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# Credit Supply Constraints on Business Activity, Excluding Construction

*by Charles Steindel and David Brauer<sup>1</sup>*

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.<sup>2</sup> 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.<sup>3</sup>

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

<sup>1</sup> Our thanks to M.A. Akhtar, Michael Boldin and Ethan Harris for comments. Joseph Abate and Stuart Selater-Booth provided extensive assistance with this paper.

<sup>2</sup> 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.

<sup>3</sup> Other papers in this study examine the relationships between the credit slowdown and the economic environment.

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.<sup>4</sup> 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

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<sup>4</sup> Cantor (1990) found that capital spending by firms with relatively high ratios of debt to assets showed greater sensitivity to cash flow changes.

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).

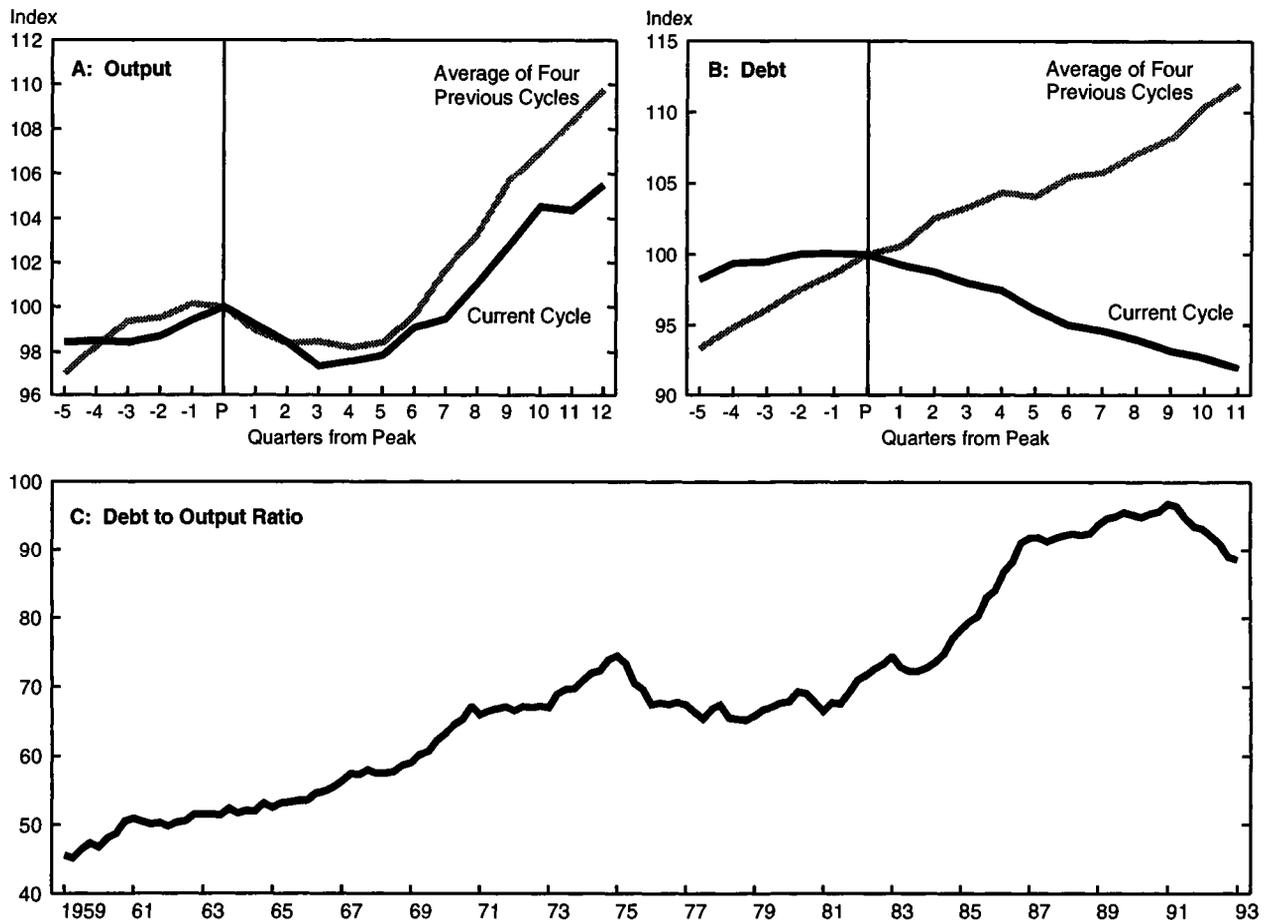
Charts 1-3 examine activity and debt measures for the three sectors we are considering.<sup>5</sup> Each chart contains three panels. Panel (A) compares a sector's activity, measured as real output, over the most recent business cycle with the average of the four preceding cycles. The data are illustrated 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.<sup>6</sup> Chart 1A shows that

<sup>5</sup> See Brauer (1993) for a more extensive discussion of economic activity for the period since 1989.

<sup>6</sup> 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.<sup>7</sup> 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.

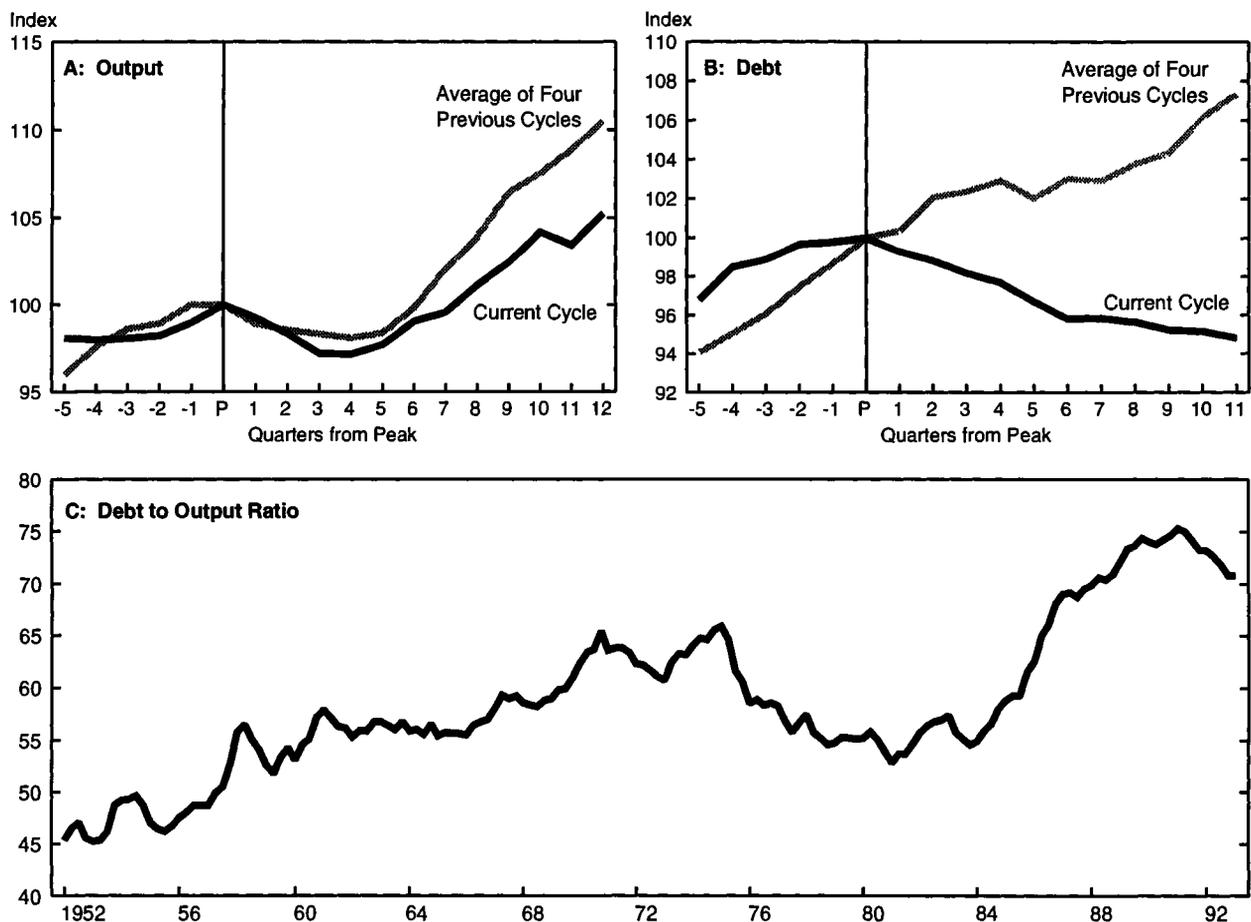
In the corporate sector output since the last peak has generally been on a par with the average of past cycles (Chart 2A), although growth was unusually slow going into the peak. Real corporate debt has fallen since the last cyclical peak, but the shortfall has been less severe than for business as a 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.

<sup>7</sup> The debt includes that owed by medical and legal partnerships and proprietorships. (see note 6, above).

