticularly likely to pick up the influence of other, transitory, factors affecting credit growth.

Using these variables explicitly in Equation (2) leads to the following regression equation:

$$\mathbf{C}_t - \mathbf{C}_{t-1} = \alpha_0 + \alpha_1 \mathbf{GDP}_{t-1} + \alpha_2 \mathbf{BusExp}_{t-1} + \ldots - \theta \mathbf{C}_{t-1} + \varepsilon_t . \qquad (3)$$

The effect of any variable on market-clearing credit is measured as the ratio α_i/θ. The initial regressions for each country included most of the variables we have just discussed. Variables which were insignificant by standard criteria were then systematically excluded. Occasionally a variable was allowed to remain despite statistical insignificance if we had strong reason to believe it was important. For example, when a variable's impact was significant in the bank credit regression but was not precisely measured in the total credit regression, we included the variable in both regressions. Likewise, if a variable's statistically measured effect on credit was inconsistent with any theory and that variable did not strongly affect overall explanatory power we excluded it.

The list of final right-hand-side variables is reported below in Table 4. A subset of these variables is used for each individual country's regressions. Many of the right-hand-side variables, such as GDP and business failures, are determined simultaneously with credit. To accommodate this, all right-hand-side variables were lagged at least one period with the exception of the already-lagged level of credit.

Results

The regression results for each country are reported separately below. Before turning to their individual analysis, let us first note how the regressions did overall. The explanatory power of these regressions was consistently high, especially in light of the fact that the dependent variables are measured as quarterly percent changes. Other performance measures for these regressions were also quite strong: there seems to be little remaining correlation in the residuals, and the signs on most coefficients were consistent with those indicated above. The R^2s for the total credit regressions generally exceeded those for the bank credit regressions, which is not surprising since the substitutability between bank loans and alternative forms of credit would make bank credit growth harder to estimate than total credit growth.

The estimated speeds of adjustment are encouraging for a number of reasons. First, they have the right sign and they are all well below unity in absolute value, supporting the stock adjustment formulation chosen here. The sizes of these variables are also quite plausible. With the exception of the very low speed of adjustment for Japanese bank credit, estimated speeds of adjustment range from 20 percent to 45 percent per quarter, implying that discrepancies between equilibrium and actual credit have half-lives of at most three quarters. The strong significance of these coefficients indicates that credit is cointegrated with the regressors, which has the reassuring implication that actual credit is always subject to forces bringing it back towards its market-clearing level.

Despite these encouraging results, the econometric findings should be interpreted with care due to the difficulties inherent in modeling credit growth during a relatively brief period characterized by major financial market changes. In particular, although some estimated coefficients do not change significantly if other variables are added or subtracted or if the time period of the regressions is slightly changed, estimated coefficients on other variables do shift significantly. Moreover, given the short period under consideration, the regressions themselves do cover the credit slowdown period in question, and thus provide only in-sample analysis. They do not claim out-of-sample reliability.

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Before going into a country-by-country discussion of the regression results, it is useful to consider how we may use the regressions to apportion responsibility for the recent credit slowdowns in each country to (i) the stock adjustment effect, (ii) changes in the factors which have a sustained effect on market-clearing credit ("fundamental factors"), and (iii) changes in the factors which have only a transitory effect on market-clearing

Table 4:

Name	Variable
GDP:	Log of Nominal GDP
PDI:	Log of Nominal Personal Disposable Income (used only for U.K. regressions)
BusExp:	Business Expectations
BusFail:	Business Failures
PHous:	Log of House Prices (used in U.K. and France Regressions)
PLand:	Log of Land Prices (used in Japan regressions)
ChLand:	Change in Log of Land Prices
StkMkt:	Log of Stock Market Prices
ChStkMkt:	Change in Log of Stock prices
IntvRate:	Official Intervention Rate
MSprd:	Mortgage Spread Relative to Government Securities
M&A:	Mergers and Acquisitions Activity
BkCap:	Log of Bank Capital
IntDum:	Intercept Dummy for BIS Announcement, begins 1988-II
LDum:	Dummy for Level of Bank Capital, begins 1988-II
ChDum:	Dummy for Growth in Bank Capital, begins 1988-II
TCred:	Log of Nominal Total Credit Outstanding to the Private Nonfinancial Sector
BCred:	Log of Nominal Bank Credit Outstanding to the Private Nonfinancial Sector
DeregDum:	Intercept Dummy for End of Encadrement in France, begins 1985-I
GDP1:	Dummy for log GDP in France, begins 1985-1
IntvRate1:	Dummy for the intervention rate in France, begins 1985-1
PHous1:	Dummy for the log of house prices in France, begins 1985-1
GDP2:	Dummy for log GDP in France, begins 1988-II
TCred1:	Dummy for TCred in France beginning in 1985-I
TCred2:	Dummy for TCred in France beginning in 1988-II
BCred2:	Dummy for BCred in France beginning in 1988-II

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credit ("transitory factors"). In order to do this apportionment, it is necessary first to specify what credit path would be implied by "unchanged" fundamental factors. Note that since we are attempting to explain the slowdown in credit from the quarter of peak credit growth, we need to look at the change in fundamental factors from the course they were taking leading up to the period of peak credit growth. Though specification is by necessity somewhat arbitrary, a reasonable assumption would be that credit would have remained on an unchanged "fundamental" path, relative to that it took leading up to the quarter of peak credit growth, if its fundamental factors continued to grow in recent quarters at the same average rate they had been growing during the eight quarters prior to the quarter of peak credit growth.[45]

The impact of changes in transitory factors on credit growth can be handled in a comparable fashion. That is, deviations from the eight quarter path followed by these factors leading up to the quarter of peak credit growth may be interpreted as changes in transitory conditions. Given that the conditions are transitory by definition, changes in them are not unexpected. However, since the natural process of change in transitory conditions does affect actual credit growth, documenting the change in this fashion allows for a quantitative assessment of its impact on actual credit growth rates.

The portion of the slowdown in actual credit growth that remains after accounting for the impact of changed fundamental and transitory factors may then be charged to stock adjustment effects.[46] Note that this methodology is based on a direct, narrow definition of stock adjustment. Some of the change in the paths of fundamental factors or transitory factors could actually reflect a stock adjustment effect working through asset price changes. That is, part of the rise in asset prices in the three countries may be attributed to credit deregulation. Some slowing in this component of asset price growth, which by our methodology would show up as a change in the fundamental credit growth path or in transitory asset price dynamics, would naturally occur as asset markets finished adjusting to credit deregulation.

The country discussions below will evaluate the contributions of various factors to the recent credit slowdown following this framework. We reserve a full examination of the consequences of the BIS announcement on each country's credit developments for a final subsection.

Japan: Table 5 shows the regressions for total and bank credit growth in Japan. Overall, the regressions track the quarterly growth rates quite well, explaining most of the variance in both total and bank credit growth. The coefficients on the regressors are generally of reasonable magnitude, when significant, and of the expected sign, supporting our earlier analysis. However, since these are in-sample results, and insufficient data were available for out-of-sample tests, we reiterate our earlier caution that these results should be considered indicative rather than definitive.

