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Deposit insurance reform in the FDIC Improvement Act: The experience to date

George J. Benston and George G. Kaufman

Introduction and summary

At yearend 1991, Congress enacted fundamental deposit insurance reform for banks and thrifts in the Federal Deposit Insurance Corporation Improvement Act (FDICIA). This reform followed the failure of more than 2,000 depository institutions in the 1980s. Many of these institutions failed at a high cost to both shareholders and taxpayers, as a result of the incentive-incompatible structure of the government-provided deposit insurance at the time. This structure encouraged both moral hazard behavior by banks that increased their risk taking and poor agent behavior by regulators that delayed the imposition of appropriate regulatory sanctions on financially troubled institutions. As a result, the ultimate cost of resolution of insolvent institutions paid by U.S. taxpayers amounted to almost 3 percent of gross domestic product (GDP).[1] FDICIA put deposit insurance and other parts of the federal government safety net underlying depository institutions on a more incentive-compatible basis by providing for a graduated series of regulatory sanctions that mimic market discipline. These sanctions first may and then must be applied by the regulators to troubled banks. In this article, we review the important features of both the old and new safety net structures and evaluate the early results of FDICIA.

At yearend 1990, U.S. banking was in its worst shape since 1933. Some 1,150 commercial and savings banks had failed since yearend 1983, almost double the number of failures from the introduction of the Federal Deposit Insurance Corporation (FDIC) in 1934 through 1983 and equal to 8 percent of the industry at yearend 1980. Another 1,500 banks were on the FDIC's problem bank list (rated in the lowest two examination categories). Five percent of the total number of banks, or some 600 banks, which held 25 percent of the industry's total assets, reported book-value capital of less than 4 percent of their on-balance-sheet assets. Under FDICIA, these banks would have been classified as undercapitalized.

The thrift industry was in even worse shape. More than 900 federally insured savings and loan associations (S&Ls) were resolved or placed in conservatorship from 1983 to 1990. However, because there were far fewer S&Ls than banks, this number represented 25 percent of the 4,000 odd associations operating at the beginning of the decade.[2] Many more associations were economically insolvent, but were permitted to continue to operate as a result of government guarantees of their deposit liabilities. Nearly 400 S&Ls reported tangible book-value capital ratios of less than 3 percent in 1990, including more than 100 that reported negative ratios. The cumulative losses incurred by the failed institutions exceeded $100 billion in 1990 dollars. These losses resulted in the insolvency and closure of the S&L's government insurance agency—the Federal Savings and Loan Insurance Corporation (FSLIC)—and its replacement by the Resolution Trust Corporation (RTC) and the Savings Association Insurance Fund (SAIF) within the FDIC, which were capitalized primarily by taxpayer funds authorized in the Financial

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Institutions Reform, Recovery, and Enforcement Act (FIRREA) of 1989. FIRREA provided some $150 billion of taxpayer funds to resolve insolvent associations.

During 1991, the banking industry continued to deteriorate rapidly. There was widespread fear that the banks would go the way of the S&Ls and the FDIC the way of the FSLIC, requiring further significant taxpayer funding. In response, at yearend, Congress enacted FDICIA. The act brought fundamental deposit insurance and prudential regulatory reform and is the most important banking legislation in the U.S. since the Banking Act of 1933 (Glass-Steagall). It dramatically altered the banking and regulatory playing field.

At yearend 1997, the banking industry had recovered significantly and was in its best financial health in decades. Commercial bank profitability was at record levels since the introduction of deposit insurance and almost no banks were classified as undercapitalized. The thrift industry also rebounded, but more slowly, and experienced a decline in assets as many resolved institutions were acquired by commercial banks.

In this article, we briefly review the causes of the U.S. banking and thrift debacles of the 1980s; describe the major aspects of and rationale for the corrective legislation enacted in FDICIA; summarize the recovery of banking in the 1990s; evaluate the effectiveness of the new prudential regulatory structure; and recommend further improvements. We conclude that under FDICIA, deposit insurance appears to have been put on a more workable incentive-compatible basis that should reduce the tendency for banks to take excessive risks and for regulators to unduly delay imposing sanctions on financially troubled institutions. However, because of the rapid recovery of the banking system, the effectiveness of the new structure has not yet been put to a real test, particularly for banks previously perceived as too big to fail. Regulators can improve the probability of the structure working as intended at least cost to taxpayers by increasing bank capital requirements to levels closer to those required by the market for noninsured bank competitors and by reinforcing their own political resolve to act consistently with the spirit as well as the letter of FDICIA.

Overview of the debacle

The savings and loan industry

Although the thrift and banking breakdowns in the 1980s are often lumped together, there are important differences. The details of the debacles have been extensively reviewed elsewhere (for example, Barth, 1991, Bartholomew, 1994, Benston and Kaufman, 1990, Day, 1993, Jaffee, White, and Kane, 1989, Kane, 1985 and 1989, Mayer, 1990, National Commission, 1993, U.S. Congress, Congressional Budget Office, 1993, and White, 1991). Here, we provide a brief overview to help set the stage for our analysis.

The thrift breakdown preceded the banking breakdown and was initially and primarily caused by the S&Ls' significant interest rate risk exposure in a period of large, abrupt, and unexpected increases in interest rates in the late 1970s. Both the duration mismatch and the interest rate increases can be blamed primarily on government policy. Since 1934 the federal government has attempted to stimulate home ownership by supporting long-term, fixed interest rate residential mortgages. Before deposit insurance was introduced in 1934, S&Ls rarely extended mortgages with stated maturities much in excess of ten years. After the introduction of deposit insurance, and particularly after World War II, S&Ls lengthened the maturities of their fixed rate residential mortgage loans first to 20 years and then to 30 years. Through the 1970s, they were in large measure prohibited from making variable rate loans.

In the era before deposit insurance, S&Ls raised funds through accounts titled share capital, which paid dividends, not interest, declared at the end of an income reporting period. In addition, the institutions could require advanced notice for withdrawal of funds. As a result, the maturity of their liabilities was effectively intermediate term. However, starting in 1934, to encourage the inflow of savings to finance mortgages, S&L shares were increasingly insured against loss by the FSLIC on the same basis as bank deposits. This effectively turned S&L shares into deposits, most of which were short term. Finally, in the 1960s, the shares were legally converted into deposits. The net effect of these government-induced changes was to greatly increase the interest rate risk exposure of S&Ls, making the industry an accident waiting to happen. The accident happened in the late 1970s, when market interest rates increased sharply. The increase reflected an even sharper rise in inflation, attributable largely to earlier excessive expansion in the money supply by the Federal Reserve.

The precarious situation in the thrift industry was exacerbated by the poorly structured and priced government-provided deposit insurance system, which caused two problems. One, it permitted S&Ls to engage in greater moral hazard behavior than noninsured firms by supporting their high-risk portfolios with insufficient capital. Two, it permitted the thrift regulators to be poor agents for their healthy institutions and taxpayer principals by delaying the imposition of adequate

sanctions on troubled associations and failing to resolve economically and, at times, even book-value-insolvent, institutions in a timely fashion. Moreover, as noted above, the system actually encouraged the institutions to assume greater interest rate risk by promoting long-term fixed rate mortgages financed by short-term deposits. Had it not been for credible federally provided deposit insurance, savers would have been less likely to have put their funds into financial institutions with such duration-unbalanced portfolios. In addition, when interest rates increased, runs by depositors to other, safer institutions would have forced the closure of unsound thrifts sooner. However, deposit insurance reduced the need for depositors to move their funds elsewhere and the need for the S&Ls' primary regulators—the Federal Home Loan Bank Board (FHLBB) and state agencies—to act quickly. Instead, in the early 1980s, the regulators were able to delay the day of reckoning. Among other actions, the regulators reduced the thrifts' book-value capital requirements, which already did not include capital losses from the interest rate increases, from 6 percent to 3 percent of assets and artificially puffed up even this amount of reported net worth by adopting *regulatory accounting practices* (RAP). RAP permitted such gimmicks as deferral of losses on asset sales and inclusion as an amortizing asset (misleadingly termed *goodwill*) of the negative net worth of insolvent S&Ls that were merged with other institutions (Barth, 1991, and Benston and Kaufman, 1990).[3]

The FHLBB engaged in these time-gaining measures for a number of reasons, including:

- being overwhelmed by the sudden large number of troubled and insolvent institutions;
- having insufficient reserves to resolve the insolvencies (the FSLIC was itself economically insolvent);
- concern that official recognition of the need for taxpayer funding would enlarge the federal government deficit;
- concern that official recognition would spread fear among depositors and ignite runs on all S&Ls and possibly even banks; and
- wishful thinking that, because many of the losses were *only* unrecognized paper losses, they would be reversed because interest rates are cyclical and are bound to decline.