**Chart 2: Nonfarm Nonfinancial Corporate Business**



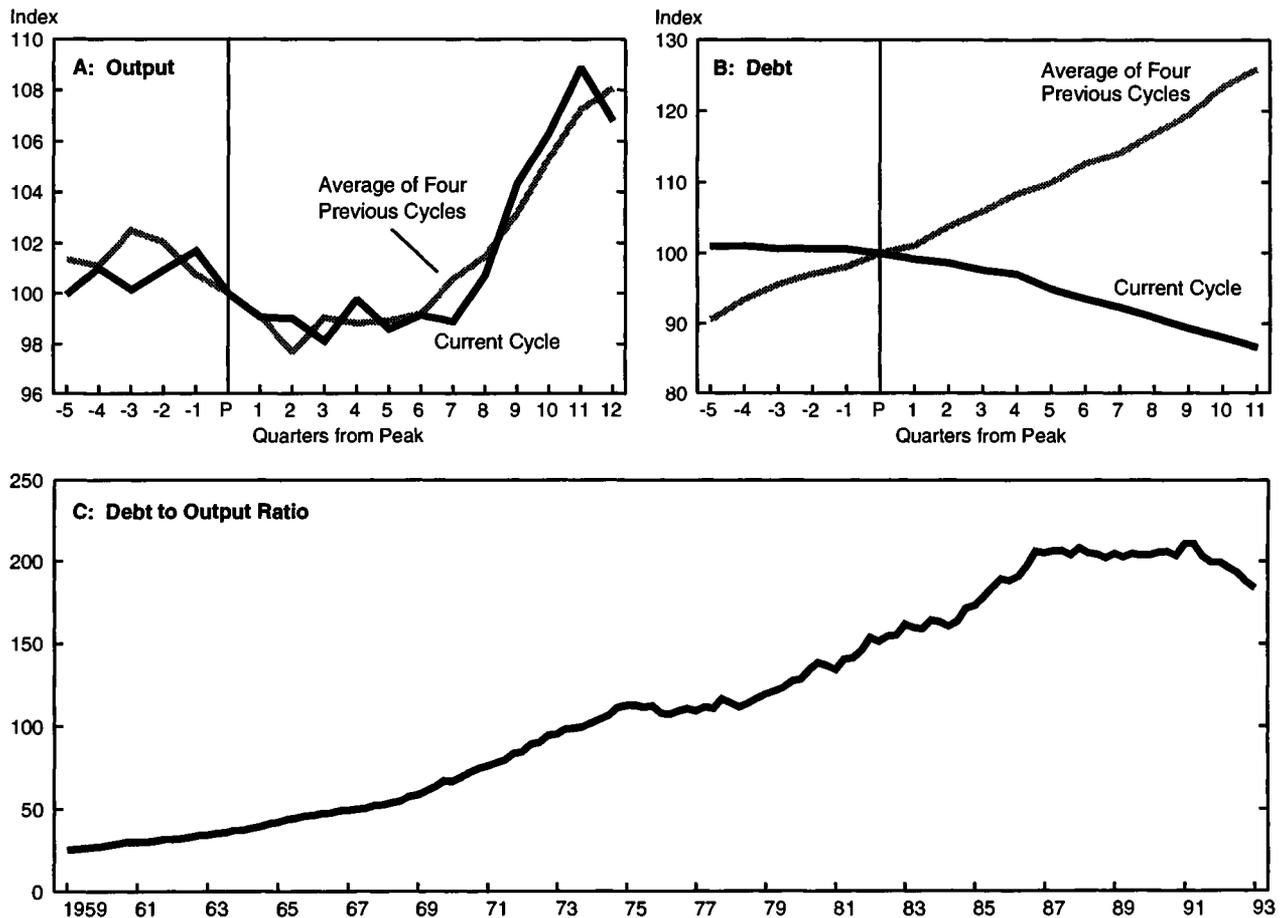
large firms—that debt problems are associated with weakness in activity.<sup>8</sup>

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.

<sup>8</sup> 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**



## II. Survey Evidence on Lending to Smaller Firms<sup>9</sup>

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."<sup>10</sup> 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.<sup>11</sup> With this survey, then, it should be possible to detect periods in which credit availability as perceived by borrowers either worsened or improved significantly.<sup>12</sup> 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

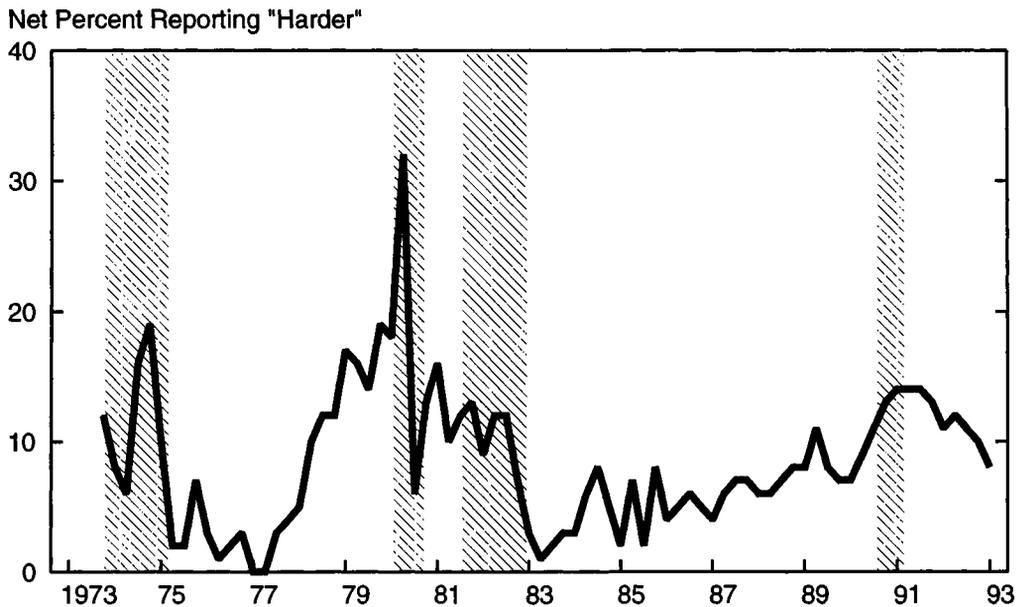
<sup>9</sup> A more exhaustive analysis of such evidence can be found in the paper by Hamdani, Rodrigues, and Varvatsoulis in this volume.

<sup>10</sup> Note that we cannot directly compare perceived current credit conditions with those of earlier years, only the extent to which they have recently worsened.

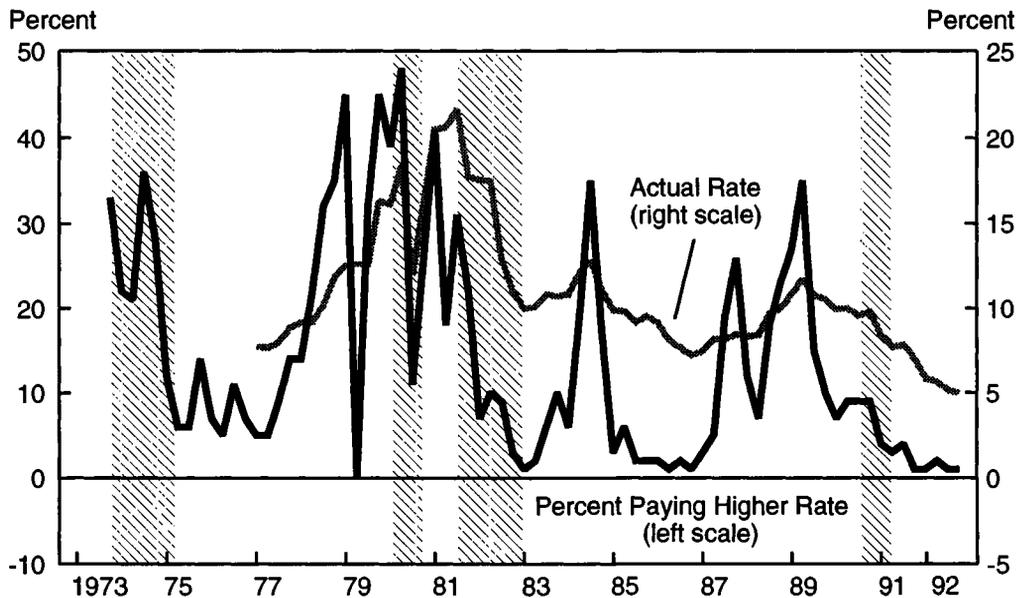
<sup>11</sup> Emphasis in original. The other choices offered are "taxes," "inflation," "poor sales," "cost of labor," "government regulation(s) & red tape," "competition from large businesses," "quality of labor," and "shortage of fuels, materials or goods." Respondents also have the option of writing in a different answer to this question.

<sup>12</sup> 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.

**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.<sup>13</sup> 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.

<sup>13</sup> 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.

## 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.<sup>14</sup> Although this breakdown is somewhat cruder than the one based on the SBA definition, it offers

<sup>14</sup> 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 <sup>a</sup>	Other Private Industries
<b>A. Recession</b>		
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>B. Early expansion</b>		
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.

<sup>a</sup> 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.<sup>15</sup> 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.<sup>16</sup> These periods encompass two recessions and the bulk of the long 1980s expansion. We want to know whether activity has contracted

<sup>15</sup> 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).

<sup>16</sup> 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

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.<sup>17</sup> 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 not 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.<sup>18</sup> We derive predicted levels of employment and capital spending by industry by regressing them against industry output over the 1980-92 pe-

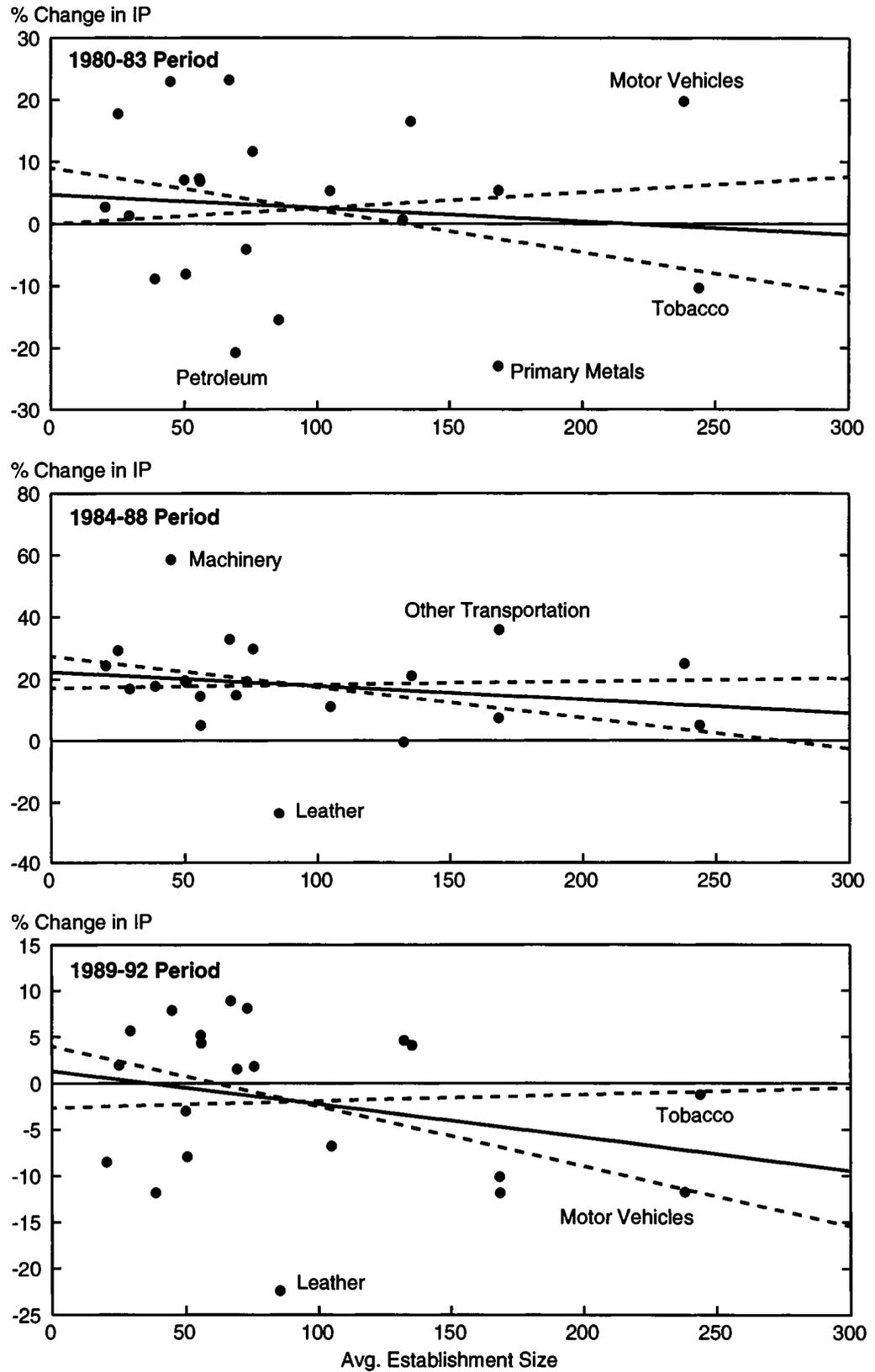
<sup>17</sup> The regression calculations provided both the slope and the standard error of the slope estimate. We then added this standard error to the slope estimate and drew a line with this new slope through the point representing the means of the horizontal and vertical values of the points plotted 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.