How does this model account for the slowdown in credit growth since 1990-I? As indicated at the top of Table 6, the growth rate of total credit slid from a peak of 4.3 per-

[45] A period of eight quarters is chosen to smooth any anomalous one quarter fluctuation in the credit determinants.

[46] The regression results make it a straightforward exercise to estimate what "actual" credit growth would be at the end of the period if all the underlying fundamental and transitory factors had grown in recent quarters at their average rate during the eight quarters leading up to the quarter of peak credit growth. The difference between this estimated "actual" credit growth accompanying unchanged fundamental and transitory credit paths and the estimated actual credit growth at the end of the period based on the estimated changed fundamental and transitory credit paths that occurred can then be attributed to changes in fundamental and transitory credit conditions.

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cent (quarterly) in 1990-I to just 1.3 percent by 1991-IV. At corresponding annual rates this represents a drop of 13.2 percentage points, from 18.3 percent to 5.1 percent. Our regression results would have predicted a decline of 2.3 percentage points in the quarterly rate, or about 80 percent of the actual decline. The predicted decline in bank credit growth, 1.6 percent at quarterly rates, falls more notably short of the actual decline of 2.4 percent. This predicted shortfall could well be the result of widely known but immeasurable factors such as a reaction to unrecognized losses on banks' property loans.[47] We are also calculating the slowdown in credit from 1990-I, the quarter of peak credit growth; chance timing factors may have made credit growth unusually strong in that quarter.

Chart 10 plots the levels of actual credit (dashed line) along with our estimated value of market-clearing total credit (solid line) and of the fundamental component of market-clearing credit (dot-dashed line). The difference between these latter two is, of course, the consequences of changes in transitory factors.

The bottom two thirds of Table 6 disaggregate the total and bank credit slowdowns into the three components described earlier: (i) the stock adjustment effect, (ii) changes in fundamental factors, and (iii) changes in transitory factors. The table shows the estimated proportionate contribution of individual factors, along with the proportionate contribution of all fundamental factors in aggregate and of all transitory factors in aggregate. For the following discussion of these contributions, we stress again that "tran-

[47] Quantitative restrictions on real estate lending, not captured in the regressions, may also have contributed to the recent slowdown in credit growth, but are generally considered to have been non-binding in 1992-I.

Table 5: Regression Results for Japan

Change in Total Credit =	
+ 0.193 GDP_{t-1}	(3.25)
- 0.001 $IntvRate_{t-1}$	(-2.08)
- 0.007 $BusFail_{t-1}$	(-3.88)
+ 0.067 $PLand_{t-1}$	(2.55)
+ 0.099 $ChLand_{t-1}$	(2.96)
+ 0.022 $ChStkMkt_{t-1}$	(3.27)
+ 0.004 $MSprd_{t-1}$	(1.57)
+ 0.020 $BkCap_{t-1}$	(2.29)
- 0.003 $IntDum_{t-1}$	(-2.70)
+ 0.068 $ChDum_{t-1}$	(4.52)
- 0.196 $TCred_{t-1}$	(-3.13)
1981-I to 1991-IV	
$R^2 = 0.76$ $Rbar^2 = 0.69$	
Q(11) = 9.05 Sig of Q = 0.62	

Change in Bank Credit =	
+ 0.0474 GDP_{t-1}	(3.02)
+ 6.667e-5 $BusExp_{t-1}$	(2.64)
- 0.005 $StkMkt_{t-1}$	(-2.15)
+ 0.230 $ChLand_{t-1}$	(5.61)
+ 0.014 $ChStkMkt_{t-1}$	(1.47)
+ 0.002 $MSprd_{t-2}$	(4.21)
- 0.006 $IntDum_{t-1}$	(-3.34)
+ 0.069 $ChDum_{t-1}$	(3.80)
- 0.041 $BCred_{t-1}$	(-2.71)
1981-I to 1992-II	
$R^2 = 0.64$ $Rbar^2 = 0.56$	
Q(12) = 17.235 Sig of Q = 0.14	

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sitory" and "fundamental" factors cannot always be clearly distinguished in the data, and the results should be interpreted with caution.

Stock Adjustment: The stock adjustment effect is estimated to account for only a trivial portion (4 percent) of the total credit slowdown. The estimated contribution of this effect to the bank credit slowdown, about one-third, is more substantial. This is consistent with our earlier analysis which stressed the importance of the elimination of credit guidelines and other constraints on bank lending. The visual counterpart of this analysis can be seen in Chart 10 where the gap between the fundamental component of market-clearing credit and actual credit begins at a relatively high level and continues to grow rapidly during the very early 1980s, the period of most intense bank deregulation. Thereafter this gap narrows, as the adjustment to deregulation takes place. The narrowing of this gap by itself would have slowed the growth of credit quite naturally during the late 1980s, if transitory factors had not begun to have great importance at that same time.

The Fundamental Component of Market-Clearing Credit: Factors whose influence on credit is likely to be sustained are estimated to account, in aggregate, for about one-third of the total credit slowdown and roughly one-sixth of the bank credit slowdown in

Table 6: Decomposition of the Credit Slowdown in Japan

	Total Credit Growth (In Percent)	**Bank Credit Growth (In Percent)**
Peak quarterly credit growth: 1990-I	4.30 (18.3 annualized rate)	2.64 (11.0 annualized rate)
End of sample quarterly credit growth (1991-IV Total; 1992-I, Bank)	1.26 (5.1 annualized rate)	0.27 (1.1 annualized rate)
Actual decline	-3.04	-2.38
Estimated decline	-2.27	-1.55
Proportion of decline attributable to:	**(In Percent)**	**(In Percent)**
Stock adjustment effect	**-4**	**-34**
Effects of fundamental factors of which:	**-36**	**-16**
GDP	-11	-4
Land or stock price levels	-3 (Land)	-20 (Stock)
Bank capital	-21	-31
Effects of transitory factors of which:	**-60**	**-50**
Land price changes	-9	-37
Stock price changes	-7	-2
Business failures (transitory component)	-45	–
Business expectations	–	-10
Intervention rate	-3	–

Note: The contributions of some regressors are not listed. The omitted contributions to the credit slowdown are all below 5 percent.