Interest rates did decline after 1982 and the regulators partially won their bet. But it was only a pyrrhic victory. Many of the insolvent or undercapitalized associations quickly incurred substantial credit losses either because of sharp economic downturns in their market areas or because they gambled for resurrection and lost. Local economic downturns started in the Energy Belt in the southwest in the mid-1980s and spread to New England and the Mid-Atlantic states in the late 1980s. Combined with stringent restrictions on the tax deductibility of losses on real estate enacted in 1986, these downturns resulted in severely depressed real estate prices. Regulators were ill-prepared to supervise adequately the new powers granted to S&Ls in the legislative deregulation of the early 1980s and were under pressure to help cut federal government spending by reducing their personnel levels. In addition, the disarray in the industry encouraged a sharp increase in fraud. As losses mounted, policymakers increased their denials and forbearance, partly in response to political pressures and partly to delay a big hit to the budget deficit. At this time, many individual S&Ls and their major trade association—the United States League of Savings Associations—stepped up their contributions to members of Congress to keep troubled associations open. As a result, instead of shrinking, S&L assets more than doubled between 1980 and 1988. However, the industry and policymakers were finding it increasingly difficult to conceal the truth. In 1987, Congress made one last attempt in the Competitive Equality Banking Act (CEBA) to fix the problem without resorting to public funds by borrowing against the FSLIC's projected future premium income.[4]

In 1989, shortly after the presidential elections (during which, by implicit agreement, little mention was made of the crisis), the regulators, Congress, and the Bush Administration finally acknowledged that some $150 billion in public funding was needed to resolve thrift insolvencies. In exchange, FIRREA required the closure of the FHLBB and its replacement as a regulatory agency with a new Office of Thrift Supervision (OTS), housed in the U.S. Treasury Department. The FHLBB's deposit insurance subsidiary, the FSLIC, was also abolished, and its insurance functions were transferred to the new SAIF, administered by the FDIC. This is one of the very rare instances when Congress terminated a government agency. In reality, however, the termination was more fiction than fact. Almost all of the affected personnel were transferred to the successor agencies.

Losses attributable to regulatory forbearance accounted for a substantial proportion of the total cost of recapitalizing the industry. Although Benston and Carhill (1994) provide evidence that many insolvent institutions did recover when interest rates declined in the mid-1980s, forbearance had a poor overall batting average in the 1980s, particularly after interest rates stopped declining. Most institutions that did not

attract additional private capital did not survive (Brinkmann, Horvitz, and Huang, 1996, Eisenbeis and Horvitz, 1994, Kane and Yu, 1996, National Commission, 1993, and U.S. Congress, Congressional Budget Office, 1991). While FIRREA provided the necessary public funding to resolve the thrift insolvencies, it introduced only minor changes in the structure of deposit insurance or prudential regulation. Instead, it sought to lay the blame for the debacle on incompetent regulators and competent crooks.

The commercial bank sector

Because they had more duration-balanced portfolios, commercial banks were not weakened greatly by the sharp increases in interest rates in 1979–81. However, like the S&Ls, commercial banks were operating with record low capital ratios. Hence, many were unable to absorb the credit losses from the regional recessions and commercial real estate lending that also affected S&Ls (Barth, Brumbaugh, and Litan, 1992, and Kaufman, 1995). The effects of these adverse events were magnified by restrictions on banks operating across state lines that limited their ability to reduce risk through geographical diversification. Seven of the ten largest banks in Texas failed in the late 1980s and two were merged in the aftermath of the recession in Texas, Oklahoma, Louisiana, and other states in the Energy Belt when the oil price bubble collapsed. In the early 1990s, the largest bank in New England and some of the largest savings banks in New York (which were also the largest in the country) failed when the real estate price bubble burst in New England and the Mid-Atlantic states. In addition, a number of large money center banks approached insolvency in the late 1980s as a result of defaults and near-defaults on loans to less developed countries made in the late 1970s (Fissel, 1991). By 1991, FDIC losses from bank failures had effectively wiped out its reserves. Indeed, on the basis of accepted insurance accounting, the FDIC was insolvent (Barth, Brumbaugh, and Litan, 1992). Coming on the heels of the seemingly ever-expanding S&L problem and the 1984 failure of the Continental Illinois Bank, the eighth largest bank in the country at the time, the increasing number of bank failures and the deteriorating condition of the industry as a whole gave rise to substantial public pressure on Congress to act swiftly to stem the crisis and ensure it would never happen again.

Development and enactment of FDICIA

Alternative proposals

By the late 1980s, numerous studies had identified poorly priced and structured federal deposit insurance as a primary cause of the banking and thrift crises. The widespread problems represented massive regulatory failure. Most of these studies emphasized moral hazard behavior by the institutions as the chief culprit but, with rare exceptions (particularly Kane, 1985 and 1989), overlooked the poor agent behavior of the regulators. From these studies, a large number of proposals for reform of deposit insurance were developed. Among those that received serious consideration were the following: 1) terminating government insurance and replacing it with either private insurance or a system of cross-guarantees among banks; 2) maintaining government insurance, but dramatically scaling back individual account coverage; 3) reregulation of deposit interest rates and additional restrictions on bank loans and investments to control risk; 4) narrow or "fail-safe" banking; 5) risk-based deposit insurance premiums; and 6) structured early intervention and resolution (SEIR). (See Benston and Kaufman, 1988.)

Serious political obstacles developed to any plan that attempted to eliminate deposit insurance or to scale it back even moderately. In the U.S. as in almost every other country, some form of explicit or implicit insurance was viewed as a political fact of life (Benston, 1995).[5] Private insurance was viewed as not sufficiently credible and bank cross-guarantees as insufficient in an undercapitalized banking environment. Deregulation was (incorrectly) seen as an important cause of the debacle by some politicians, media commentators, and academics, and in retrospect the implementation of deregulation left much to be desired. However, little support developed for reestablishing deposit interest rate ceilings or rolling back the expansion of lending authority to consumer and commercial loans granted S&Ls in the early 1980s. Reregulation was viewed as too late and impractical. Technology had let the genie out of the bottle to stay. Narrow banking received support primarily from the academic and think-tank communities (for example, Benston et al., 1989, Bryan, 1988, and Litan, 1987). It would mean a substantial change in the way banking had been conducted, which Congress and the banking industry were reluctant to initiate.[6] While risk-based insurance premiums partially addressed the moral hazard problem, how they would be determined was unclear and, by themselves, they did not address the regulatory agency problem. This left SEIR on the congressional radar screen.

Structured early intervention and resolution

Although various parts of SEIR had been proposed earlier, it was developed as a comprehensive package as part of a broader project on banking reform sponsored by the American Enterprise Institute in 1986–87 (Benston and Kaufman, 1988). The concept was subsequently modified and improved by a

number of scholars and policymakers (Benston et al., 1989, and Shadow Financial Regulatory Committee, 1992). SEIR offered the advantages of basically maintaining the existing system's banking and deposit insurance structures, while correcting its primary flaws.

Because SEIR maintains government-provided deposit insurance, although on a more restricted basis, market discipline on banks remains weaker than otherwise and the government maintains a direct interest in the financial health of the banks. It continues to protect its interest through regulatory discipline. But, SEIR changes the structure of deposit insurance and prudential regulation from incentive-incompatible to incentive-compatible. To deal with the moral hazard problem, regulatory sanctions on deposit-insured institutions mimic those the market imposes on similar enterprises that do not hold federally insured debt. Agency problems are dealt with by first allowing and then requiring specific intervention by the regulatory authorities on a timely basis. Thus, SEIR imposes on banks the same conditions that the banks impose on their own borrowers. SEIR calls for

- higher capital, with subordinated (explicitly uninsured) debt counted fully as capital;
- structured, prespecified, publicly announced responses by regulators triggered by decreases in a bank's performance (such as capital ratios) below established numbers;
- mandatory resolution of a capital-depleted bank at a prespecified point when capital is still positive; and
- market value accounting and reporting of capital.

In addition, the proposal called for maintaining government-provided deposit insurance for "small" investors. Below, we discuss each of these components.

For banks protected by the safety net (deposit insurance, central bank discount window, and central bank settlement finality), capital as a percentage of assets should be equivalent to the ratio maintained by uninsured nonbank competitors of banks, which is set by the marketplace. For example, bank book-value capital/asset ratios had dropped to 6 percent in the 1980s, while insurance companies, finance companies, and similar financial companies generally maintained capital ratios of between 10 and 25 percent (Kaufman, 1992). The SEIR proposal specified four capital/asset ratio zones or tripwires. *Adequately capitalized* banks, with ratios approximately equal to those of firms without government-provided deposit insurance (say, 10 percent or above with capital measured by market values) would be subject to minimum prudential supervision and regulation. Supervision would be limited to determining that the bank was reporting correctly and was not being managed fraudulently or recklessly. Should a bank's capital ratio fall below this level, say below 10 percent but above 6 percent, it would fall into the *first level of supervisory concern*. A bank in this zone would be subject to increased regulatory supervision and more frequent monitoring of its activities. The authorities could, at their discretion, impose such sanctions on the bank as restricting its growth, prohibiting it from paying dividends, and requiring a business plan for quick recapitalization. A bank would fall into the *second level of supervisory concern* if its capital/asset ratio fell below the next prespecified ratio (for example, 6 percent). The authorities then *must* impose additional and harsher sanctions, including still more intensive monitoring and supervision, restrictions on deposit rates, suspension of dividends, suspension of interest payments on subordinated debt, and prohibition of fund transfers to related entities. At or before this point, the bank would have considerable incentives to restore its capital ratio either by raising more capital or by shrinking its assets.