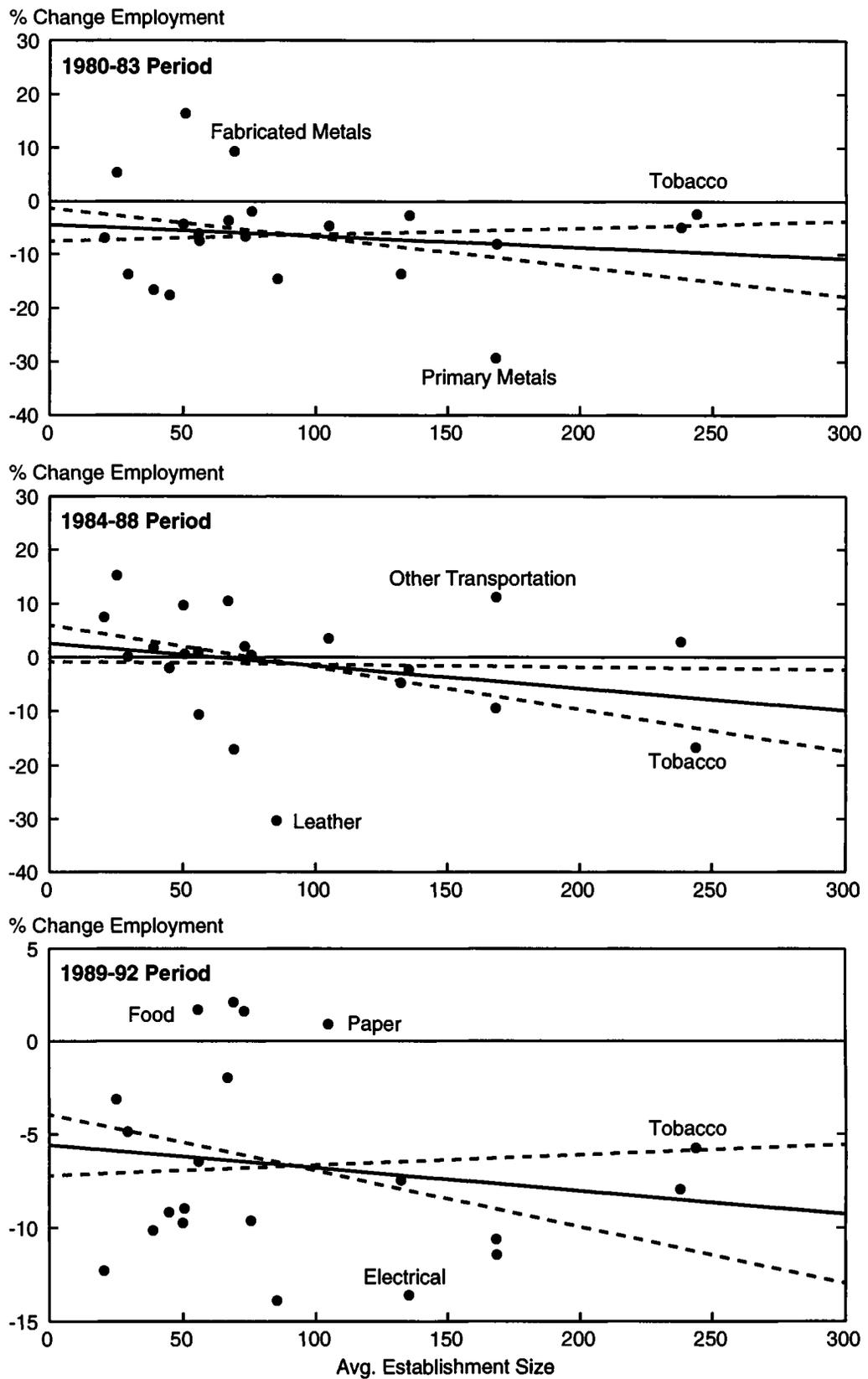
<sup>18</sup> Industrial production has some flaws as a demand measure. An industry can in the short run use inventory swings to break the connection between demand and production, and in the long run, production and demand can drift apart because production is an index of value added (sales less purchased 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**