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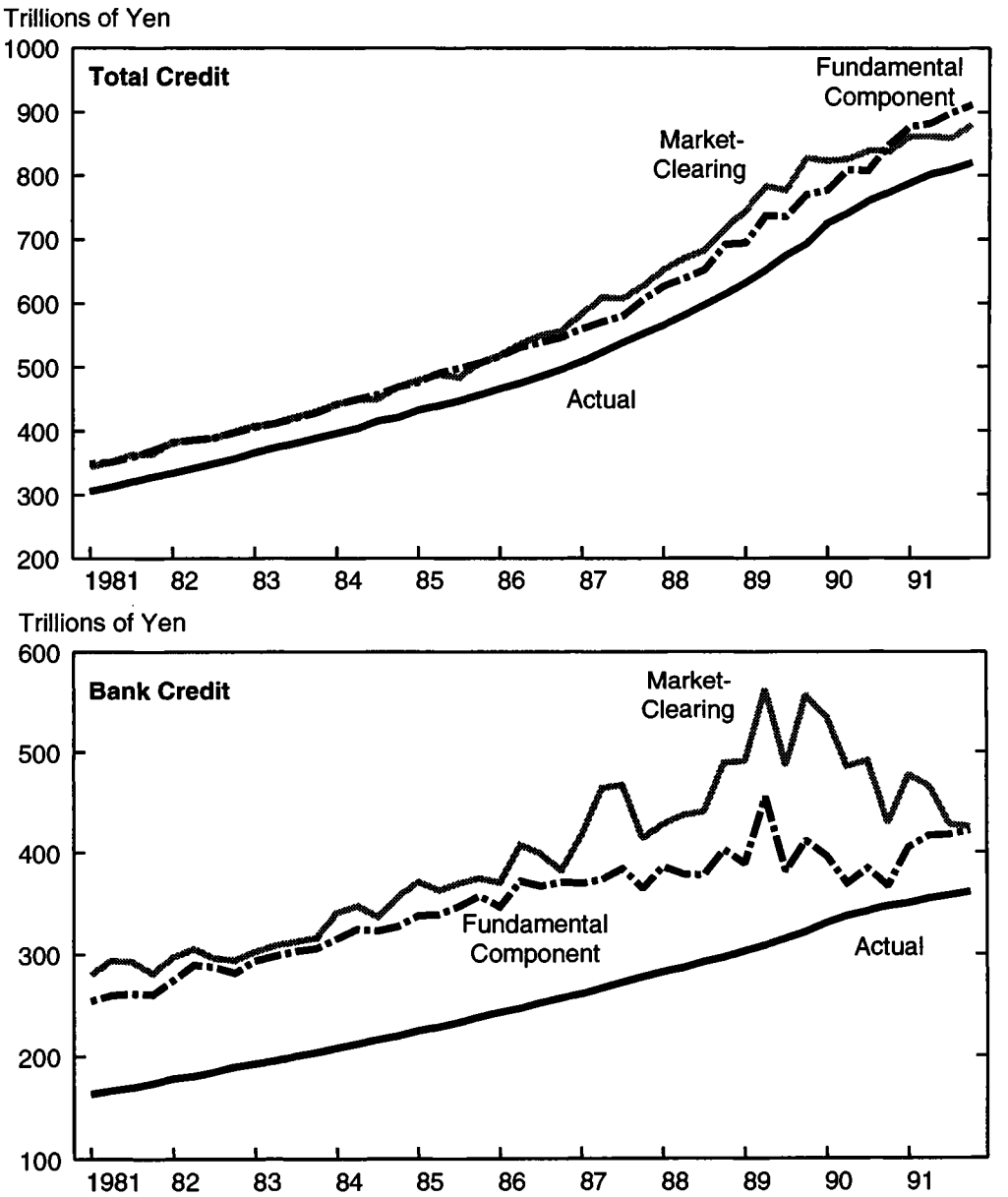
Japan. Within this category, slowing growth in nominal GDP was generally of modest importance, accounting for about one tenth of the total credit slowdown and one twentieth of the bank credit slowdown. The contribution of increased attention to bank capital growth following the announcement of the BIS standards was, predictably, stronger for the slowdown in bank credit than the slowdown in total credit. It is interesting to note, however, that in both cases the contribution is estimated to exceed the contribution of slowing GDP growth.

Stock price developments appear to have played a significant role in the recent evolution of bank credit. The overall decline in the level of the stock market between 1990 and 1991 seems to have directly supported bank credit growth by encouraging firms to substitute bank loan finance for equity funds or bond funds tied to equity markets. This

Chart 10: Japan



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substitution toward bank credit is estimated to have prevented the slowdown in bank credit growth from being 20 percent larger. The net effect of stock price changes on bank credit, however, is ambiguous since falling stock prices indirectly played a role in determining the level of bank capital and the consequent negative effect of bank capital on credit. Other fundamental factors are estimated to have had only a negligible effect on credit growth.

The Transitory Component of Market-Clearing Credit: The importance of factors whose influence on credit is likely to be transitory, such as speculative activity and monetary policy, grew substantially in the late 1980s and dissipated in the early 1990s. In aggregate these factors are estimated to account for half or more of the credit slowdown in Japan. The variables intended to capture speculative activity—land price changes, stock price changes, and the transitory component of business failures[48]—themselves account for about half of the total credit slowdown and almost 40 percent of the bank credit slowdown. As such, speculative factors appear to have been the strongest single force behind the slowdown in Japanese credit growth. Worsening business expectations and tighter monetary policy also had small transitory effects on credit growth.

Summary: Overall, the Japanese regression results generally support our earlier conclusions about the causes of the Japanese credit slowdown. Declining asset prices and associated bankruptcies are estimated to have been extremely important to the slowdown. Indeed, transitory asset market dynamics appear to have greatly aggravated a more muted underlying credit deceleration. Bank capital developments are also estimated to have played a significant role in the Japanese credit slowdown. Deteriorating economic conditions, by contrast, are estimated to have been of secondary importance.

The United Kingdom: The U.K. regressions, shown in Table 7, also appear to fit the data well. The U.K. regressions differ most notably from those for Japan and France in two dimensions. First, the value of mergers and acquisitions activity is included based on its importance, as suggested by our analysis in Section II. Second, personal disposable income (PDI) was chosen as an activity variable, since it consistently outperformed GDP in our regressions. We believe this superior performance is related to the fact that PDI partially screens out the erratic effects of the oil sector.

Once again the equations have fairly high explanatory power. The speeds of adjustment are both over 20 percent per quarter, indicating that most adjustment of actual credit to changes in market-clearing credit takes place in less than three quarters. Most of the coefficients have the sign predicted by our earlier analysis.[49] Looking more closely at the individual coefficients, however, it becomes immediately apparent that *total* credit responds to personal disposable income with a unit elasticity over the long run, but *bank* credit's response is negligible. This asymmetry presumably reflects the fact that during most of our sample period the commercial banking industry was adjusting to the end of the corset and the newly competitive environment for banking. This also underlines our

[48] The "transitory" component was taken as the portion of business failures not predicted by a simple regression of business failures on lagged GDP.

[49] Taken at face value the dummy variables intended to capture the effects of the BIS announcement of new capital adequacy standards present a puzzle. The coefficient on the intercept dummy in the total credit regression is positive while the corresponding dummy in the bank credit regression is negative. Since it seems unlikely that regulations directly aimed at affecting banks would have a distinctly different effect on credit in aggregate, the dummies must be capturing some other factor, in addition to the BIS announcement. This additional factor affecting total credit is likely to be the 1986 inception of the U.K. commercial paper market, which grew rapidly during its first few years. In addition to spurring growth in total credit this market may have taken business away from the banking sector.

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commitment to viewing the results as providing a general indication of whether or not our earlier analysis was on target, rather than as providing point values for various elasticities or for the contribution of individual factors to the credit slowdown.