Finally, if the capital ratio fell below the third specified number, say 3 percent, the authorities *must* resolve the bank quickly through sale, merger, or liquidation. However, rather than permit a government agency to take at least temporary control and possibly dissipate its remaining capital, a solvent bank most likely would voluntarily raise its capital ratio into compliance or sell to or merge with another institution. Any losses incurred in resolution or from the authorities not acting quickly enough would be charged pro-rata to the insurance agency, uninsured depositors, and other creditors.

The structured, predetermined capital/asset ratios that trigger actions by the regulatory authorities have two purposes. One is to reduce a bank's moral hazard behavior. Similar to covenants that creditors impose on borrowers in most private loan and bond contracts, SEIR is intended to turn troubled institutions around before insolvency. The performance zones serve as speed bumps or tripwires to slow the deterioration of weak banks and reduce incentives and opportunities for them to increase their gambling as they approach the floor of a zone. Equally important, banks are encouraged to perform better by enticements, such as additional product and geographic powers and reduced monitoring in the highest zone. Thus, SEIR includes carrots as well as sticks.

The second purpose is to reduce the regulators' agency problem and discourage forbearance. The regulators first have the opportunity of using their discretion to get banks to restore depleted capital. But, if

the banks do not respond and their capital ratios continue to fall, appropriate sanctions, including resolution at least cost to the FDIC at a prespecified low but positive capital level, become mandatory. The regulatory rules supplement but do not replace regulatory discretion. Requiring and enforcing resolution at a predetermined and explicit minimum capital ratio represents a *closure* rule. Without such a rule, regulators can delay closing insolvent institutions because deposit insurance has reduced the probability of runs by depositors, which previously had forced at least temporary closure. Deposit insurance has effectively shifted control of the timing of the closure of an insolvent bank from the market to the regulators.[7]

Likewise, under SEIR, institutions can no longer effectively bring political pressure on regulators to forebear from closing them down. Nor would the institutions be given second and additional chances to gamble for resurrection. Resolution at a positive capital level does represent a "taking" by the government; any remaining funds would be returned to the shareholders. However, if the shareholders had perceived greater value in the bank, they would have recapitalized it before the closure tripwire was hit. Moreover, by specifying and permitting gradual increases in the strength of the sanctions, the multiple-performance-zone structure makes the imposition of sanctions by the regulators both more likely and more credible than if sudden and severe sanctions were specified.

Market value accounting for capital is desirable both to provide a more accurate picture of the financial condition of institutions and to increase the transparency and accountability of the regulatory agencies. Because banks frequently delay and under-reserve for loan losses and do not include changes in value due to changes in interest rates, reported book value capital tends to lag market value capital. Under SEIR, deposit insurance ceilings on individual accounts would be maintained at most at the existing $100,000 level, but would be strictly enforced *de facto* as well as *de jure*. Uninsured depositors would lose the same proportion of their uninsured funds in resolutions as the FDIC, thereby encouraging market discipline to supplement regulatory discipline. However, if the closure rule were strictly enforced, it is doubtful that the insurance would be required. In effect, all deposits would be collateralized by assets of at least the same market value (the bank would effectively be a narrow bank) and deposit insurance would be redundant, except in cases of massive fraud, inadequate monitoring by the regulatory agencies, or large, rapid declines in asset values across the board.

Legislative adoption and modification of SEIR in FDICIA

Although SEIR was not the first choice of most academics, it appealed to both Congress and the Administration in the early 1990s as a politically feasible, quickly implementable, and effective solution to minimize both the future costs of the ongoing banking debacle and the likelihood of a recurrence (Benston and Kaufman, 1994a, and Carnell, 1997a). What could appeal to Congress more than passing a law that promised to outlaw future losses at insolvent institutions without a radical change in the banking or deposit insurance structures or an appropriation of taxpayers' funds?

A modified form of SEIR was first introduced in the Senate in 1990 as part of a larger banking bill, but failed to be adopted. After much of it was recommended in a major study of the deposit insurance system by the Treasury Department that was mandated by FIRREA (U.S. Department of the Treasury, 1991), it was reintroduced in the Senate and introduced in the House of Representatives in early 1991. The bill included wider product and geographic powers for banks, but these provisions were deleted before final passage. The greatest opposition to SEIR, which resulted in the addition of the prompt corrective action (PCA) and least-cost resolution (LCR) provisions, came from bank regulators, who correctly perceived it as a reduction in their power, visibility, and freedom to micromanage banks (Horvitz, 1995).[8] Although the regulators' own credibility had been weakened greatly by the banking crisis and criticism of their response, they still were able to weaken many of the provisions that reduced their discretionary powers before FDICIA was passed by Congress and signed by the President at yearend 1991.[9]

The regulators further diluted the potential effectiveness of the act by drafting weak regulations to implement it (Benston and Kaufman, 1994b, and Carnell, 1997b). For example, the act specifies five capital/asset ratios, but largely delegates the setting of the numerical values of the zones to the banking agencies. (Table 1 shows selected sanctions and the numerical tripwire values established by the regulators). The regulators set the threshold values so low that almost all banks were classified as "adequately capitalized" or better, even before the industry had fully recovered. Moreover, after full recovery, when the capital ratios of most banks easily exceeded the required minimums for "well capitalized," the regulators opposed even small increases in the threshold values that would have demoted only a few banks.

TABLE 1

Summary of prompt corrective action provisions of FDICIA, 1991

Zone	Mandatory provisions	Discretionary provisions	Capital ratios (%) Total	Risk-based Tier 1	Leverage Tier 1
1. Well capitalized			>10	>6	>5
2. Adequately capitalized	1. No brokered deposits, except with FDIC approval		>8	>4	>4
3. Undercapitalized	1. Suspend dividends and management fees 2. Require capital restoration plan 3. Restrict asset growth 4. Approval required for acquisitions, branching, and new activities 5. No brokered deposits	1. Order recapitalization 2. Restrict inter-affiliate transactions 3. Restrict deposit interest rates 4. Restrict certain other activities 5. Any other action that would better carry out prompt corrective action			
4. Significantly undercapitalized	1. Same as for Zone 3 2. Order recapitalization[a] 3. Restrict inter-affiliate transactions[a] 4. Restrict deposit interest rates[a] 5. Pay of officers restricted[a]	1. Any Zone 3 discretionary actions 2. Conservatorship or receivership if fails to submit or implement plan or recapitalize pursuant to order 3. Any other Zone 5 provision, if such action is necessary to carry out prompt corrective action	<6	<3	<3
5. Critically undercapitalized	1. Same as for Zone 4 2. Receiver/conservator within 90 days[a] 3. Receiver if still in Zone 5 four quarters after becoming critically undercapitalized 4. Suspend payments on subordinated debt[a] 5. Restrict certain other activities				<2[b]

[a]Not required if primary supervisor determines action would not serve purpose of prompt corrective action or if certain other conditions are met.

[b]Tangible equity only.

Source: Board of Governors of the Federal Reserve System.

At yearend 1997, only 2 percent of all commercial banks were not classified as well capitalized. Studies completed after enactment of the legislation conclude that had these low numerical values for the capital tripwires been in place in the 1980s, the required PCA sanctions would likely have been ineffective (Jones and King, 1995, FDIC, 1997, and Peek and Rosengren, 1996, 1997a, and 1997b). Indeed, a study by the General Accounting Office (GAO, 1996) reported that less than 20 percent of the banks and thrifts classified by the FDIC as problem institutions between 1992 and 1995 were also classified as undercapitalized.

The act specifies three definitions of capital—one leverage ratio and two risk-based ratios—and differentiates between equity (tier 1) and nonequity (tier 2) capital accounts. This basically follows the capital guidelines developed in the Basle Accord for international banks in industrial countries. Nevertheless, little if any empirical support has been found for these risk weights (Grenadier and Hall, 1995, Kane, 1995, and Williams, 1995). Rather, they operate as a form of credit allocation. Nor is the division of capital into the two tiers supported by economic or financial theory.

FDICIA also requires regulators to develop a means for estimating market values to the "extent feasible and practical." However, the agencies quickly viewed market value accounting as neither feasible nor practical and did not even fully implement the Financial Accounting Standards Board's standards with respect to marking securities to market for purposes of computing capital. During the congressional hearings, the time delay permitted for mandatory resolution of undercapitalized institutions was lengthened and limited waivers were permitted.

Implementation of the act's requirement to include interest rate risk in risk-based capital was postponed a number of times beyond its scheduled June 1993 deadline and finally left up to supervisory discretion on a case-by-case basis. Restrictions on permitting banks to maintain interbank balances at and extend credit to weak banks, which were included at the behest of the regulators to protect against systemic risk, were weakened. Also weakened substantially were first-time-ever penalties on the Federal Reserve for lending through the discount window to banks that subsequently failed. This provision was introduced after a congressional study found that 90 percent of all banks that had received extended credit through the discount window in the late 1980s later failed (U.S. House of Representatives, 1991). The penalty to the Fed for such lending was reduced from sharing in any loss resulting from the bank's failure—thereby putting the Fed's own funds at risk—in an earlier draft to effectively only a small loss of interest income received from a failed bank.