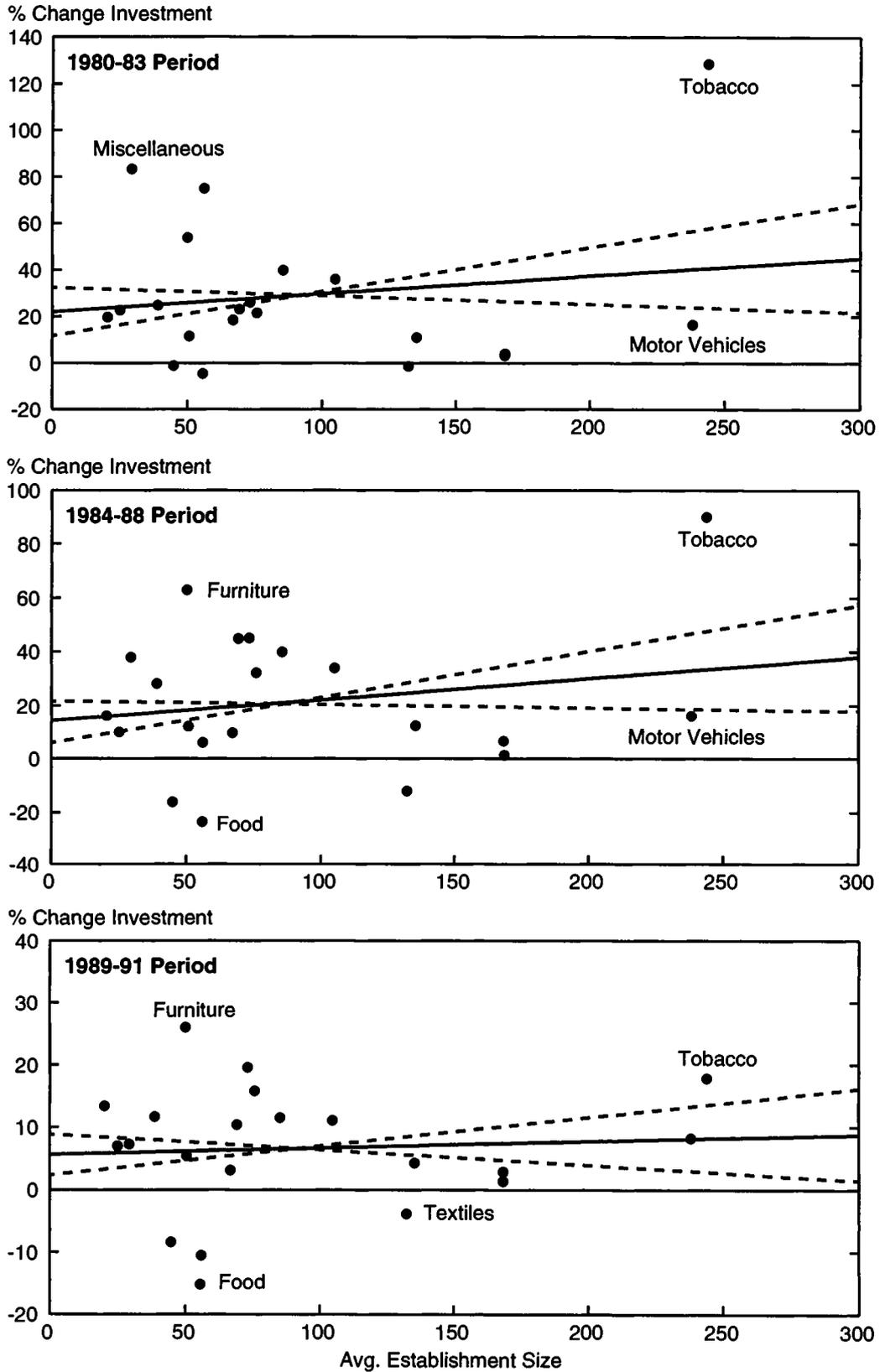


**Chart 7: Percentage Change in Employment against Average Establishment Size**

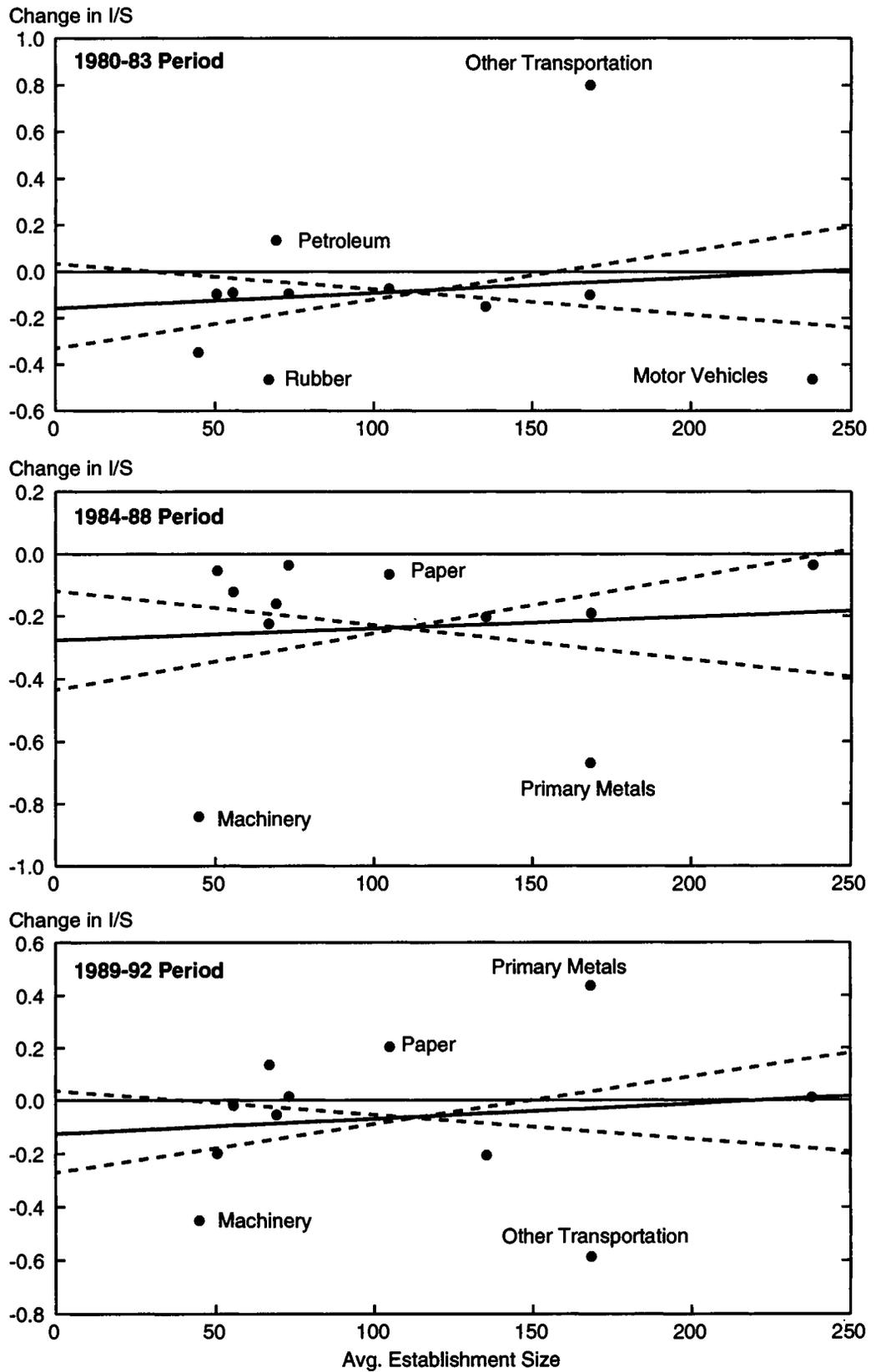


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**Chart 8: Percentage Change in Investment against Average Establishment Size**



**Chart 9: Change in Inventory/Sales Ratio against Average Establishment Size**



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riod.<sup>19</sup> 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.<sup>20</sup>

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.

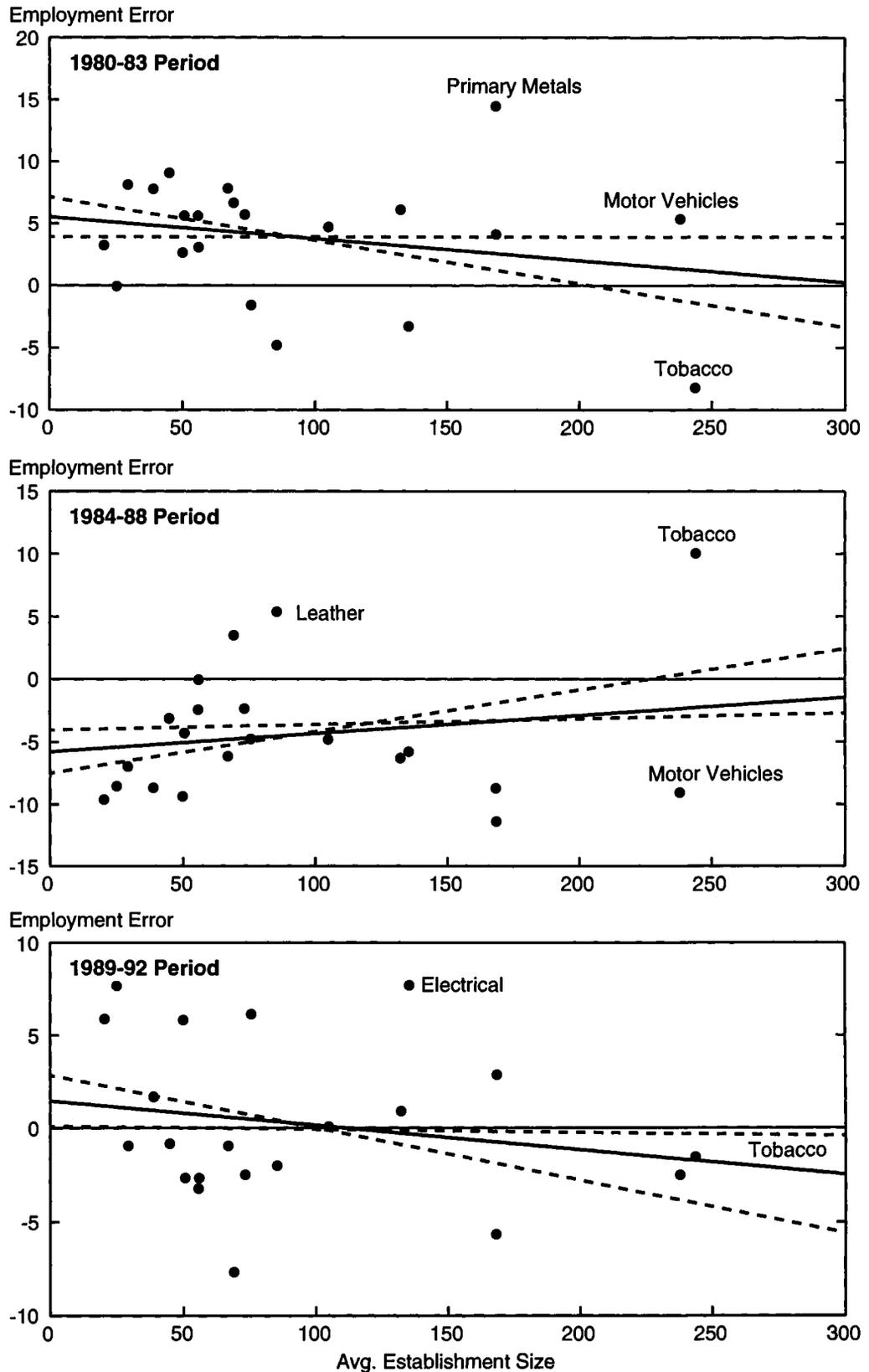
Chart 10 plots the cumulative residual change in employment over each of the three periods against average establishment size. A positive reading for any industry in any period would imply that employment growth was unusually strong in that industry given actual industrial production during that period—in 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.<sup>21</sup> 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.

<sup>19</sup> 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.

<sup>20</sup> 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.

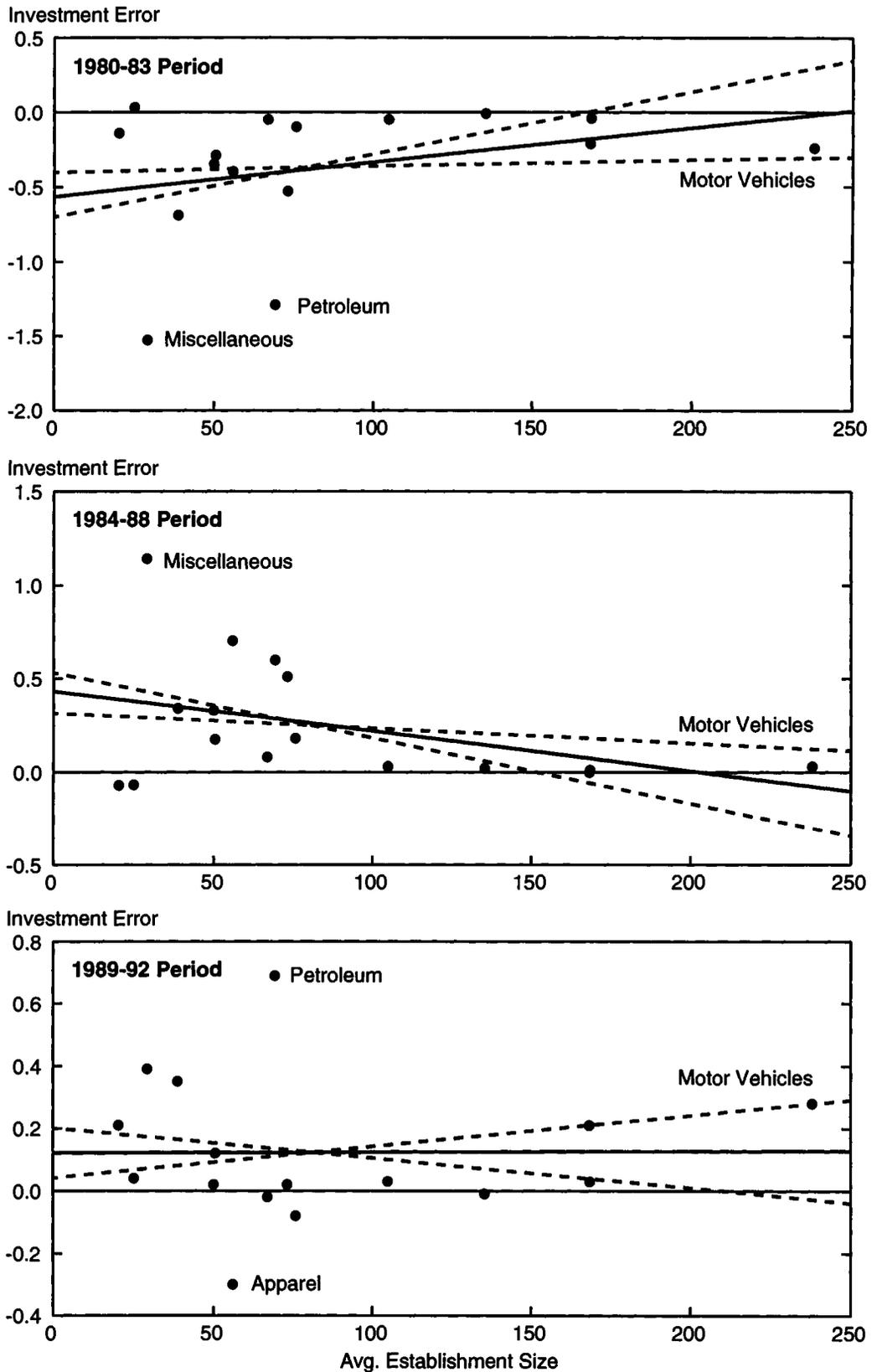
<sup>21</sup> Alternatively, productivity growth was particularly strong in large-establishment industries.