Table 8 shows that predicted declines in U.K. credit growth are fairly close to the actual declines from the quarter of peak credit growth, 1988-II, to 1991-IV. Total credit growth actually declined 6.3 percent while the regression results predicted a 6.7 percent decline. Bank credit growth declined 8.9 percent while the regression findings predicted a decline of 9.8 percent.

Chart 11 provides a graphical depiction of the growth in actual, market-clearing, and fundamental credit during the slowdown period, and Table 8 shows the contribution of the stock adjustment, fundamental, and transitory factors.

Stock Adjustment: The estimated slowdown of growth in market-clearing total credit generated by a slowdown in both fundamental and transitory factors was much less pronounced than the estimated slowdown of growth in market-clearing bank credit generated by these factors. Consequently, more of the slowdown in actual total credit growth must be attributable to the stock adjustment effect. Indeed, Table 8 shows that the stock adjustment effect is measured to have accounted for roughly 30 percent of the total credit slowdown but virtually none of the bank credit slowdown.

The Fundamental Component of Market-Clearing Credit: Our estimates indicate that land price deflation was by far the strongest force behind both the U.K. bank and total credit slowdowns. This deflation is estimated to account for roughly three-quarters

Table 7: Regression Results for the United Kingdom

Change in Total Credit =		Change in Bank Credit =	
- 1.813	(-6.12)	-0.819	(-1.50)
+ 0.273 PDI_{t-1}	(5.4)	+ 0.026 PDI_{t-1}	(0.33)
+ 1.30e-4 $BusExp_{t-4}$	(2.70)	+ 1.21e-4 $BusExp_{t-4}$	(1.80)
- 0.016 $PerInsol_{t-1}$	(-1.74)	- 0.018$PerInsol_{t-1}$	(-3.30)
+ 0.182 $PHous_{t-1}$	(5.91)	+ 0.318 $PHous_{t-1}$	(11.18)
- 0.027 $StkMkt_{t-1}$	(-2.68)	- 0.037 $StkMkt_{t-1}$	(-2.61)
+ 0.003 $M\&A_{t-1}$	(1.87)	+ 0.006 $M\&A_{t-1}$	(1.75)
+ 0.001 $Msprd_{t-1}$	(1.22)	+ 0.003 $Msprd_{t-1}$	(2.28)
+ 0.056 $BkCap_{t-1}$	(2.08)	--	
+ 0.733 $IntDum_{t-1}$	(4.40)	- 0.561 $IntDum_{t-1}$	(-4.03)
- 0.68 $LDum_{t-1}$	(-4.42)	+ 0.049 $LDum_{t-1}$	(3.96)
- 0.274 $TCred_{t-1}$	(-4.72)	-0.211 $BCred_{t-1}$	(-6.04)
1982-I to 1991-IV		1982-I to 1992-I	
$R^2 = 0.85$ $Rbar^2 = 0.78$		$R^2 = 0.76$ $Rbar^2 = 0.68$	
Q(11) = 7.89 Sig of Q = 0.64		Q(12) = 11.99 Sig of Q = 0.29	

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of the slowdown in bank credit growth and half of the slowdown in total credit growth. Given the large contribution mortgage credit growth made to bank and total credit growth during the credit surge, it is not surprising that real estate developments played an important role in the credit growth deceleration. The land price variable, in fact, is estimated to have had the strongest single effect on the credit slowdown in this country.

Nominal personal disposable income (PDI), the economic activity variable for the United Kingdom, does not seem to have been particularly important for the credit slowdown. This does not mean, however, that the slowdown in *real* economic growth had little effect on real credit growth, since any effects on real credit growth of the onset of recession would have been masked by a simultaneous acceleration of inflation.

The bank capital variables indicate that bank capital developments had a slight effect on the bank credit slowdown and virtually no effect on the total credit slowdown. This supports the Bank of England's view that U.K. banks are well capitalized and have not substantially slowed their lending for capital-related reasons.[50]

The Transitory Component of Market-Clearing Credit: Our estimates indicate that

[50] Bank of England (1991): 256-259.

Table 8: Decomposition of the Credit Slowdown in the United Kingdom

	Total Credit Growth (In Percent)	**Bank Credit Growth (In Percent)**
Peak quarterly credit growth: 1988-II	7.10 (31.6 annualized rate)	8.32 (37.7 annualized rate)
End of sample quarterly credit growth (1991-IV)	0.78 (3.2 annualized rate)	-0.62 (-2.5 annualized rate)
Actual decline	-6.33	-8.95
Estimated decline	-6.69	-9.79
Proportion of decline attributable to:	**(In Percent)**	**(In Percent)**
Stock adjustment effect	**-28**	**-1**
Effects of fundamental factors of which:	**-52**	**-74**
PDI	-3	0
Land or stock price levels	-50	-72
Bank capital	+2	-4
Effects of transitory factors of which:	**-20**	**-23**
Personal insolvencies (transitory component)	-10	-9
Mergers and acquisitions (transitory component)	-5	-10
Business expectations	-5	-4

Note: The contributions of some regressors are not listed. The omitted contributions to the credit slowdown are all below 5 percent.