Some who claim that the prompt correction and resolution tripwires would have been ineffective in the 1980s blame this on the provisions of FDICIA (for example, Peek and Rosengren, 1996, and FDIC, 1997). In part, this reflects their failure at the time to read the act carefully. The only numerical value specified in the act is one defining critically undercapitalized banks. As noted above, the act delegates setting all the other numerical values for the tripwires to the regulatory agencies. Moreover, the sole numerical capital value specified in the act—2 percent tangible equity to total assets—is a minimum, which can be exceeded or superseded by other definitions of capital. Some critics also argue that the use of capital, per se, as an indicator of bank performance is flawed because it is a lagging indicator of performance and less informative than examiner evaluations. As already noted, however, the act encourages regulators to move away from historical book value capital, which permits delayed and under-reserving for loan losses and excludes losses due to interest rate changes, and toward market value accounting, which would make capital a more accurate and timely indicator. (The role of bank capital is examined in greater detail in Benston, 1992, Berger, Herring, and Szego, 1995, Kane, 1992, and Kaufman, 1992.) In addition, the act permits regulators to downgrade banks and impose harsher sanctions on the basis of examination reports and other information. Thus, if the regulators failed to increase the numerical values of the capital tripwires and enhance the definition of capital to make the tripwires more effective, the fault lies with the regulators, not the legislation.

As is true for much federal legislation, FDICIA is long and complex and contains much more than deposit insurance reform. This has contributed to a lack of understanding of both the purpose and contents of the act. There are numerous provisions that deal only marginally with prudential matters and some that appear to have been motivated more by bank bashing and the personal agendas of individual members of Congress. The latter include a number of sanctions on troubled banks that permitted restrictions on employee compensation and the establishment of minimum ratios of book to market values of a bank's stock. Although for the most part these provisions were harmless (and possibly useful if interpreted wisely by the regulators) and some were repealed, the regulators and many bankers used them as examples of counterproductive and costly regulatory micromanagement of banks to impugn the overall act. They were at least temporarily successful in giving it a bad name (Kaufman,

1993, and Shadow Financial Regulatory Committee, 1996a and 1996b).

The establishment of the capital zones and the mandatory regulatory responses by FDICIA represent partial replacement of regulatory discretion by rules, somewhat like the partial replacement of Federal Reserve lender of last resort discretion by FDIC insurance rules following the Fed's failure to prevent the economic and banking crisis of the early 1930s. However, the FDICIA sanctions become mandatory only after the discretionary sanctions prove ineffective in improving a bank's performance and restoring its capital to a satisfactory percentage of assets. Thus, the mandatory sanctions serve as credible backup that should strengthen rather than weaken the regulators' discretionary powers. Moreover, because both the discretionary and the mandated sanctions and other rules are explicit and known a priori, they give the regulators stronger ex-ante influence in helping to shape banks' future behavior. (The design and the working of the PCA sanctions are analyzed in detail in Bothwell, 1997, and Carnell, 1997a.)

In addition to the PCA sanctions, FDICIA sought to further reduce the incentive for moral hazard behavior by requiring the FDIC to inaugurate risk-based deposit insurance premiums, which it did promptly. The risk classifications are based on the FDICIA capital categories and the regulatory agencies' examination ratings. In the first years, the spread between the premiums charged to the safest and riskiest banks was considerably narrower than that assigned by the market to the noninsured debt of these banks (Fissel, 1994). Over time, the premium spreads were widened, although almost all banks qualified for the safest bank category. In 1995, the Bank Insurance Fund (BIF) was recapitalized to the maximum 1.25 percent of insured deposits required in FDICIA, and premiums for all but a few banks were effectively reduced to zero. Legislation adopted in late 1996 increased the banks' premiums slightly by requiring them to contribute to meeting the payments on the FICO bonds, which, as noted earlier, were in danger of default from insufficient premium revenues from S&Ls only. The legislation also required S&Ls to make a one-time payment to recapitalize SAIF to the required 1.25 percent level and reduced their future insurance premiums to the same level as that of the banks, except for an additional 6 basis point charge for the FICO bonds.

FDICIA additionally attempts to increase the accountability of the regulators in carrying out their delegated responsibilities. The FDIC is required to compute and document the costs of resolving a troubled institution in alternative ways, justify its selection of the option used as the least-cost option, and have a report prepared by the agency's inspector general if it incurs a material loss. This documentation must be provided to the Administration and Congress and is audited annually by the GAO for compliance with the provisions of the act. The first GAO annual reviews were critical of both the FDIC's and the RTC's PCA and LCR procedures (GAO, 1994a and 1994b). Likewise, the FDIC's inspector general was critical of the agency's early implementation of PCA in 1993 and the first half of 1994 (FDIC, 1994). In response, both organizations changed their procedures and received better evaluations in subsequent GAO reviews, although a more recent GAO report still includes criticisms of the agencies' PCA directives through 1995.

Effective January 1, 1995, the FDIC is prohibited from protecting uninsured depositors or creditors at any failed bank if it would result in an increased loss to the deposit insurance fund. However, an exemption from LCR is provided for banks that regulators judge as too-big-to-fail (TBTF) cases, in which not protecting the banks' uninsured depositors or creditors from loss "would have serious adverse effects on economic conditions or financial stability." This exemption requires a determination that the country's financial security is threatened and that FDIC "assistance [to failed banks] ... would avoid or mitigate such adverse effects" by the Secretary of the Treasury, based on the written recommendation of two-thirds of the FDIC Board of Directors and the Board of Governors of the Federal Reserve System and consultation with the President. Moreover, any loss incurred by the FDIC from protecting insured claimants must be recovered with a special assessment on all insured banks based on their total assets, rather than just domestic deposits, the current base for insurance premiums. Thus, this assessment affects large banks proportionately more than do the regular assessments and makes it less likely that the protected bank's competitors would be supportive of such a rescue. Finally, the GAO must review the basis for the decision. The requirement to justify violations of the act, even ex-post, is likely to improve the regulators' accountability and make them think twice before taking actions that are outside the spirit of the act (Mishkin, 1997). Thus, compared with the pre-FDICIA situation, TBTF is likely to be used rarely, if at all.[10]

The recovery of banking in the 1990s

Banking recovered dramatically in the early 1990s. The number of bank failures declined steadily from 221 in 1988, to 127 in 1991, to 41 in 1993, to five in 1996, and only one in 1997. As shown in table 2, at yearend 1990, 5 percent of all BIF-insured banks,

TABLE 2

FDICIA capital positions of U.S. commercial banks, 1990–97
(percent of total banks or assets)

FDICIA capital zone	December 1990		December 1991		December 1993		December 1997[a]	
	Number of banks	Dollar assets	Number of banks	Dollar assets	Number of banks	Dollar assets	Number of banks	Dollar assets
Well capitalized	85.6	37.0	90.7	47.9	98.1	96.3	97.9	98.5
Adequately capitalized	9.8	37.6	6.2	43.8	1.5	3.5	2.0	1.4
Undercapitalized	2.5	23.1	1.7	7.6	0.2	0.1	0.1	–
Significantly undercapitalized	0.9	1.1	0.6	0.4	0.2	0.1	–	–
Critically undercapitalized	1.2	1.2	0.8	0.3	0.1	–	–	0.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Number of banks	**12,172**		**11,777**		**10,856**		**9,403**	

[a]Includes all BIF–insured commercial and savings banks.
Source: Federal Reserve Bank of Chicago and Federal Deposit Insurance Corporation.

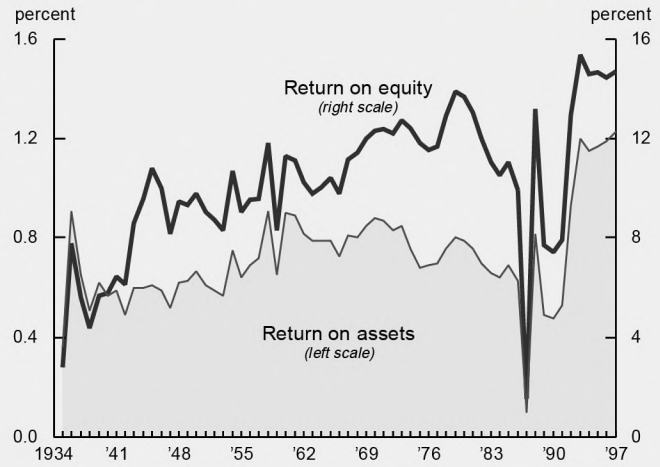
holding 25 percent of all bank assets, would have been classified as undercapitalized (in the lowest three of the five FDICIA zones). By yearend 1993, only 0.5 percent, holding 0.2 percent of all bank assets, would have been so classified. At yearend 1997, there were hardly any undercapitalized banks. Over the same period, the percentage of banking assets at well-capitalized banks increased from 37 percent to nearly 99 percent. The improvement is somewhat overstated because it reflects, in part, the resolution and, therefore, disappearance of insolvent institutions. As shown in figure 1, returns on both assets and equity for the remaining commercial banks rose to record levels. Except for consumer loans, nonperforming loan rates, which were high through the 1980s, declined sharply, as did loan charge-offs.