**Chart 10: Sum of Errors of the Percentage Change in Employment against the Percentage Change in Industrial Production Plotted against Average Establishment Size**

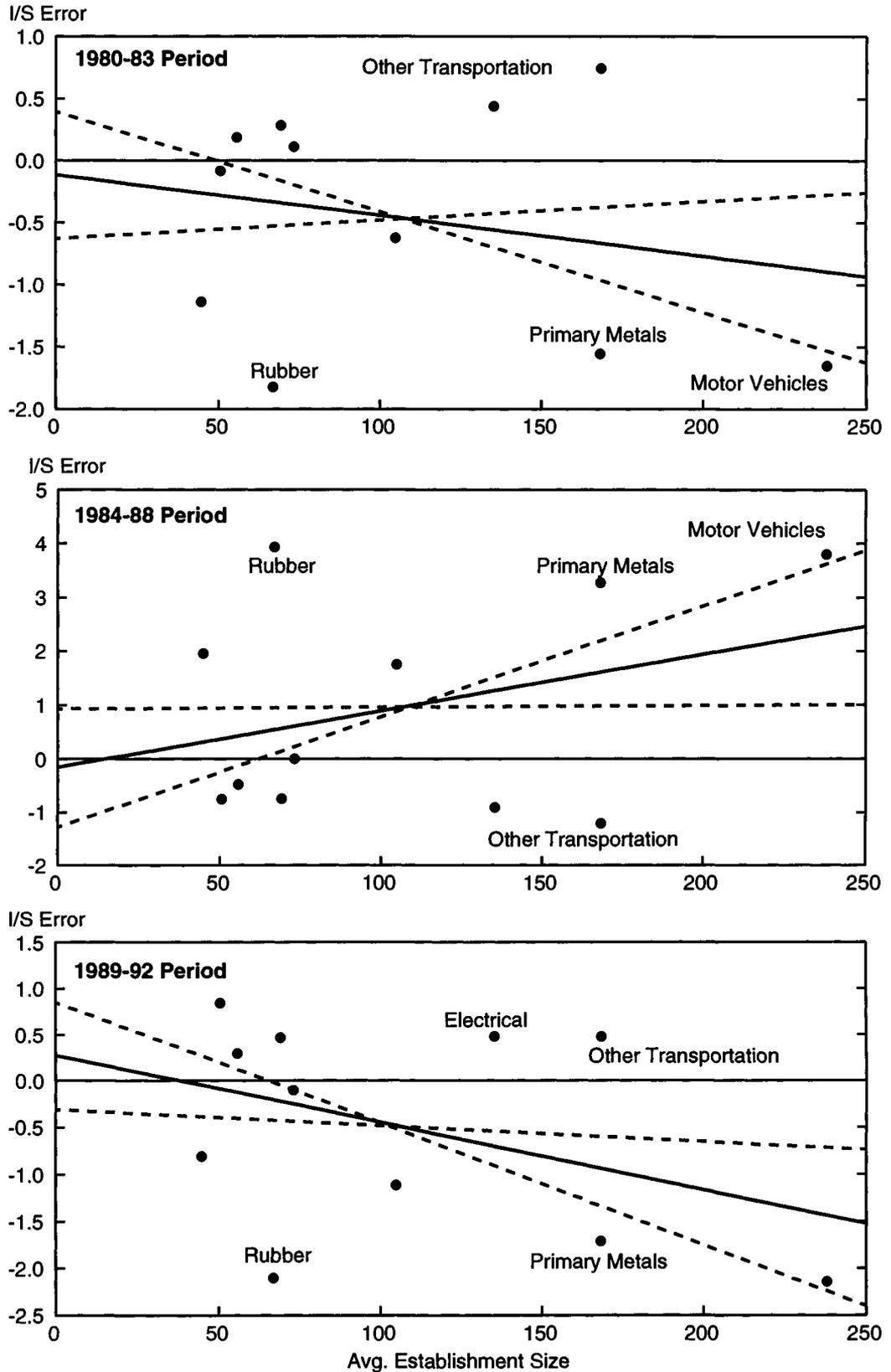


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**Chart 11: Sum of Errors of the Log of Investment against the Log of Industrial Production Plotted against Average Establishment Size**



**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 <sup>a</sup>		
	Bank	Nonbank	Total	Bank	Nonbank	Total
<b>Recessions</b>						
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
<b>Recoveries</b>						
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
<b>Expansions</b>						
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

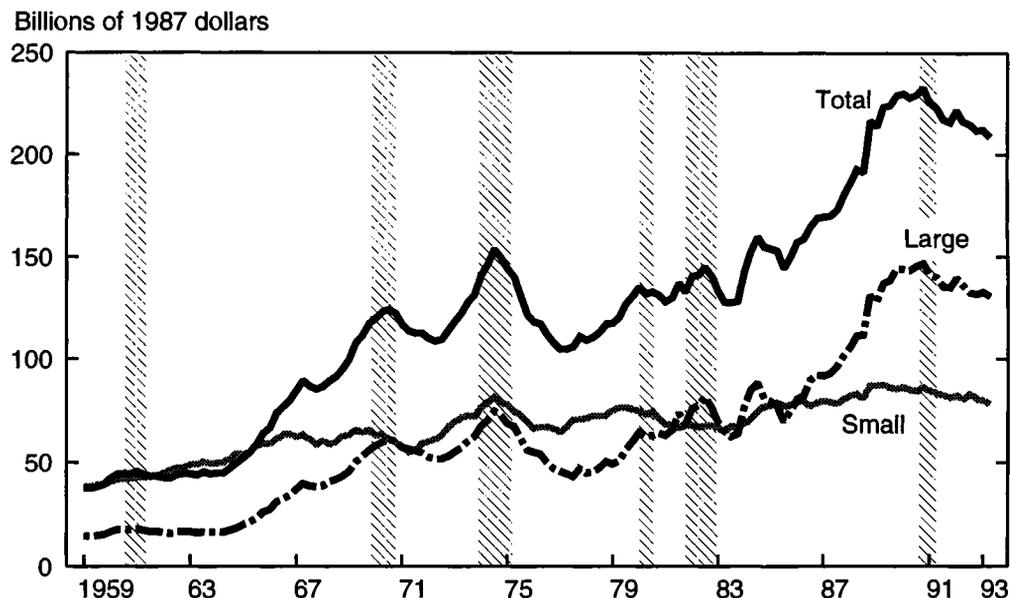
<sup>a</sup> Based on deflation using implicit GDP deflator.

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).

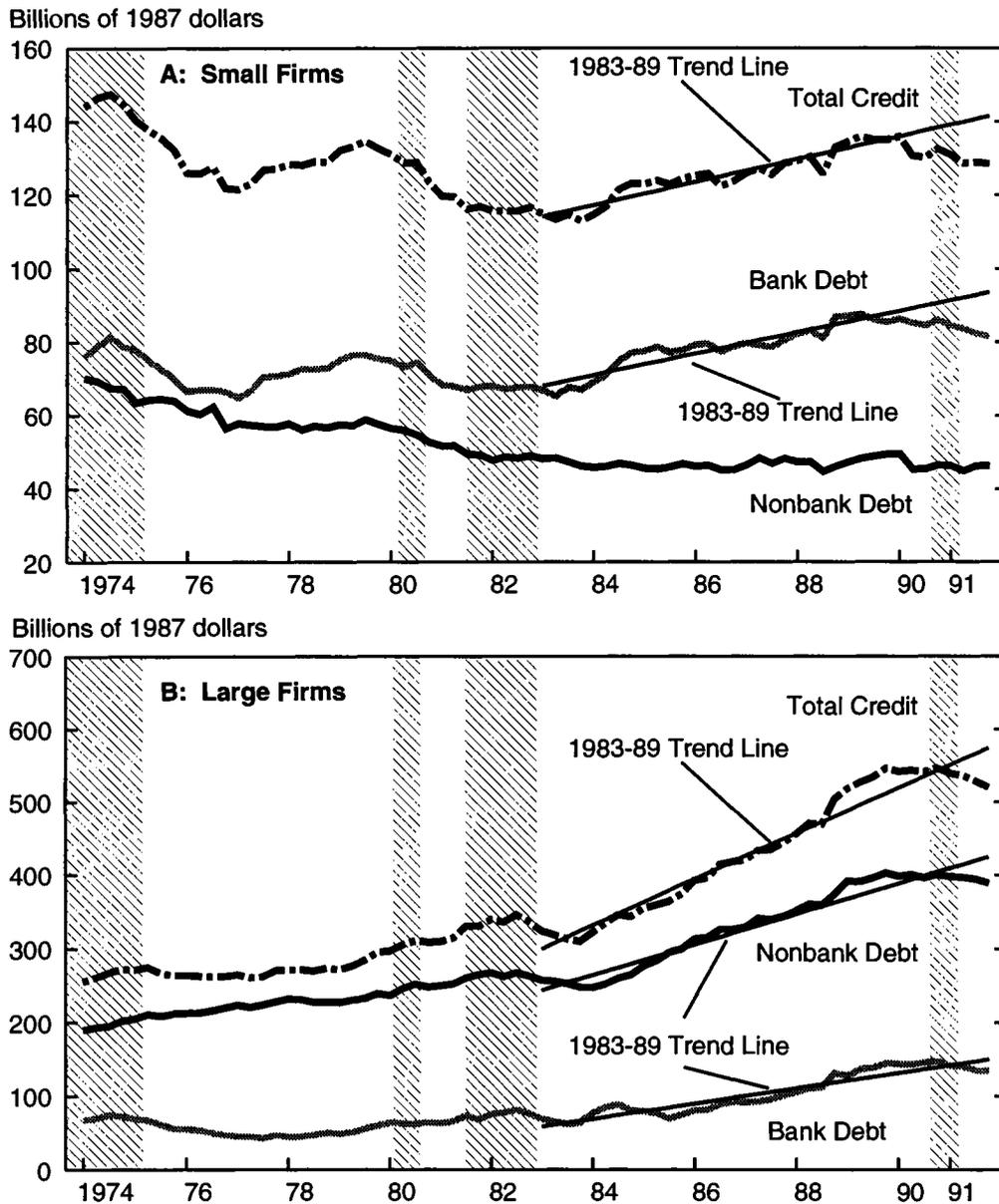
**Chart 13: Bank Debt by Firm Size**



## Causes and Consequences

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.