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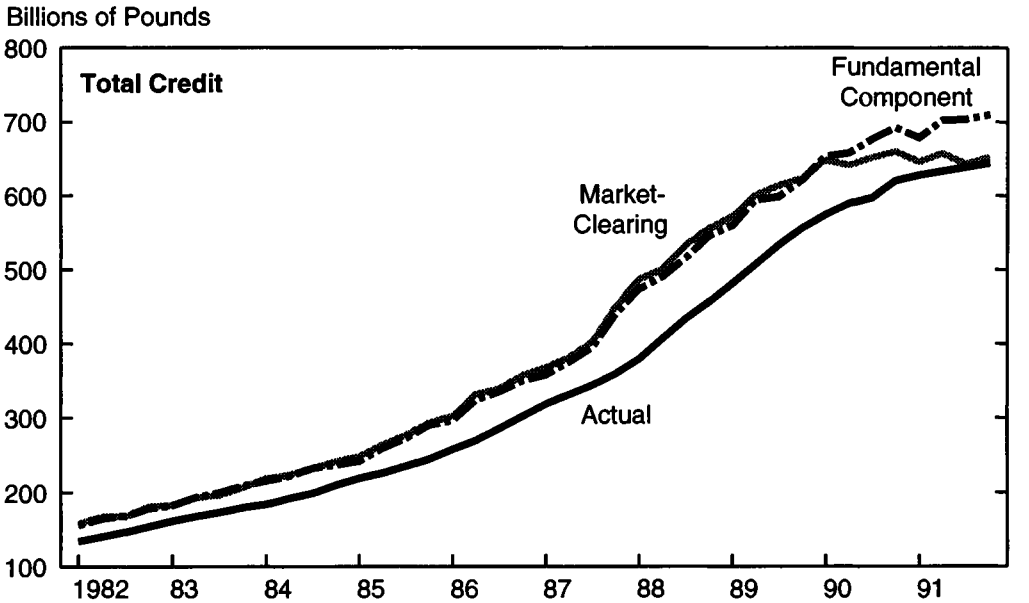
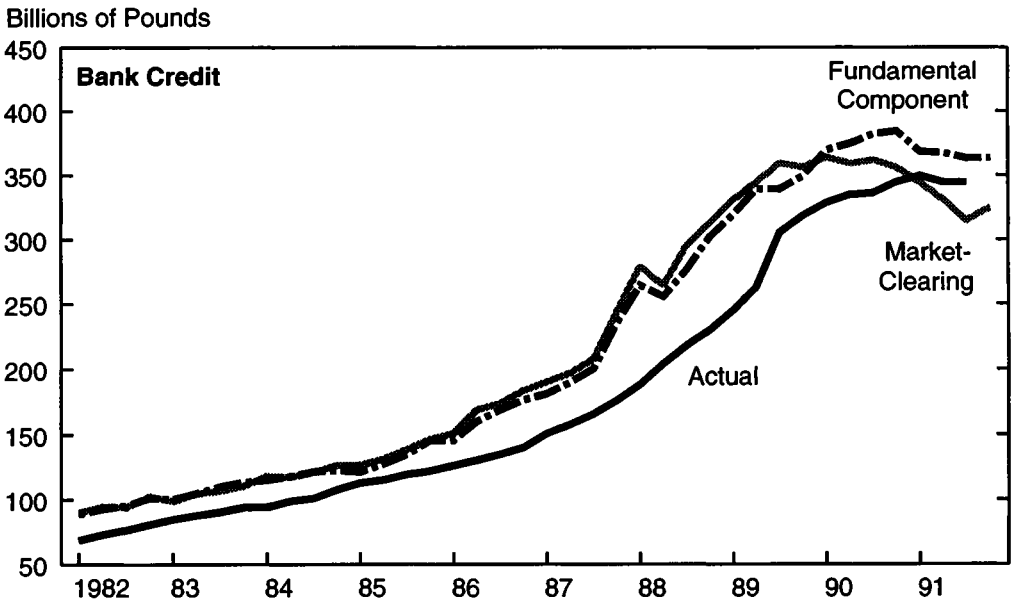
the contribution of transitory factors to the U.K. credit slowdown was quite small compared with their contribution to the Japanese credit slowdown. Nonetheless, the roughly 10 percent contribution of the transitory component of personal insolvencies to both the total and the bank credit slowdowns is notable. Declining mergers and acquisitions activity and business expectations also played a minor but significant transitory role in the U.K. credit slowdown.

Summary: In sum, the U.K. regression results generally agree with our earlier analysis of the U.K. credit slowdown. Mortgage developments played a predominant role in the slowdown. The stock adjustment effect and transitory factors were present but neither was particularly strong. Weakened economic conditions and bank capital developments made only minor contributions to the U.K. credit slowdown.

Chart 11: United Kingdom





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France: Table 9 shows our stock adjustment regressions for credit growth in France. These regressions were the most challenging of the set, since the end of the *encadrement* took place in 1985-87, the middle of our sample period. It is unsurprising, therefore, that there were some disappointments in the results, such as the marginally significant Q-statistic in the total credit regression.[51]

Overall, however, the results were surprisingly good. The regressions' overall "fit" are more than respectable: they appear to capture over 80 percent of the changes in credit growth rates during the sample period. Most of the coefficients are of the expected

[51] This statistic is the sum of (adjusted values of) the correlations between the first eleven lags of the residuals. That this sum is statistically "high" indicates that we may not have fully captured the dynamics of aggregate credit's response to variables such as GDP and house prices. The point estimates are likely to be unbiased and efficient, nonetheless.

Table 9: Regression Results for France

Change in Total Credit =		Change in Bank Credit =	
-0.420	(-1.06)	-0.939	(-3.37)
+ 0.220 GDP_{t-1}	(3.74)	+ 0.157 GDP_{t-1}	(3.91)
+ 0.685e-3 $IntvRate_{t-1}$	(2.30)	+ 1.765e-3 $IntvRate_{t-1}$	(3.14)
+ 0.087 $BankCap_{t-1}$	(5.71)	+ 0.004 $MSprd_{t-1}$	(1.81)
+ 1.503 DeregDum	(2.92)		
-0.312 $GDP1_{t-1}$	(-4.59)	- 0.195 $GDP1_{t-1}$	(-12.07)
+ 3.758e-3 $IntvRate1_{t-1}$	(5.42)	+ 9.055e-3 $IntvRate1_{t-1}$	(6.86)
+ 0.066 $PHous1_{t-1}$	(7.18)	+ 0.289 $PHous1_{t-1}$	(12.24)
+ 0.427 $GDP2_{t-1}$	(3.12)	+ 0.291 $GDP2_{t-1}$	(2.93)
+ 0.073 $ChDum_{t-1}$	(2.19)	+ 0.103 $ChDum_{t-1}$	(7.48)
- 3.708 $IntDum_{t-1}$	(-2.56)	- 2.127 $IntDum_{t-1}$	(-1.88)
- 0.110 $LDum_{t-1}$	(-2.13)		
-0.385 $TCred_{t-1}$	(-6.02)	- 0.180 $BCred_{t-1}$	(-4.39)
+ 0.273 $TCred1_{t-1}$	(-4.65)		
- 0.199 $TCred2_{t-1}$	(-5.53)	- 0.271 $BCred2_{t-1}$	(-5.24)
1980-III - 1991-III		1980-III - 1992-I	
$R^2 = 0.81$ $Rbar^2 = 0.72$		$R^2 = 0.86$ $Rbar^2 = 0.81$	
D.W. = 2.99 Q(11) = 20.94 Sig of Q = 0.04		D.W. = 2.48 Q(12) = 12.98 Sig of Q = 0.29	

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sign and reasonable magnitude, and the speeds of adjustment are plausible.[52] Lagged asset price changes are not significant, supporting our earlier conclusion that speculative demand for credit was not a major factor behind French credit developments in the 1980s. Despite these successes, we stress that the results, especially those for total credit, should be interpreted with great care.

To deal with French deregulation during the 1980s, it seemed appropriate to allow credit behavior to vary over time by including dummy constant and slope variables for a number of the regressors. The deregulation was quite protracted, so we allowed the responses of credit to its major determinants to change at two points, first in 1985-I and then around the time of the BIS announcement, in 1988-II.[53] The results are largely consistent across the two forms of credit and generally conformed to our expectations, with the exception of those for the 1985-87 period. Since the 1985-87 period was one of tumultuous changes in the French financial structure, this difficulty is not surprising and we will not try to draw quantitative inferences about the importance of various factors during this period. Our more general caution regarding the interpretation of the regression results stems in part from the fact that they are not robust to changes in the choice of which regressors are included with dummies and which years the dummies are introduced.[54]

The deregulation dummies tell a story regarding the consequences of deregulation that is largely consistent with our earlier, more impressionistic analysis. Comparing the behavior of credit in the prederegulation period, up until 1985, and the post deregulation period, after 1987, indicates that after deregulation credit was more sensitive to most of its determinants. House prices, which are estimated to have had no significant effect on credit prior to deregulation, had an estimated bank credit elasticity of 0.64 and total credit elasticity of 0.21 afterwards. The estimated long run elasticity of total credit with respect to GDP also rose substantially. The estimated long-run elasticity of bank credit with respect to GDP actually declined, however. This decline may reflect reduced government control of bank credit growth (earlier government control had aimed to keep bank credit growth in line with GDP growth).