The industry's book-value equity capital/assets ratio climbed above 8 percent at yearend 1993 for the first time since 1963, after having declined to below 6 percent. For large banks the increase was even greater. The increases reflected both high retained earnings from profits and record sales of new capital. From 1991 through 1993, sales of new stock issues by large bank holding companies totaled nearly $20 billion, 33 percent more than the amount of equity capital raised in the previous 15 years and approximately 10 percent of their book-value equity capital at yearend 1990. The increase in the industry's market value capital/asset ratio was even greater than the increase in the book-value capital/asset ratios. In 1990, stocks of publicly traded banks sold at about 80 percent of their book value. In 1995, they traded at nearly 150 percent of book value.

As a result of resolutions and improved profits and capital positions, there are fewer commercial banks that require special supervision. Problem banks peaked at more than 1,500 at yearend 1987, or 11 percent of the industry, and at over $500 billion in assets (held by some 1,000 banks) in early 1992, or 15 percent of all bank assets. By yearend 1993, there were fewer

FIGURE 1

Return on assets (ROA) and equity (ROE)



Source: Federal Deposit Insurance Corporation, *Quarterly Banking Profile*, Fourth Quarter 1997, p. 2.

than 500 problem banks, holding $250 billion in assets; and at yearend 1997, there were only 71 such banks, holding $5 million in assets. Some of the improvement reflects bank resolutions rather than recoveries, particularly in the early years.

The thrift industry has also recovered in the 1990s, but at a slower rate, and proportionately more of the industry's better performance reflects the disappearance of insolvent institutions. Between 1989, after the enactment of FIRREA, and 1995, the number of OTS-regulated institutions declined by 50 percent, from nearly 3,000 to about 1,400, and S&L assets dropped by 45 percent. At yearend 1990, 32 percent of the institutions, holding nearly 50 percent of total assets, would have been classified as undercapitalized. By yearend 1992, only 4 percent of the remaining institutions, holding 8 percent of assets, were so classified. At mid-year 1996, only 0.5 percent of the 1,397 associations were undercapitalized (table 3). The S&Ls' returns on assets and equity also improved sharply from negative values in 1990 to nearly 1 percent on assets and 11 percent on capital in 1996. At the same time, the corresponding values for commercial banks were 1.2 percent and nearly 15 percent, respectively.

In addition to the impact of FDICIA, a number of economic factors contributed to the recovery of banks and S&Ls. The national and regional economies recovered at a low inflationary rate, the residential and, particularly, the commercial real estate markets bottomed out and recovered, interest rates declined as monetary policy eased during the recession that started in mid-1990 and inflationary expectations receded, and the yield curve turned steeply upward, generating at least temporary profits to asset-long institutions.[11] In addition, the funding provided by FIRREA permitted the resolution of insolvent institutions that were making profitability difficult for solvent institutions by frequently paying higher-than-market interest rates to attract deposits and charging lower-than-market rates on their loans.

Evaluation of deposit insurance reform in FDICIA

How well has the deposit insurance reform enacted in FDICIA worked to date? The PCA and LCR provisions, even in their weakened form, appear to have been effective in reducing the moral hazard and agency problems previously associated with deposit insurance and to have contributed to the strengthening of the industry. Three aspects of the SEIR provisions of FDICIA are particularly important. First are the improved, but, at times, still less-than-prompt, actions of the regulatory authorities in penalizing poorly performing institutions and resolving institutions that do not meet FDICIA's minimum capital requirements. Second are the actions of banks and thrifts to exceed the law's minimum requirements by raising additional capital; this has made them less prone to fail and to take excessive risks. Third is the potential ending of the FDIC's protection of uninsured deposits at insolvent institutions and its imposition on these deposits of their pro-rata share of any losses incurred. This has given uninsured depositors at other institutions more reason to monitor their own institutions and the

TABLE 3

FDICIA capital positions of U.S. thrift institutions[a]
(percent of total thrifts or assets)

	December 1990[b]		June 1996	
FDICIA capital zone	**Number of thrifts**	**Dollar assets**	**Number of thrifts**	**Dollar assets**
Well capitalized	52.6	25.0	97.3	97.6
Adequately capitalized	15.5	26.4	2.3	2.4
Undercapitalized	10.2	18.5	0.4	0.1
Significantly undercapitalized	3.7	3.1	0.0	0.0
Critically undercapitalized	18.0	27.0	0.1	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**
Total thrifts	**2,539**		**1,397**	

[a]Regulated by the Office of Thrift Supervision.
[b]All thrifts, including those operated by the Resolution Trust Corporation.
Source: Office of Thrift Supervision.

institutions more reason to increase their capital to assuage depositors' concerns.

Prompt actions to correct institutions with inadequate capital and resolve undercapitalized banks at least cost

Despite the large number of resolutions, since the enactment of FDICIA, the regulatory agencies have not always initiated corrections as promptly or as firmly as the act requires. As noted earlier, the FDIC's inspector general (FDIC, 1994) found that the agency, for various reasons, had not used these tools in about one-third of a sample of 43 undercapitalized banks between December 1992 and July 1994. Likewise, the GAO (1996) found that through 1995 the Comptroller of the Currency and the Federal Reserve initiated PCA directives against only eight of a sample of 61 banks identified as undercapitalized at some time in 1993 and 1994, although the agencies generally resolved critically undercapitalized (the lowest capital zone) banks within the specified 90-day period. Despite frequent criticism that PCA zones based solely on capital do not make full use of the more current information the agencies possess, only twice between yearend 1992 and mid-1996 did the two agencies either downgrade banks from well capitalized to adequately capitalized or treat a bank as if it were in a lower zone on the basis of their own evaluation that the bank was "engaging in an unsafe or unsound practice" (Bothwell, 1997).

In addition, the GAO (1994a) found that the FDIC may not have marketed large failed banks effectively in 1992 and, thus, may have solicited too few bidders or the type of bid not likely to lead to least-cost resolution. A follow-up study (GAO, 1995) reported that the FDIC had improved its marketing practices in 1993. Nevertheless, the GAO found that, in a number of instances in 1995, the FDIC had failed to document its decisions on LCR as completely as required. Thus, despite the cries by the agencies that PCA and LCR would severely limit if not eliminate their discretion, the GAO concluded that to date "the subjective nature of the standards continues the wide discretion that regulators had in the 1980s over the timing and severity of enforcement actions" (GAO, 1996a, p. 57).

The FDIC's average loss rate has not declined significantly since the enactment of FDICIA. It averaged nearly 14 percent in the years immediately before and after enactment (Bothwell, 1997). In part, this may reflect the greater decline in large bank failures, resulting in proportionately smaller losses. Nevertheless, it would appear that the regulatory agencies could move faster to impose sanctions and to resolve undercapitalized institutions and reduce FDIC losses. Indeed, FDICIA-mandated annual reviews by the banking agencies' own inspectors general and the GAO of resolutions that involve material losses to the FDIC (losses that exceed $25 million) found that in three of the four such cases in 1995, the "bank regulators either did not take sufficiently aggressive enforcement actions to correct identified safety and soundness deficiencies or to ensure that troubled banks complied with existing enforcement actions" (GAO, 1996b, p. 5).

For large banks, FDIC losses might also be reduced by the depositor preference legislation, enacted in 1993 as part of the Omnibus Budget Reconciliation Act, although the complex dynamic implications of the act have yet to be sorted out (Kaufman, 1997). This legislation gives the FDIC and uninsured depositors at domestic offices of insured banks priority in failure resolution over the banks' depositors at overseas branches and general creditors, for example, Fed funds sellers. Previously, all these claimants had equal standing. Moody's responded to this change by quickly downgrading the newly subordinated obligations of some then poorly capitalized banks below the rating of the bank's domestic deposits. At first glance, this provision gives major U.S. money center banks, like Citibank, which have large foreign deposits and are large buyers of Fed funds, a near 50 percent capital ratio from the FDIC's vantage point. Thus, the FDIC should expect to suffer no losses in resolving such banks. Dynamically, however, this could change as the subordinated claimants act to protect themselves by either collateralizing their claims or by running. As a consequence, the FDIC could become more vulnerable than before. Unlike FDICIA, the depositor preference legislation was enacted as part of a nonbanking bill with little publicity and analysis.

A quicker FDIC response is also desirable because the agencies have defined a "critically undercapitalized" institution as having only 2 percent or less of book-value-tangible equity to capital, which is the minimum ratio specified in the act. Although little research has been done on the appropriate capital/asset cutoff level, 2 percent appears much too low, particularly in light of increasing use by banks of derivatives with which they can change their risk exposures quickly and greatly and for which even effective internal control and monitoring systems are difficult to construct. As the continuing high loss rate to the FDIC suggests, it is likely that in many, if not most, instances this ratio will be breached only after an institution's market value capital has become negative. This lessens the likelihood that insolvencies will be resolved without loss to depositors and that deposit insurance will truly be redundant. However, with fewer

insolvencies, the regulators should be able to act faster to resolve insolvencies.

Additional capital raised by banks

The record amounts of new equity and subordinated debt sold by the industry in the early 1990s attest to the greater fears of bank management and shareholders that the era of liberal forbearance was over and that painful and costly sanctions would be imposed quickly if their banks did not satisfy the capital ratio performance criteria. By 1995, the capital ratios of nearly all banks exceeded the required minimum for even the well-capitalized classification, suggesting that the marketplace encouraged banks, even after widescale share repurchases, to maintain noticeable "excess" capital above their requirements. That is, the market views the regulatory requirements as too low and, at best, as minimums. Although still far below the capital held by most of their noninsured competitors, the maintained higher capital base should allow these banks to absorb a higher level of losses than before and reduce any incentive they may have to engage in moral hazard behavior. Nevertheless, Standard and Poor's states that "without this regulatory support [that boosts its creditworthiness], the [banking] industry's high leverage ratio alone would rank it lower than the current assessment" (Standard and Poor's, 1996, p. 1).