## 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.<sup>22</sup>

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.<sup>23</sup> By contrast, employment growth was considerably weaker than sales growth in the other quartiles (Table 4).<sup>24</sup>

<sup>22</sup> 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.

<sup>23</sup> 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.

<sup>24</sup> 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 <sup>a</sup>			
	Low	Second	Third	High
<b>Average employment</b>				
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
<b>Average real sales<sup>b</sup></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.

## Causes and Consequences

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 <sup>a</sup>			
	Low	Second	Third	High
<b>Average employment</b>				
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
<b>Average real sales<sup>b</sup></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.

<sup>a</sup>. Based on sales in initial year (1972, 1979, 1988).

<sup>b</sup>. Deflated by GDP deflator.

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.<sup>25</sup>

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

<sup>25</sup> 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

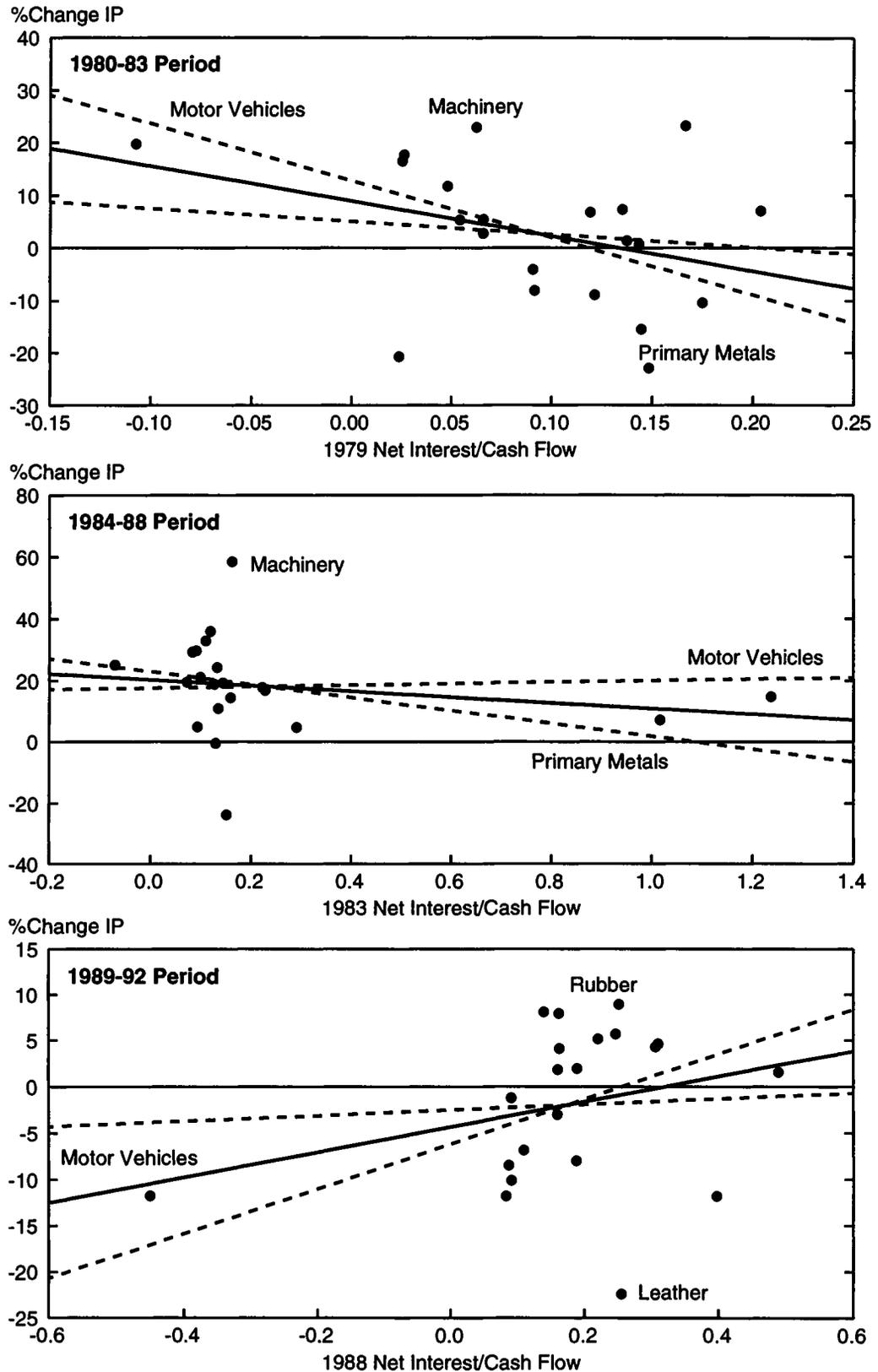
	Quartiles <sup>a</sup>			
	Low	Second	Third	High
1972-75	62.7	35.8	39.5	39.5
1979-82	110.2	69.3	67.2	51.7
1988-91	29.8	90.1	25.5	29.3

Source: Compustat.

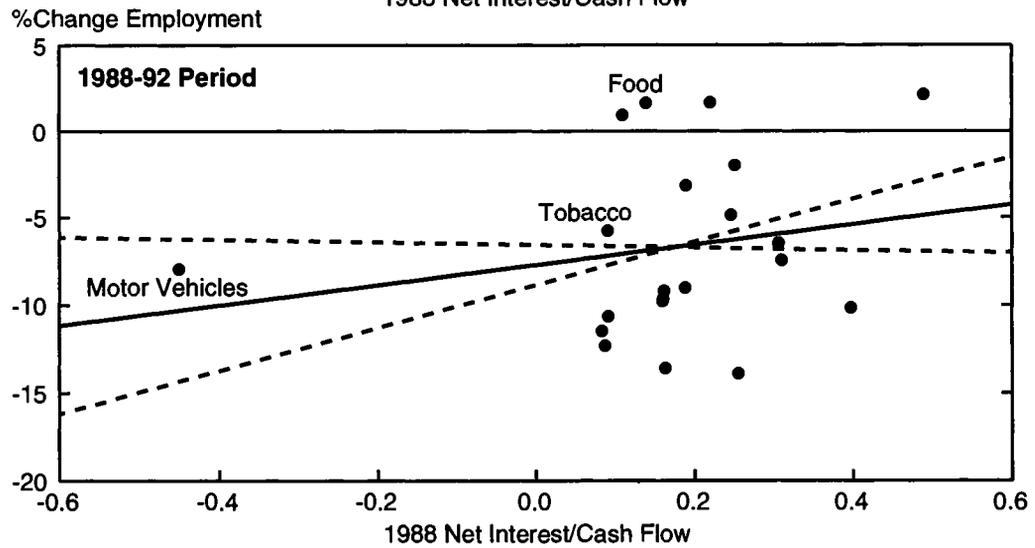
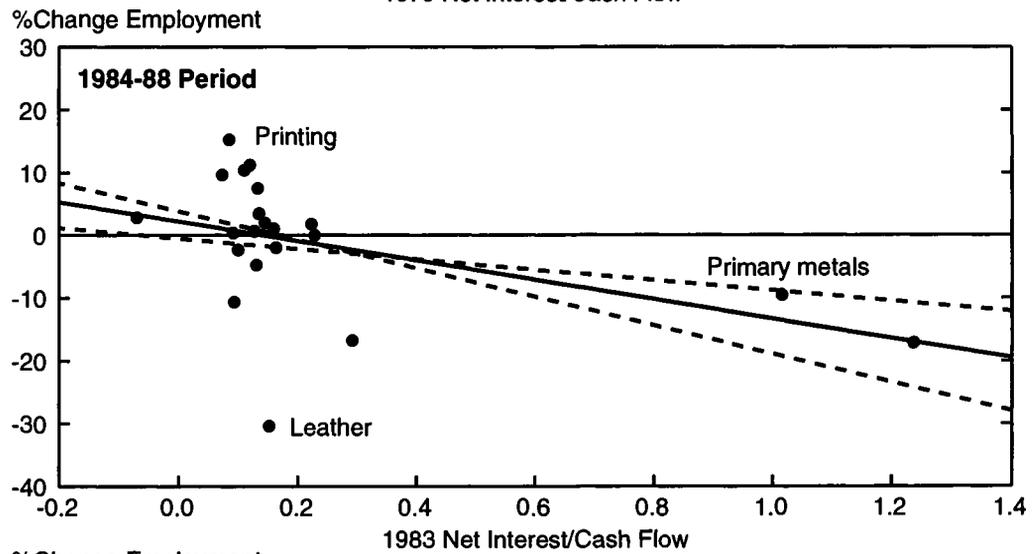
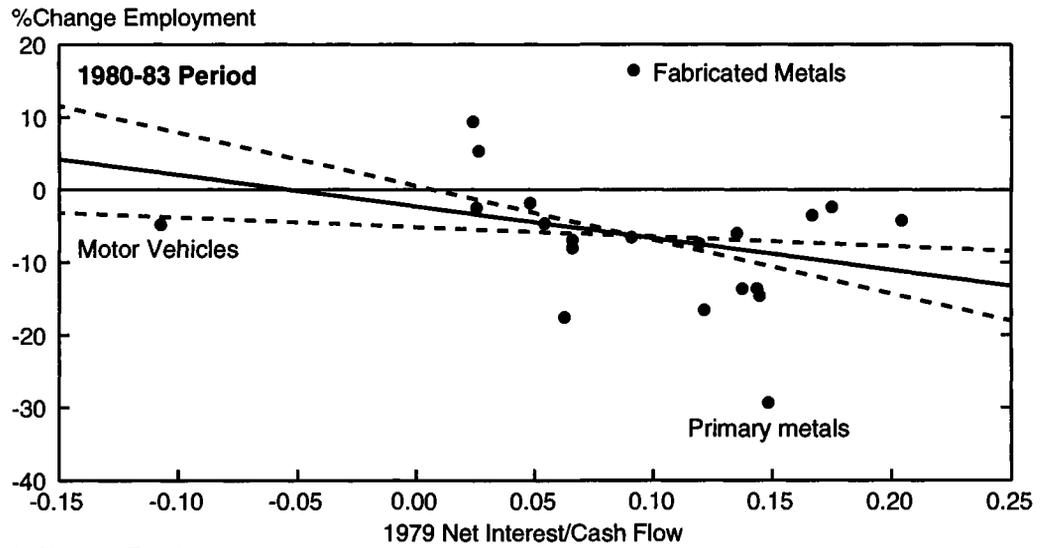
<sup>a</sup>. Based on initial year sales.