The positive sign and strong significance of bank capital growth after 1988-II for both total and bank credit growth would seem to challenge our earlier statement that bank capital considerations played little role in determining French credit growth. The significance of the bank capital variables in the post 1987 period may be due to Tier 1 capital constraints faced by state-owned French banks which could not issue equity.

Table 10 shows the predicted decline of French credit growth rates between 1989-II, the peak of the economic cycle, and the end of our sample period. The implied declines in bank and total credit growth rates are once again fairly close to the actual declines. This is very encouraging in view of the many regulatory shifts during this period.

Stock Adjustment: Chart 12 shows the levels of actual credit, market-clearing credit, and the fundamental component of market-clearing credit in France during our sample period.[55] Due to credit controls, the market-clearing credit levels are not well estimated

[52] For these regressions we excluded the business expectations variable, despite its significance, since it seemed unacceptably collinear with GDP.

[53] Since the deregulation dummies use so many degrees of freedom, we did not include additional dummy variables to capture the effects of tax changes.

[54] We tried systematically to exclude dummies on variables which seemed least important for the determination of credit, as a method of husbanding our few degrees of freedom.

[55] We have adjusted the equilibrium credit values in 1985-I and 1988-II to eliminate discontinuities in this level series arising from dummy shifts in the estimated speed of adjustment.

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prior to 1985. Growth in estimated market-clearing credit began to surge around 1986-III, and continued at a very rapid pace through 1989. Though this growth brought with it a rapid increase in actual credit, the gap between estimated market-clearing credit and actual credit remained large. In light of this it is not surprising that the stock adjustment of French credit to the mid-1980s deregulation is estimated to have accounted for almost half of the slowdown in bank credit growth and a third of the slowdown in total credit growth, as shown on the middle rows of Table 10. These stock adjustment shares are larger than the corresponding shares for the British and Japanese credit slowdowns. The French stock adjustment shares support our conclusion that, because it occurred later in the decade, deregulation was more important to the French credit slowdown than deregulation was to the credit slowdowns in the other countries.

The Fundamental Component of Market-Clearing Credit: Our regression results indicate that, excluding the stock-adjustment effect, slowing economic activity may have been the single most important factor behind the total credit slowdown in France. This factor is also estimated to have contributed significantly to the slowdown in bank credit growth. In both cases the relative contribution of slowing economic activity is notably larger in France than in Japan or the United Kingdom.

House prices, but not share prices, appear to have been significant determinants of credit growth in France. Table 10 indicates that slowing growth in the level of house prices accounted for more than half of the slowdown in bank credit growth, and almost a third of the slowdown in total credit growth. The importance of the cooling of house prices to the French credit slowdown is a little surprising, given that mortgage credit growth did not slow as precipitously as other types of credit. However, in part the esti-

Table 10: Decomposition of the Credit Slowdown in France

	Total Credit Growth (In Percent)	**Bank Credit Growth (In Percent)**
Peak quarterly credit growth: 1989-II	4.02 (17.1 annualized rate)	5.50 (23.9 annualized rate)
End of sample quarterly credit growth (1991-III, Total; 1992-I, Bank)	1.84 (7.6 annualized rate)	0.70 (2.8 annualized rate)
Actual decline	-2.18	-4.80
Estimated decline	-2.66	-4.49
Proportion of decline attributable to:	**(In Percent)**	**(In Percent)**
Stock adjustment effect	**35**	**-44**
Effects of fundamental factors of which:	**61**	**-57**
GDP	-31	-8
Land price levels	-32	-53
Bank capital	+2	+2
Effects of transitory factors of which:	**-4**	**+1**
Intervention rate	-4	+1

Note: The contributions of some regressors are not listed. The omitted contributions to the credit slowdown are all below 5 percent.

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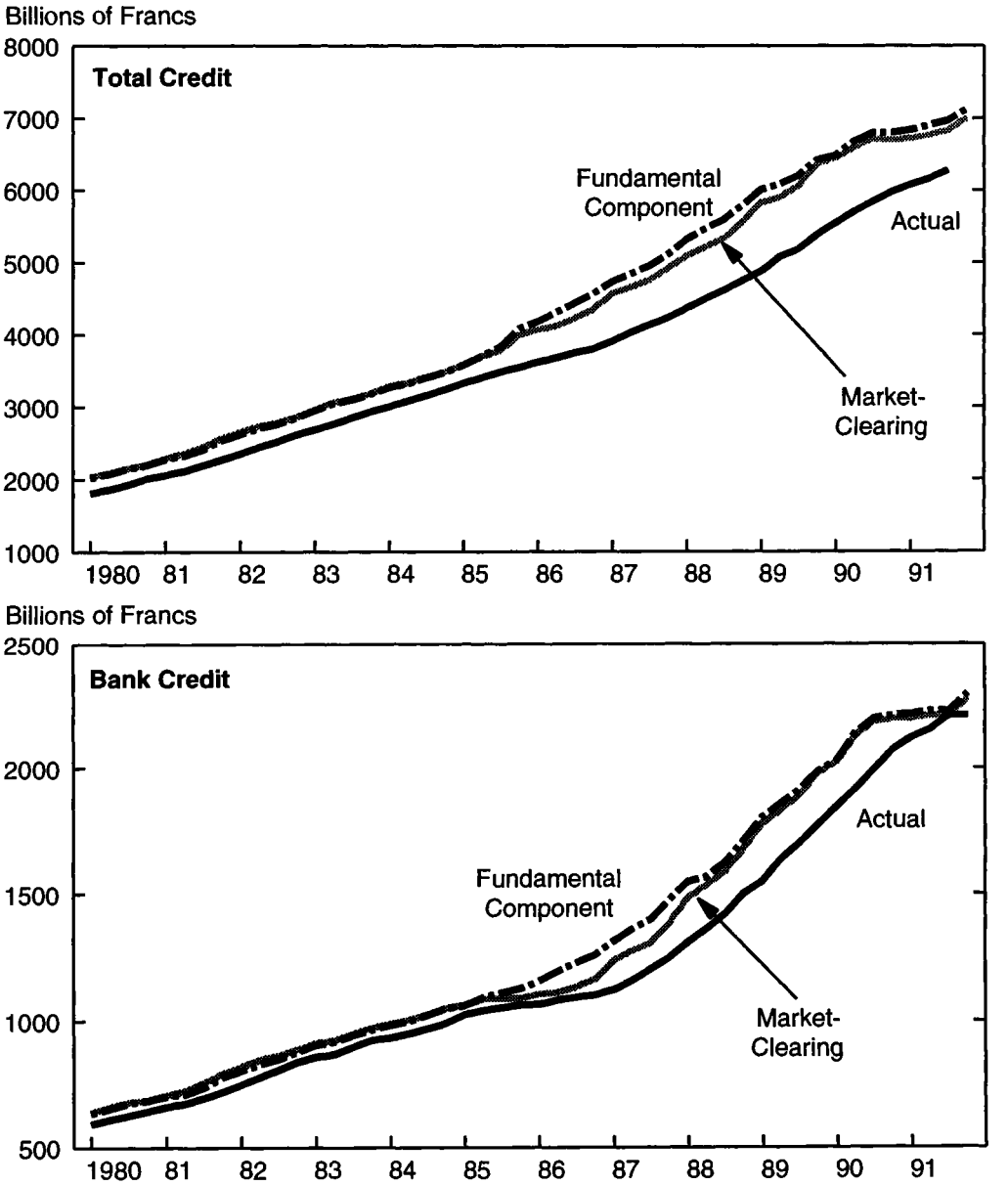
mated impact of slowing house price changes may actually reflect the stock adjustment mechanism in France, working its way through asset prices. We noted earlier the ambiguity in excluding all asset price changes from the stock adjustment effect.