Subordinated and explicitly uninsured debt with remaining maturity of at least two years, so that it cannot be repaid before the authorities can act, is an inexpensive and effective way of increasing capital requirements, particularly for larger banks (Benston and Kaufman, 1988, Benston et al., 1986, Keehn, 1989, and Evanoff, 1993).[12] Unlike equity, interest on such debt is tax deductible. Permitting banks to meet capital requirements with subordinated debt allows them the same income tax advantages as corporations in general. Consequently, higher capital requirements would not increase banks' cost of capital above that which the market would demand. Rather, the higher requirement would only eliminate any deposit-insurance subsidy. Moreover, such debt would require little change in bank operations. Banks effectively only have to substitute explicitly uninsured term debt for large-denomination term certificates of deposit that are slightly FDIC-guaranteed. Because their losses occur only after a bank's equity is depleted and they do not have the option of running, these bondholders may be expected to carefully monitor the bank's equity position and begin to impose discipline as soon as they perceive serious financial problems. FDICIA requires interest and principal payments on subordinated debt to be suspended when the bank becomes "critically undercapitalized." Thus, private market discipline will supplement, if not precede, regulatory discipline. The current capital requirements would be strengthened significantly at little if any additional cost by requiring at least large banks to maintain an additional margin of, say, 2 percent subordinated debt. Indeed, in 1985, the FDIC requested comment on a proposal to increase capital requirements on insured banks to 9 percent, 3 percent of which could be satisfied by subordinated debt (FDIC, 1985). Unfortunately, this proposal was not implemented.

Imposition of resolution costs on uninsured depositors

To satisfy the LCR provisions of the act, the FDIC dramatically changed its resolution procedures to leave more uninsured depositors (with deposits in excess of $100,000 at risk) unprotected, even before the yearend 1994 requirement to do so. Before FDICIA, the FDIC almost always provided financial assistance for the purchase and assumption of all liabilities of resolved insolvent institutions, particularly larger banks by other banks, thereby protecting depositors with uninsured funds at these institutions from loss. Table 4 shows the number and total assets of banks resolved by the FDIC from 1986 through 1997. In 1991, for example, the FDIC imposed losses on uninsured depositors in only 17 percent of the 127 resolved BIF-insured banks that were costly to it. The unprotected depositors were mainly at small banks, holding only 3 percent of all resolved bank assets. Uninsured depositors at all large banks, including the Bank of New England, were fully protected.

In 1992, the unprotected percentages increased sharply to depositors at 54 percent of all 122 resolved banks, holding 45 percent of all resolved bank assets. Uninsured depositors at the relatively large First City Bank (Texas) and American Savings Bank (Connecticut) were left unprotected. However, uninsured depositors at four other large institutions—CrossLands Savings (New York) and three other savings banks, which tend to have proportionately fewer uninsured deposit accounts than commercial banks—were protected. In 1993, the pendulum completed its swing. Uninsured depositors at 85 percent of the 41 resolved institutions holding 94 percent of assets were left unprotected, including the uninsured depositors at the largest of the relatively small banks that failed.

The results for 1994 appear mixed at first. In part, this reflects the small number of resolutions and, in part, the relative importance of savings banks. Of the 13 BIF-insured banks resolved, uninsured depositors were unprotected in eight (62 percent) of these banks, holding 57 percent of the dollar assets of all resolved

TABLE 4

FDIC resolutions of banks, 1986–97, by protection of uninsured depositors

	Number of banks				Total assets ($ in billions)			
Year	Total	Protected	Not protected	Percent not protected	Total	Protected	Not protected	Percent not protected
1986	145	105	40	28	7.6	6.3	1.3	17
1987	203	152	51	25	9.2	6.7	2.5	27
1988	221	185	36	16	52.6	51.3	1.3	3
1989	207	176	31	15	29.4	27.2	2.2	8
1990	169	149	20	12	15.8	13.3	2.5	16
1991	127	106	21	17	62.5	60.9	1.6	3
1992	122	56	66	54	45.5	25.0	20.5	45
1993	41	6	35	85	3.5	0.2	3.3	94
1994	13	5	8	62	1.4	0.6	0.8	57
1995	6	0	6	100	0.8	0.0	0.8	100
1996	5	2	3	60	0.2	0.1	0.1	63
1997	1	1	0	0	–[a]	–	–	–

[a]Less than 0.1.

Source: Federal Deposit Insurance Corporation.

banks. But two of the five banks at which uninsured depositors were protected were savings banks and were the two largest banks resolved during the year, even though the largest had assets of only $337 million. Moreover, the FDIC did not expect to suffer losses in these resolutions or in two others in which uninsured depositors were protected, including one trust company that had no deposits. Excluding these two savings banks and the two other banks in which the FDIC did not expect to suffer losses changes the picture. Uninsured depositors were unprotected at eight of the nine (89 percent) commercial banks resolved, holding 96 percent of assets at all resolved commercial banks.

In 1995, only six banks were resolved and uninsured depositors were protected in none. As in the earlier years, all were small banks, the largest having less than $300 million in assets at the time of its resolution. In 1996, only five small banks were resolved and losses were imposed on the very few uninsured depositors at three of these banks. In 1997, one bank with deposits of less than $30 million was resolved, with the few uninsured deposits protected. Thus, in contrast to its pre-FDICIA policy, it appears that the FDIC did not favor depositors at larger banks in its 1992 through 1997 resolutions.

Because no large money center bank has been critically undercapitalized since the enactment of FDICIA, the too-big-to-fail provisions of the act have not yet been tested. However, to the extent the ex-ante incentives and sanctions in FDICIA prevent concurrent widescale failures (such as occurred in the 1980s), so that only a few banks are likely to be in trouble at any one time, and the multiple sign-offs required by FDICIA protect uninsured depositors at large banks, the regulators might be expected to use the TBTF exemption sparingly, if at all. It should be noted that the Bank of England, which had earlier pursued a TBTF policy, did not protect uninsured depositors in its most recent two large failures, those of the Bank of Credit and Commerce International (BCCI) in 1991 and Barings in 1995.

Conclusion

FDICIA appears to have been successful in its first six and a half years in helping to strengthen the financial condition of the U.S. banking and thrift industries.[13] Deposit insurance appears to have been placed on a workable incentive-compatible foundation. Whether it will continue to work well depends on a number of factors, including the political will of bank regulators to carry out the intent of the legislation. The regulators could signal their intent to do so by, among other strengthening actions, 1) stopping their foot dragging and complaining about the difficulty of implementing market or current value accounting for federally insured institutions and allocating part of their large research budget and staff to improving the reporting and disclosure process, and 2) raising the thresholds for all capital categories to levels more consistent with those the market imposes on the banks' nonbank competitors and that the agencies themselves appear to view as more appropriate for nonproblem

banks. For example, while 71 commercial banks were classified as problem banks by the FDIC at yearend 1997, only 17 BIF-insured institutions were classified as undercapitalized. Because of the current good health of the industry, a moderate move in this direction at this time would cause only a few institutions to be downgraded to undercapitalized, if they did not raise additional capital. The resulting increase in capital would put the banking sector in a better position to absorb future losses and reduce the probability of bank failures. The failure rate should also be reduced by the recent removal by Congress of most restrictions on interstate banking and by regulatory agency actions increasing the ability of banks to engage in insurance and securities activities. As a result, banks will be able to diversify more effectively both geographically and across product lines.

The general features of FDICIA's PCA and LCR provisions are being incorporated in the deposit insurance structures of a number of other countries, as well as being recommended by international agencies, such as the Bank for International Settlements (BIS) and the International Monetary Fund (IMF). Many countries have experienced banking debacles similar to that in the U.S. in the 1980s. A recent survey by the IMF reported serious banking problems since 1980 in more than 130 of its 180-plus member countries (Lingren, Garcia, and Saal, 1996). In many cases, the cost of resolution, in terms of the use of taxpayer funds to finance the difference between the protected par value of deposits at insolvent institutions and the market value of their assets, exceeded the 3 percent of GDP cost borne by the U.S. In a number of countries, the cost is estimated to have exceeded 20 percent of GDP. Poorly structured and priced government-provided deposit insurance and other bank guarantees have been identified as a major culprit in almost all of these debacles. Thus, basing deposit-insurance reform on the structure pioneered in the U.S. may assist in preventing future banking crises in other countries as well.[14]

NOTES

[1]In these resolutions, the institutions were closed or merged with assistance from the Federal Savings and Loan Insurance Corporation.

[2]These data omit some 600 nonfederally insured institutions. These were predominantly small institutions operating in a small number of states. Many, particularly in Ohio and Maryland, experienced severe financial problems in the mid-1980s and either failed or obtained federal deposit insurance (English, 1993, and Kane, 1992).

[3]In 1996, the Supreme Court ruled that the creation of such goodwill represented legal contracts that Congress did not have the authority to reverse in 1989 in FIRREA without appropriate compensation. Any damages awarded to the thrift shareholders that have sued the government will add to the net cost of resolving the debacle.