*Causes and Consequences*

**Chart 15: Percentage Change in Industrial Production against Net Interest/Cash Flow**

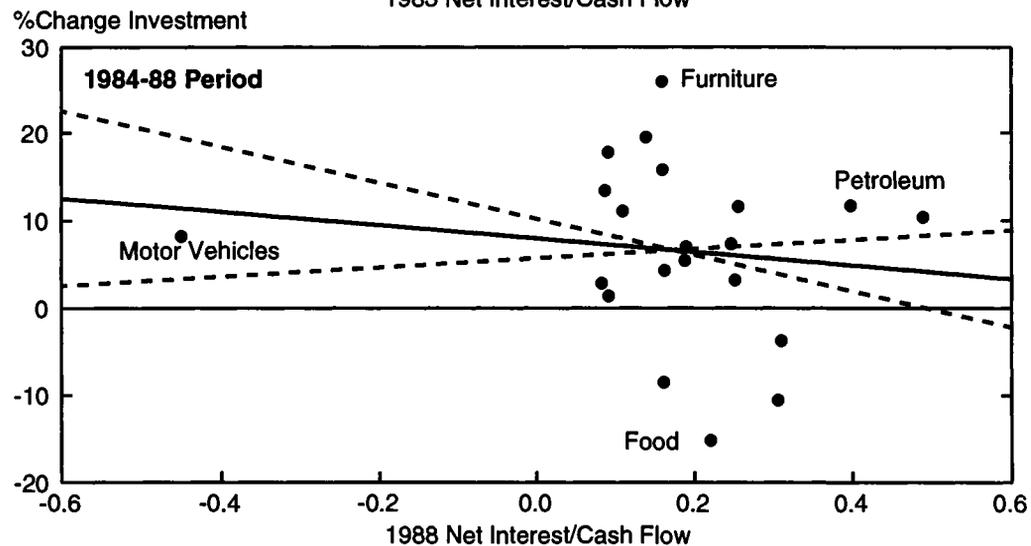
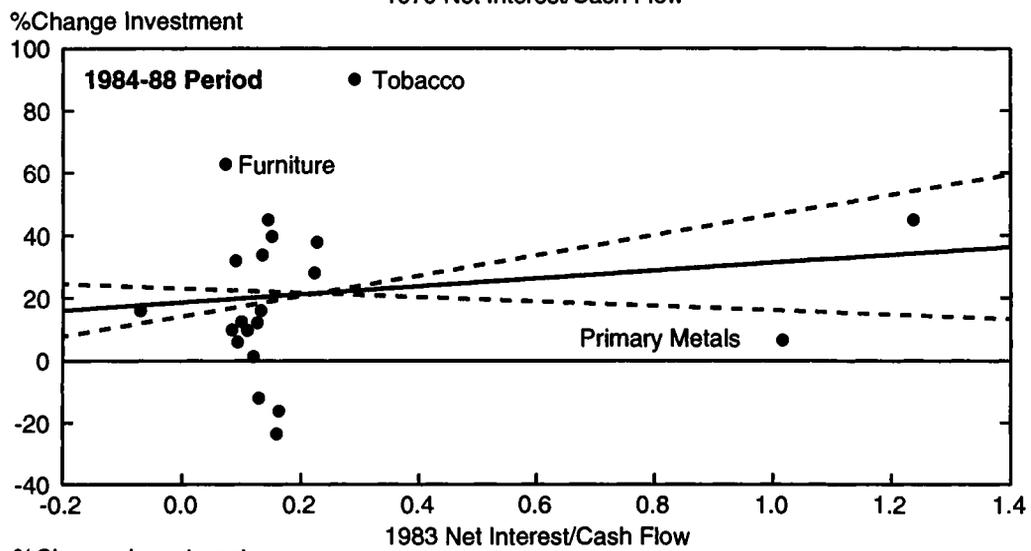
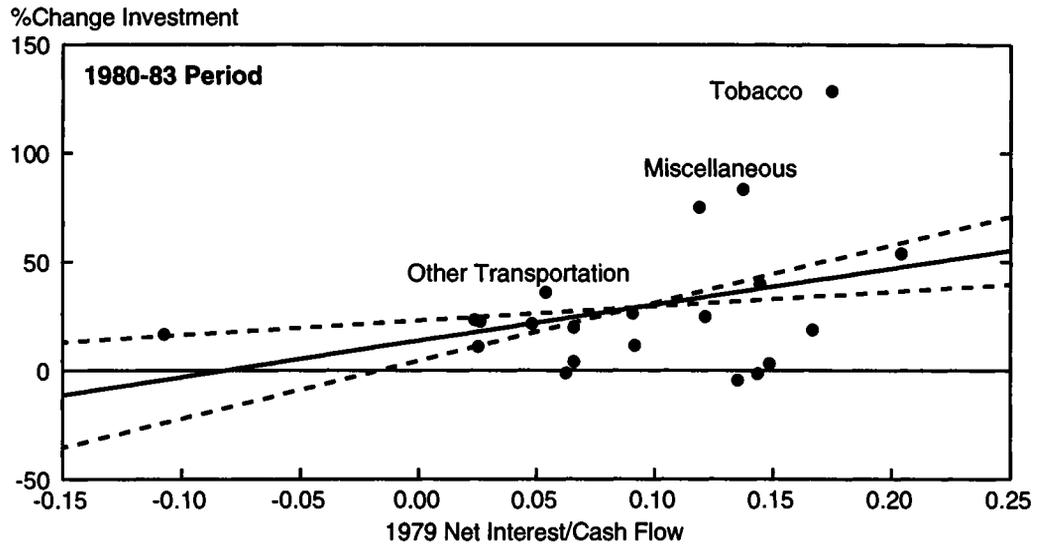


**Chart 16: Percentage Change in Employment against Net Interest/Cash Flow**

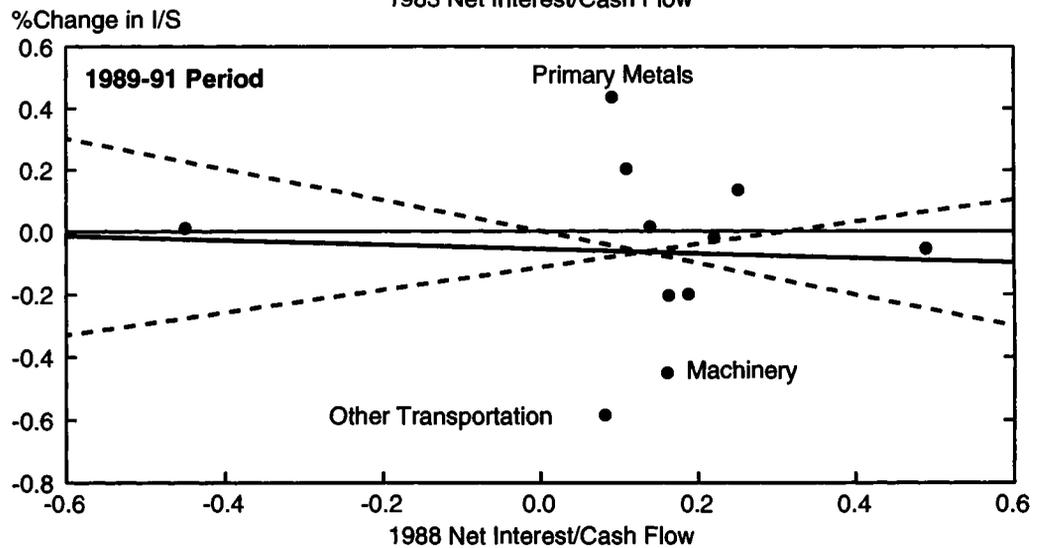
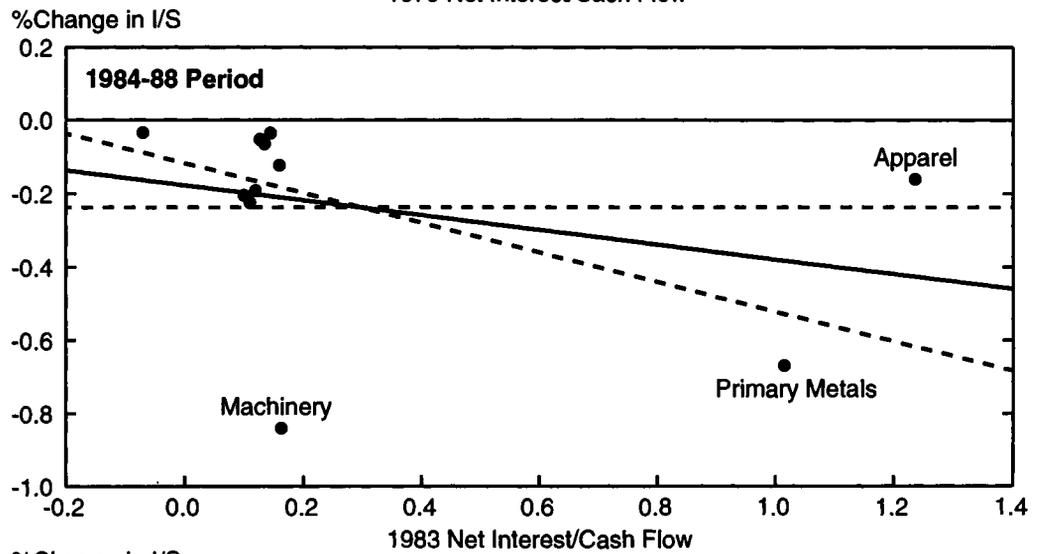
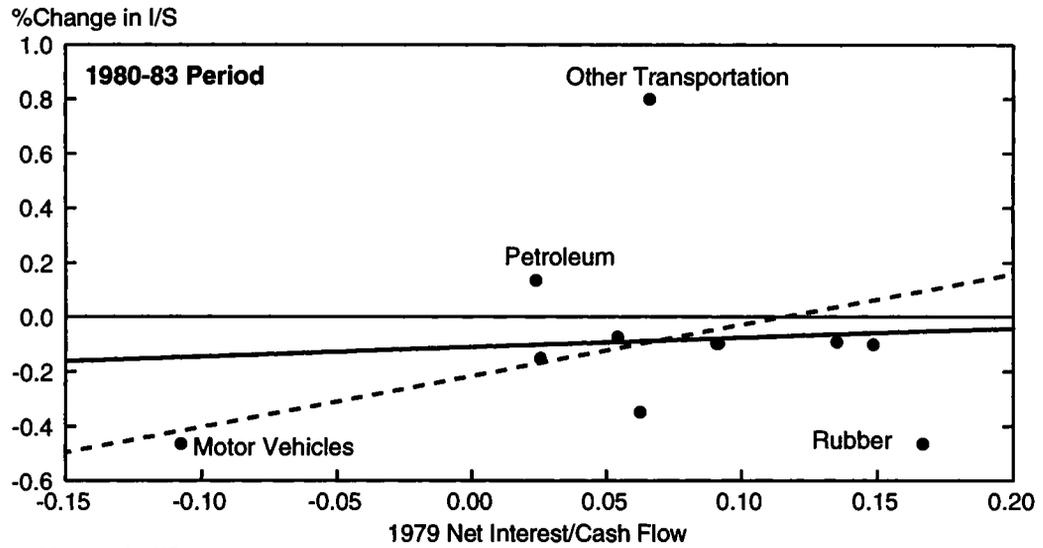