Bank capital is estimated to have had negligible effects on the overall credit slowdown in France. Although the bank capital variables were significant in our French regressions, bank capital continued to grow at a sufficiently rapid pace that it made no apparent contribution to the French credit slowdown. This result is consistent with our earlier French analysis.

The Transitory Component of Market-Clearing Credit: The contribution of transitory forces to the French credit slowdown is quite small, consistent with the analysis of Section II. This is also consistent with Chart 12, where market-clearing credit and its fundamental component track each other quite closely.

Chart 12: France



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Summary: Overall, the French regression results generally support our earlier French credit analysis. Adjustment to relatively recent credit decontrol was very important in determining the path of credit growth. The economic slowdown was also a significant factor behind the French credit slowdown, and speculative forces were not. The regression results suggest house price developments following credit deregulation were an important factor behind the evolution of credit growth at the end of the 1980s.

BIS Standards: Our regression framework allows us to make a quasi-quantitative assessment of the impact of the BIS capital adequacy standards on Japanese and U.K. bank lending in the late 1980s. This assessment cannot be accomplished for France because the effects of the BIS announcement are not distinguishable from the effects of deregulation, which occurred roughly simultaneously with the announcement itself. We characterize our assessments for Japan and the United Kingdom as only quasi-quantitative because they are based on the coefficients on dummy variables which are subject to other influences and tend not to be highly robust to changed specifications. In fact, we have separated this BIS standard analysis from the country analysis above to highlight its tenuous nature.

To evaluate the effects of the announcement of the BIS standards we ran a counterfactual simulation of our Japanese and U.K. regression estimates assuming the BIS announcement never occurred and, consequently, the BIS dummies in our regressions equalled zero. This counterfactual exercise suggests that the BIS announcement slowed quarterly bank credit growth in Japan by roughly 0.25 percentage points on average from 1988-II to 1992-I. A similar exercise for the United Kingdom shows a weaker impact of the BIS standards: growth in U.K. bank credit is estimated to have been slowed by only 0.18 percentage points in response to the BIS announcement. This supports our earlier conclusion that bank capital constraints have had their most notable effect in Japan.

Synthesis: Overall, the regression results strongly support our earlier conclusions about the causes of the credit slowdowns in Japan, the United Kingdom, and France.[56] The (stock) adjustment of these markets to earlier developments, especially deregulation, is estimated to have been an important factor in the credit slowdown. As expected, this factor is estimated to have been most important for credit in France. Asset price changes, predominantly changes in the price of real estate, have also played a major role in the credit slowdown. In Japan the contribution of asset price developments has largely been through transitory channels, that is through the impact on the credit market of speculative asset transactions which fed and then burst the asset price bubble, causing ripple effects throughout the financial system. In the other countries speculative demand does not seem to have been nearly as important, but the actual changes in asset price levels appear to have altered the amount of credit needed to finance nonspeculative real estate purchases or the amount of funding obtainable through equity issuance. Through these two more fundamental channels asset price developments appear to have strongly influenced credit growth in France and the United Kingdom. As for the other determinants

[56] The results of similar regressions using U.S. data may be of interest to the reader. These suggest that stock adjustment effects account for one tenth and one quarter of the slowdowns in bank and total credit, respectively. The largest single factor behind the slowdowns in both bank and total credit growth was the concurrent slowdown in GDP growth. Asset price developments are estimated to have contributed modestly to the bank credit slowdown but to have been unimportant in the total credit slowdown.

There are many reasons for viewing these U.S. results with caution. First, to accurately capture the consequences of the thrift crisis would have required greater disaggregation of the data. Second, the consequences of regional developments, such as the apparent bubbles in real estate prices in the Northeast and Southwest, are probably not well-measured in the aggregate data.

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having a sustained impact on credit growth, bank capital as expected is estimated to have contributed notably to the credit slowdown in Japan, but not to the credit slowdowns in the United Kingdom or France. For France, slowing nominal GDP growth has been important, but cyclical developments have not been the chief determinant of the credit slowdown in any of the three countries.

All told, the results in this Section, coupled with those in Section II, suggest that the recent credit slowdown abroad primarily reflects a break in the rise in credit relative to GDP that occurred throughout most of the 1980s in all three focus countries. This break came as the key factors underlying this rise—stock adjustment and asset price dynamics—unwound over the last few years.

III. Credit Developments in Other Major Industrial Economies

We reviewed the experiences of six other industrialized nations—Germany, Italy, Spain, Sweden, Switzerland, and Australia—to see whether the common pattern of credit development we found in Japan, the United Kingdom, and France occurred more generally. We found that in all of these countries but Germany the pattern could be discerned quite clearly, though typically it began somewhat later in the 1980s than in our focus countries. As shown in Table 11, Italy, Spain, Sweden, Switzerland, and Australia all experienced growth in credit which greatly exceeded growth in GDP following deregulation or financial innovation (or both). The shift in the credit-GDP relationship was accompanied in all five countries by surging real estate prices. A shift towards monetary tightening in 1989 or thereafter generally contributed to a slowing or reversal of these asset and credit developments. Loan problems resulting from the real estate retrenchment as well as the cyclical downturn exacerbated the decline in credit growth, though the magnitude of credit losses due to problem loans varied greatly across countries.

This pattern was most extreme in Sweden, where bank credit reached the astonishing average annual rate of 34 percent during 1988, far exceeding GDP growth. Sweden is also notable for having had, prior to these credit developments, a financial market structure in which government controls on quantities and prices were particularly pervasive and powerful. In the aftermath of the mid-1980s deregulation of domestic financial markets, while credit quantities were adjusting, commercial and residential property prices in Stockholm rose on average about 20 percent per year during the 1987-90 period. The boom ended following monetary tightening begun in 1989. Commercial real estate prices dropped 43 percent in 1991, and residential prices also began to soften in that year. The bursting of the real estate bubble created large bank and finance company loan loss problems, necessitating massive government support for two major banks.