[4]The bonds sold were issued by a specially established government sponsored enterprise (GSE) type of financing corporation (FICO). Because premium revenues to the corporation from S&Ls to pay the interest on the bonds were far less than projected, legislation was enacted in 1996 to require commercial banks to contribute funding to avoid default and ease the burden on the S&Ls.

[5]In his analysis of the reasons Argentina reinstated deposit insurance in 1995 only a few years after it had abolished it, Miller (1996, pp. 229–230) concluded that "overwhelming political forces trumped the [economic] theory to which these individuals [those in charge of the government and who were 'ideologically attuned to the dangers of socializing risk in the banking sector'] subscribed."

[6]For example, institutions offering federally insured deposits would no longer be permitted to make or hold most types of loans. Their earning asset portfolios would be restricted to very high credit quality, very short maturity securities or their deposits would have to be collateralized with virtually risk-free securities. Proponents claimed that the other services and products provided by banks could be free from regulation. They did not consider the following four concerns important. First, narrow banks would be more costly to depositors, since they would be restricted to low-yielding earning assets, while incurring the considerable expense of processing checks. Second, narrow banks would lose economies of scope with respect to operating costs, customers' transactions costs, and risk reduction from diversification. Third, other providers of fund transfer services would be established. Using fractional reserves and investing in more profitable assets, these providers could outbid banks for similar services. It would be difficult, perhaps impossible, for government to forbear from rescuing "depositors" in these firms, should they fail. Hence, nothing substantial would have changed. Fourth, capital, reporting, and auditing requirements and a closure rule still would be required to prevent insolvent or near-insolvent narrow banks from engaging in fraudulent or moral-hazard behavior and to resolve insolvencies quickly.

[7]Barth and Brumbaugh (1996) describe in detail the process and implications of regulatory forbearance at one S&L.

[8]The PCA provisions of FDICIA are more specific than those proposed in SEIR and reflect the understanding of the role of economic incentives by staff drafters of the House and Senate Banking Committees. The opposition of some regulators to the act may be gauged by their statements shortly after its enactment. For example, William Seidman, chairman of the FDIC, described FDICIA as "the Credit Crunch Enhancement Act of 1991 ... the greatest overload of regulatory micromanagement seen anywhere in the world" (Seidman, 1993, p. 47). John La Ware, a governor of the Federal Reserve Board said, "how they had the audacity to call it an 'improvement act' I'll never understand" (Carnell, 1997b, p. 11).

[9]Although, unlike the FSLIC, the FDIC did not require permanent taxpayer funding to validate its deposit guarantee, FDICIA did make such funds available if necessary and provided temporary funds for working capital, which the FDIC and RTC used and repaid in full.

[10]All depositors generally have access to all or part of their funds at resolved banks the next business day, regardless of the resolution process used. Insured deposits at domestic offices of insured banks are paid in full either at a successor bank that acquired the deposits at lowest cost to the FDIC or at the resolved bank, if it is being liquidated by the FDIC, which generally serves as receiver. (Insured institutions whose capital declines below the tripwire value for critically undercapitalized must shortly thereafter be placed in receivership or conservatorship by their primary federal supervisor. Insured institutions are not subject to the general corporate bankruptcy process.) Uninsured deposits are paid according to the lowest cost of resolution to the FDIC. They are paid in full if either the FDIC does not expect to suffer a loss on the resolution (particularly since the enactment of depositor preference under which losses are first charged against nondepositor creditors and depositors at foreign branches) or another bank assumes these deposits at lowest cost of resolution to the FDIC. The uninsured deposits are paid at less than full value if the FDIC expects to suffer a loss in the resolution. The FDIC will advance owners of uninsured deposits a prorata share of the recovery value based on a conservative estimate of what it expects to receive on the sale of the bank's assets. Thus, uninsured depositors share with the FDIC in the expected loss from resolution. Because the FDIC is the receiver of insolvent banks and, under PCA, is likely to have been involved in reviewing the bank's activities closely before insolvency, it is able to estimate recovery values reasonably quickly and accurately at time of resolution. If the FDIC is successful at resolving the bank before or shortly after its capital becomes negative, any losses should be small. If the FDIC overestimates the recovery values (underestimates the loss), it will assume the additional loss. If it underestimates the recovery values (overestimates the loss), it will reimburse the uninsured depositors as the additional recoveries are realized. The payments are made through the resolved bank operating under FDIC receivership. Thus, there is effectively no delay in providing depositors at resolved institutions access to the higher of the insured or near-market value of their funds and the payments system is minimally disrupted, if at all.

[11]Among its easing actions, the Federal Reserve reduced reserve requirements on time deposits from 3 percent to 0 percent at yearend 1990 and on demand deposits from 12 percent to 10 percent in February 1992. Both actions should have increased bank profitability; the 1992 reduction was specifically implemented "to reduce funding costs for depository institutions ... [and] strengthen banks' financial condition" (Board of Governors, 1993, p. 95).

[12]Currently, for purposes of regulatory capital compliance, term subordinated debt with an original weighted average maturity of greater than five years may be included as supplementary (tier 2) capital up to an amount no greater than 50 percent of tier 1 capital. However, the eligible amount is partially reduced as the remaining maturity of any subordinated debt declines below five years and is reduced by the full amount of any such debt with a remaining maturity of less than one year. Although not included for measuring capital compliance, term subordinated debt maintained in excess of these limits is taken into account by regulators in their overall assessment of a bank's financial condition.

[13]The apparent success of FDICIA is also reflected in the increasing number of recommendations to introduce PCA and LCR type provisions in other countries (for example, Goldstein, 1997, and Goldstein and Turner, 1996).

[14]Predictions of large and lasting improvements in bank safety from changes in prudential regulation have often been overly optimistic. For example, the U.S. Comptroller of the Currency argued confidently in his 1915 annual report, one year after the enactment of the Federal Reserve Act, that: "The establishment of the Federal Reserve banks makes it practically impossible for any national bank operating in accordance with the provisions of the national banking act and managed with ordinary honesty, intelligence, and efficiency to fail" (Comptroller of the Currency, 1916, p. 32).

Likewise, Milton Friedman and Anna Schwartz wrote in their seminal review of U.S. monetary history that: "Federal insurance of bank deposits was the most important structural change in the banking system to result from the 1933 panic, and, indeed in our view, the structural change most conducive to monetary stability since state bank note issues were taxed out of existence immediately after the Civil War" (Friedman and Schwartz, 1963, p. 434).

And Paul Samuelson predicted in the eleventh edition of the classic textbook *Economics*, published just before the U.S. banking and thrift crises, that because of deposit insurance, "in the 1980s, the only banks to fail will be those involving fraud or gross negligence" (Samuelson, 1980, p. 282).

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Assessing the impact of regulation on bank cost efficiency

Douglas D. Evanoff

Introduction and summary

The purpose of financial regulation is to improve upon the performance of financial markets relative to how they would perform driven solely by the forces of the private marketplace. For example, in the 1930s it was decided that, left unchecked, competition in the pricing of U.S. banking services could become so intense that it would actually be harmful to the functioning of the markets. This resulted in the introduction of interest rate and price restrictions to provide banks with an inexpensive source of funds. In addition, to insure that local market participants were not forced from the market as a result of "excessive" competition, entry barriers and branching restrictions were introduced.

Such regulation, however, frequently results in unintended behavior and market inefficiencies. The price restrictions aimed at providing an inexpensive source of bank funding resulted in disintermediation and significant bank expenditures to circumvent the restrictions. The entry barriers resulted in inferior service levels and the generation of local market power by incumbent institutions as competing service providers were unable to use an efficient entry mechanism. These unintended effects often prompt re-regulation to realize the original intent of the regulation, but without the resulting inefficiencies. However, re-regulation typically results in additional responses by bankers aimed at avoiding the effect of the regulation.

In responding to regulation, banks are altering the production process. The theoretical foundation for most bank cost studies is based on the maintained assumption of cost minimization with respect to market input prices in competitive markets.[1] However, extensive evidence suggests that this is not the behavior practiced by regulated firms. Regulated firms frequently alter the production process from what it would be absent the regulation. Banking firms are subject to extensive regulation in nearly all facets of operations, raising the possibility that the assumption of cost-minimizing behavior in response to market input prices may be particularly inappropriate for this industry.

Our objective is to evaluate whether industry regulations distort firm behavior and, as a result, generate productive inefficiency in the mix of inputs used by banks (for example, physical capital to labor ratios). We estimate this *allocative* inefficiency using a generalized cost function that allows for cost-minimization behavior, taking into account the above-mentioned distortions resulting from regulation. From a theoretical viewpoint, the generalized model is superior to the standard model. We test to see if there is also a statistical difference. We evaluate the impact of accounting for the regulatory distortions on various cost characteristics.[2] In addition to generating a measure of inefficiency resulting from banks using a suboptimal mix of inputs, we obtain a measure of the level of inefficiency resulting from the underutilization or mismanagement of inputs, that is, *technical inefficiency*. Finally, we analyze the effect of relaxing the regulatory constraints.