*Causes and Consequences*

**Chart 17: Percentage Change in Investment against Net Interest/Cash Flow**



**Chart 18: Change in Inventory/Sales against Net Interest/Cash Flow**



## Causes and Consequences

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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.<sup>26</sup> 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.<sup>27</sup> 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."

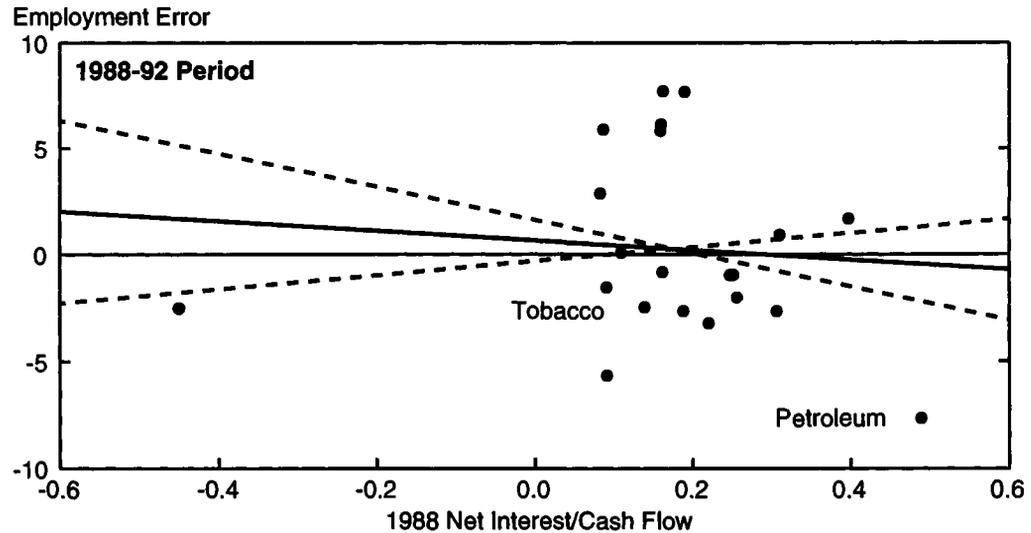
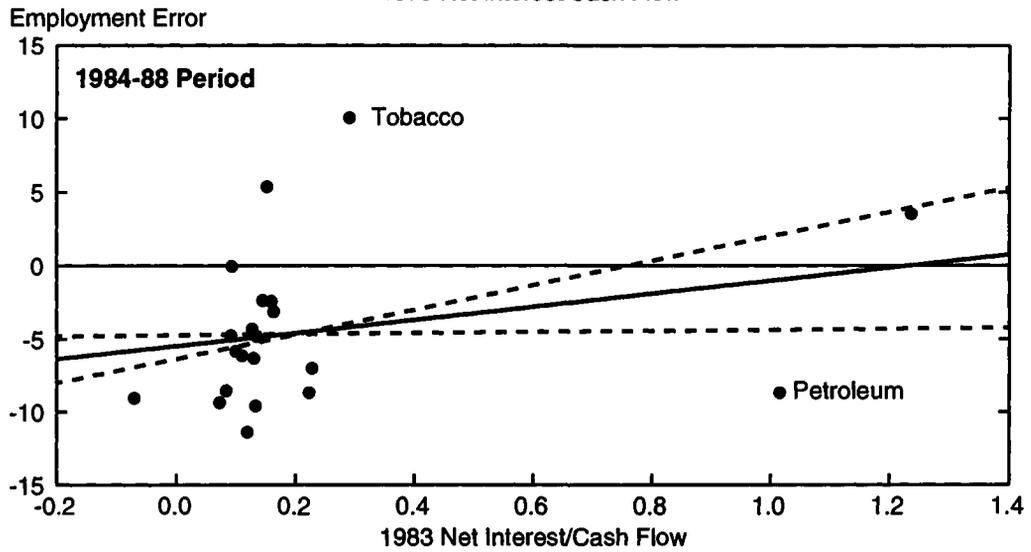
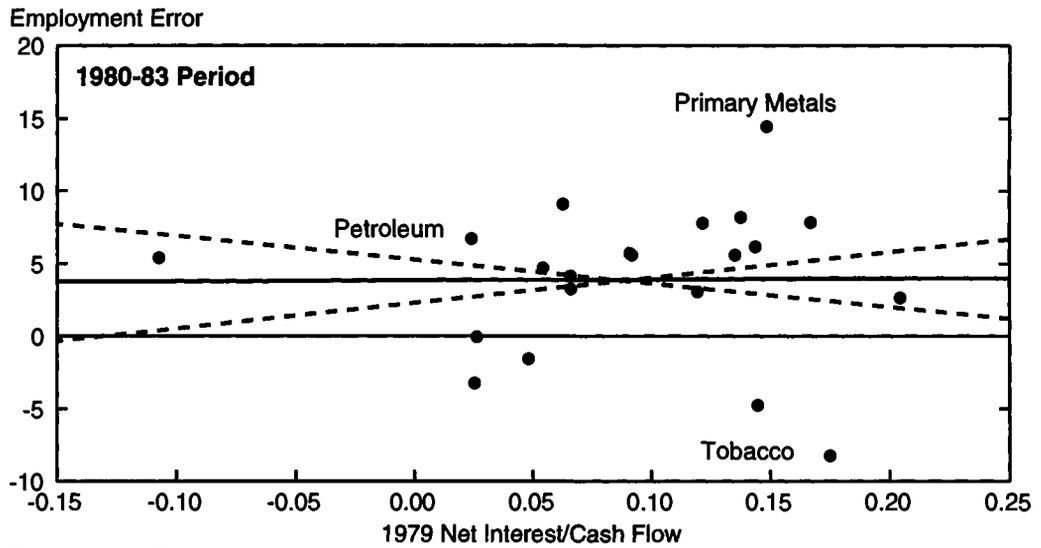
### Summary of Financial Distress Effects

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-

<sup>26</sup> An alternative view is that their productivity growth was surprisingly strong.

<sup>27</sup> The relevant charts are available from the authors.

**Chart 19: Sum of Errors of the Percentage Change in Employment against the Percentage Change in Industrial Production Plotted against Net Interest/Cash Flow**



## Causes and Consequences

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.<sup>28</sup> These three periods encompass the last three prolonged recessions and the initial stages of recovery (actually, with 1980 included, the last four

<sup>28</sup> 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 <sup>a</sup>			
	Low	Second	Third	High
<b>Average employment</b>				
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
<b>Average real sales<sup>b</sup></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.

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:

$$\log E_{ijt} - \log E_{ijt-1} = a \log E_{ij0} + b(D/A)_{ij0} + c_j + d_t + e.$$

$E_{ijt}$  = 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.

## Causes and Consequences

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:

$$\text{Log } l_{ijt} - \text{Log } S_{ijt} = a \text{ log } E_{ij0} + b(D/A)_{ij0} + c_j + d_t + e.$$

$l_{ijt}$  = 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.

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:

$$\text{Log NP}_{ijt} - \text{Log S}_{ijt} = a \log E_{ijo} + b(D/A)_{ijo} + c_j + d_t + e.$$

$\text{NP}_{ijt}$  = 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:

$$\text{Log RD}_{ijt} - \text{Log S}_{ijt} = a \log E_{ijo} + b(D/A)_{ijo} + c_j + d_t + e.$$

$\text{RD}_{ijt}$  = 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.<sup>29</sup>

## 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

<sup>29</sup> 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.

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,<sup>1</sup> 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,<sup>2</sup> 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

<sup>1</sup> For a collection of such opinions, see “The Credit Crunch For Small- and Medium-Sized Businesses”, Field Hearing before the Committee on Banking, Finance, and Urban Affairs, House of Representatives. March 20, 1993.

<sup>2</sup> “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.

**Appendix 2 Table 1: Dependent Variable: Employment Growth**

Industry	Coefficient		R <sup>2</sup>	Durbin-Watson
	Constant	Production Growth		
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 <sup>a</sup>				
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.

<sup>a</sup>. Negative coefficient on both current and lagged production variables.

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### Appendix 2 Table 2: Dependent Variable: Log of Real Gross Investment

Industry	Coefficient		R <sup>2</sup>	Durbin-Watson
	Constant	Log Production		
Nonelectric machinery <sup>a</sup>				
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 <sup>a</sup>				
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 <sup>a</sup>				
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 <sup>a</sup>				
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 <sup>a</sup>				
Textiles <sup>a</sup>				

Notes: Standard errors in parentheses. Estimation period: 1980-91.

<sup>a</sup> Negative coefficient on both current and lagged production variables.

**Appendix 2 Table 3: Dependent Variable: Real Inventory/Sales Ratio**

Industry	Coefficient		R <sup>2</sup>	Durbin-Watson
	Constant	Time		
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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