Germany, where the ratio of private non-financial debt/nominal GDP remained virtually unchanged from 1982 through 1989, represents the other extreme of foreign credit experience.[57] Germany also stands out as having undertaken the least degree of financial market deregulation in the 1980s. Most notably, Germany had not employed quantitative credit controls during the 1970s and, consequently, experienced no credit surge following credit control removal in the 1980s. Concomitant with the absence of a German credit surge in the 1980s was the absence of marked asset price inflation in Germany. Frankfurt residential real estate prices, for example, rose on average only 2 percent per year, much less than residential real estate prices in other large cities abroad. Though Germany stands out as unusually insulated from the credit and asset market ex-

[57] Data apply only to the former West Germany; developments are only analyzed through 1989 to abstract from the impact of German unification.

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Table 11: Credit Growth in the Private Nonfinancial Sector in Selected Other Major Foreign Countries
Average Annual Growth Rates

	1980-IV to 1987-IV	1987-IV to 1988-IV	1988-IV to 1989-IV	1989-IV to 1990-IV	1990-IV to 1991-IV
West Germany					
Nominal GDP	4.6	5.5	5.8	–	–
CPI	2.9	1.7	3.0	–	–
Total credit	5.4	4.6	6.5	–	–
Bank credit	5.8	5.5	7.4	–	–
Italy					
Nominal GDP	14.8	10.6	9.3	9.7	8.1
CPI	12.2	5.1	6.3	6.7	6.1
Total credit	12.2	15.6	18.0	15.4	14.7
Bank credit[a]	8.4	17.3	22.4	16.0	16.0
Spain					
Nominal GDP[b]	13.5	11.1	12.1	11.2	9.4
CPI	10.9	5.5	7.1	6.8	5.6
Total credit	n.a.	17.6	15.4	9.9	11.7
Bank credit	10.1	14.1	17.9	9.3	16.9
Sweden					
Nominal GDP[c]	9.6	9.6	9.4	6.7	5.3
CPI	8.2	5.9	6.5	11.2	7.9
Total credit[d]	n.a.	21.9	21.3	15.5	3.4
Bank credit[e]	12.5	33.8	26.5	16.6	-3.5
Switzerland					
Nominal GDP	6.0	3.9	8.1	7.6	5.4
CPI	3.4	1.8	4.4	5.9	5.3
Total credit	n.a.	n.a.	n.a.	n.a.	n.a.
Bank credit[f]	8.4	12.8	15.2	8.8	5.1
Australia					
Nominal GDP	11.8	13.6	9.2	4.1	0.7
CPI	8.5	7.7	7.8	6.8	1.5
Total credit[d]	n.a.	23.9	15.5	7.3	-1.0
Bank credit[f]	17.2	25.0	29.9	16.8	5.1

n.a. = not available

a. Loans to private nonfinancial enterprises and persons for consumption purposes.
b. Year average (not Q4/Q4) growth rates.
c. 1981-IV to 1987-IV.
d. Excludes bonds.
e. Includes loans to local authorities.
f. Includes loans to financial sector.

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periences of most industrialized countries in the 1980s, its experience further supports the idea that common forces were at work in those countries, among which financial market deregulation seems particularly important.

IV: Conclusions

This study has examined the marked slowdown in credit growth in Japan, the United Kingdom, and France after 1990. It has found that for all three countries a tightening in monetary policy preceded the slowdown and the ensuing decline in GDP growth contributed significantly to the credit weakness. However, most of the recent weakening in credit growth is explained by the unwinding of noncyclical factors that had led to credit surges earlier in the 1980s. Prominent among these factors was financial market deregulation which spurred credit growth as the stock of credit outstanding rose to a new, higher equilibrium level relative to nominal GDP. Once this new credit level was approached, credit growth naturally slowed. Another major factor, whose importance differed significantly across the three countries, was the rapid increase in asset prices during the 1980s. These prices slowed or actually fell as the decade ended. The recent reversal in asset price developments removed this earlier accelerant to credit growth and in some cases actively slowed credit growth. Financial problems resulting from unsuccessful speculative asset purchases have further dampened credit conditions.

For France, our analysis, supported by econometric results, suggests that the end of adjustment to bank deregulation, combined with the cyclical downturn, accounts for much of the waning in credit growth. Slowing French demand for credit to finance primarily nonspeculative asset purchases, concomitant with a slowdown in asset price increases, also appears to have been a significant factor. In the United Kingdom, the country with the largest credit surge, qualitative and econometric analyses indicate that increases in personal insolvencies and sharply declining housing prices in the initial wake of the credit slowdown significantly exacerbated the weakening credit situation. Credit ultimately slowed dramatically as both speculative and nonspeculative asset market forces took their toll.

Finally, in Japan we find that sharply declining stock market and land prices hurt the financial base of the banking system which was less well capitalized than that of France or the United Kingdom. Juxtaposed against tighter banking capital standards, measured by required BIS capital/asset ratios, the deterioration in the Japanese banks' capital base contributed significantly to the recent credit weakness. A sharp fall in credit demand to finance speculative purchases, following the bursting of the Japanese asset price bubble, also substantially reduced credit growth. More fundamental factors, such as the stock adjustment process and slowing Japanese economic growth also contributed—but to a smaller extent than in France or the United Kingdom—to the credit slowdown.

The credit experiences of Japan, the United Kingdom, and France appear to fit into a broader pattern common to many foreign industrialized countries. Looking at developments in half a dozen other countries, we generally find that financial deregulation and innovation led to soaring credit growth and sharply rising credit/GDP ratios in the 1980s. Although the timing of developments varied across countries, eventual tightening in monetary policy, coupled with a natural decline in credit growth rates as the stock adjustment to credit deregulation worked itself out, brought on a credit correction. Rapidly rising asset prices typically contributed to the credit surge, and their subsequent levelling off or decline contributed to the credit slowdown. Credit adjustment problems tied to speculative asset market dynamics appear to have been substantial in about half the countries experiencing a pronounced credit surge.

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In a volume devoted primarily to considering the U.S. credit slowdown, it may be appropriate to finish by comparing the U.S. experience with those abroad. The overall process of financial innovation and deregulation was important to the evolution of both the U.S. and foreign country credit cycles over the 1980s. The extent of deregulation within the broader process, however, appears to have been greater abroad than in the United States. Quantitative credit controls, for example, were generally pervasive and economically significant abroad, but not here in the U.S. For this reason the removal of those controls probably played an important role in many of the credit cycles abroad.

The role of monetary policy also differs between the U.S. credit experience, where the credit slowdown was not associated with monetary tightening, and the experiences of the U.S.'s major trading partners, where tightening of monetary policy helped precipitate the credit slowdowns in most cases. Both in the United States and abroad, however, the evolution of credit growth was most strongly affected by a set of market forces, such as financial innovation and asset price developments, which initially promoted rapid credit expansion but eventually led to a slowdown in credit growth.

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