For a sample of large U.S. banks, we find statistically significant input price distortions, and resulting allocative inefficiency, which we attribute to regulation. We reject the standard cost model in favor of a more general one, which allows for cost minimization

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subject to *effective* input prices that can differ from market prices as a result of regulation. Findings from our analysis of the 1972–87 period suggest that for our sample of banks, scope economies and minor scale economies existed. Scope economies exist if the cost of joint production is less than the cost resulting from independent production processes; scale economies exist if, over a given range of output, per unit costs decline as output increases. In addition, technology played a significant role in reducing costs, and regulatory induced allocative inefficiency existed. Although statistically significant, the allocative efficiency distortions appear to be relatively minor. The advantages of the generalized cost model become apparent, however, when we compare the 1972–79 period, one of significant regulation, with the 1984–87 period, which is considered the deregulated environment. Our findings suggest that the banking environment changed significantly between these two periods. Allocative inefficiency was a factor in 1972–79, but was nearly nonexistent in the later period. Banks apparently responded to the deregulated environment by altering their production process to fully exploit scale economies, and reaped significant returns from technological change. We conclude that the heavy regulation of the earlier period had a significant adverse effect on bank efficiency.

Productive efficiency: The basics

Basic economic theory assumes that production occurs in an environment in which an attempt is made to maximize profits by operating in the most efficient manner possible. The competitive model suggests that firms that fail to do so will be driven from the market by more efficient ones. These competitive forces generate an industry of firms producing efficiently with respect to the scale and scope of operation and the mix and quantity of inputs used. However, when market imperfections weaken competitive forces, inefficient firms may continue to prosper. True firm behavior may vary from that implied by the competitive model. Firms may find they are not required to operate as efficiently as possible because they are protected from the discipline of the market by either natural or regulatory forces. Inefficiencies can then arise and the characteristics associated with the competitive model (efficient scale, scope, and input utilization) no longer hold.

Variations from productive efficiency can be broken down into input- and output-induced inefficiencies. Assuming a given level of output, input inefficiency implies the firm is not optimally using the factors of production. That is, the given level of output is not produced at the lowest possible cost. Output efficiency requires the production of both the optimal level and the optimal mix of outputs.

Overall input inefficiency resulting from the suboptimal use of inputs can be divided into *allocative* and *pure technical* inefficiency. Allocative inefficiency occurs when inputs are combined in suboptimal proportions. Regulation is typically given as a major reason for this. An extreme example would be if regulations mandated that regulated firms use a particular process to produce a commodity. For example, no machinery can be used. Even if the inputs other than capital were used as effectively as possible, the ban on machinery would most likely result in a production process that would be less efficient than the unrestricted process.

Pure technical inefficiency occurs when more of each input is used than should be required to produce a given level of output. This type of inefficiency is more difficult to explain, but it is typically attributed to weak competitive forces that allow inefficient firms to remain in the market despite their inferior productivity. Pure technical inefficiency implies that firms employ the proper mix of inputs, but mismanage them. Combining allocative and pure technical inefficiency, we get the overall inefficiency resulting from the improper use of inputs. The distinction between the two types of inefficiency is important because they may be caused by different forces and, therefore, be correctable by different means. For example, the explicit repeal of regulations may result in an increase in allocative efficiency, while a general increase in the level of competition permitted (perhaps through reductions in entry barriers) may increase pure technical efficiency.

Productive efficiency also requires optimizing behavior with respect to outputs. Here, optimal behavior necessitates production of the level and combination of outputs that correspond to the production process with the lowest per unit cost. An optimal output level is possible if economies and diseconomies of scale exist at different output levels. Economies of scale exist if, over a given range of output, per unit costs decline as output increases. Increases in per unit cost correspond to decreasing returns to scale. A scale-efficient firm will produce where there are constant returns to scale; that is, changes in output result in proportional changes in costs. Many recent bank mergers have been justified on the basis of potential scale economies realized by the new combined entity.[3] Because it involves the choice of an inefficient level, scale inefficiency is considered a form of technical inefficiency. Thus, total technical inefficiency

includes both pure technical and scale inefficiency, or inefficient levels of both inputs and outputs.

Additional cost advantages may result from producing more than one product. For example, a firm may be able to jointly produce two or more outputs more cheaply than producing them separately. If the cost of joint production is less than the cost resulting from independent production processes, economies of scope exist. Diseconomies of scope exist if the joint production costs are actually higher than the cost of specialized or stand-alone production of the individual products. In banking, potential scope economies are typically precluded by regulatory limitations on bank activities.

Finally, pure technical inefficiency is entirely under the control of, and results directly from the behavior of, the producer, whereas output inefficiency and allocative inefficiency may be unavoidable from the firm's perspective. For example, a firm optimally using inputs may find that per unit cost declines over the entire range of market demand. While increasing production would generate cost savings or efficiencies, the characteristics of market demand may not justify it. Failure to exploit scope advantages may also result from factors outside of the control of the firm. Clearly, in banking the array of allowable activities is constrained by regulation. This may preclude potential gains from the joint production of various financial services. Further, as mentioned earlier, allocative inefficiency may occur as a direct result of regulation. For example, during the 1970s, banks were restricted with respect to the explicit interest rates they could pay depositors. As market rates rose above allowable levels, banks frequently substituted implicit interest payments in the form of non-price payments or improved service levels—for example, a free toaster with the opening of a new savings account, or more offices per capita or per area.[4] This resulted in an overutilization of physical capital relative to other inputs. In this case, regulation was the driving force behind the resulting allocative inefficiency.

Generalized model of bank costs

To generate our cost and efficiency estimates, we use a methodology developed by Lau and Yotopoulos (1971) and Atkinson and Halvorsen (1980). This *shadow price* model has been employed in previous studies to account for regulatory-induced market distortions, for example, Atkinson and Halvorsen (1984), and Evanoff, Israilevich, and Merris (1989). In this model, firms optimize with respect to the shadow price or effective price of inputs, which includes any non-price aspects such as regulatory burden. We apply the more general shadow price (SP) model with additional variables specific to banking. (See the studies listed above for a detailed discussion of the methodology and the technical appendix for a summary of the formal derivation of the cost relationships.)

From basic microeconomics, the condition required for optimization behavior in the standard cost model is for the firm to produce at the level where the ratio of the marginal products of the inputs employed[5] (that is, the ratio of the changes in output associated with marginal changes in inputs) is equal to the ratio of the prices of the inputs.

$$1)\quad \frac{f_i}{f_j} = \frac{P_i}{P_j} \text{ for } i \neq j = 1, \ldots, m.$$

In equation 1, f_i denotes the marginal product of input i, and P_i is the price of input i. Given that the firm takes input prices and the level of output as given, it can then derive the optimal combination of inputs to minimize costs.[6]

The standard model typically assumes that the optimal combination of inputs is determined by prices observed in the marketplace. Therefore, the observed and optimal costs are equivalent. However, if additional constraints exist, such as those imposed by regulation, the true cost of the input need not equal the observed price. There may be non-price costs induced by regulations, and these will also be accounted for in the firm's optimization process. As discussed earlier, when deposit rate ceilings were imposed, banks were limited in their ability to compete directly for funds. The banks then used non-price competition in an attempt to elude the restriction.[7] One result of this in the 1970s was the significant proliferation of bank offices in states allowing broad branching as banks attempted to "compete with brick and mortar." The decision to introduce more branch offices was not driven entirely by the market price of physical capital. More physical capital was used than would have been suggested by the market price alone, because the perceived return on these capital expenditures differed from that implied by the market prices. In other words, the effective price of physical capital was less than the market price. In determining the true effective price of inputs, these additional regulatory constraints must be taken into account. This possibility is captured by the more generalized cost model presented in the technical appendix.

The input combination generating cost minimization, therefore, equates the ratio of marginal products to the ratio of the *effective* prices of the inputs, including the non-price costs. It is these effective or shadow prices that are influenced by regulation and drive

behavior. In the technical appendix, we show how one can derive the bank's cost function using shadow prices rather than observed prices. The resulting shadow cost function is a more comprehensive representation of costs to be minimized and is the appropriate representation of the production process. In the absence of binding regulatory constraints, shadow and actual prices are equal and the shadow model reduces to the standard cost model. However, if market and shadow prices are not equivalent (likely to be the case in a heavily regulated industry like banking), one needs to account for the additional regulatory constraints.

The shadow prices of bank inputs are not directly observable. Therefore, we assume that the shadow prices are proportional to market prices:

$$2) \quad P_i^* = k_i P_i \text{ for } i = 1, \ldots, m,$$

where P_i is the price for input i, k_i is a measure of the extent of the factor price distortion, and there are m inputs used in the production process.[8] If regulation is nonbinding, all shadow prices equal the respective market prices, $k_i = 1$ for all i, and the shadow cost function reduces to the standard formulation.

In applying the generalized model to large U.S. banks, we make certain assumptions concerning the bank production process. We include variables generally thought to affect costs in the banking industry, including measures for the number of bank offices, the holding company structure, and the role of technological change. We assume that banks produce four outputs: the dollar value of commercial and industrial loans, installment loans, real estate loans, and investment securities. Banks produce these outputs using labor, physical capital, and financial funding.[9] More details of the empirical specification are given in the technical appendix.

We estimated the model for the years 1972–87 for the largest banks in the U.S. that were members of a holding company over the entire period. This is a period during which regulation of the industry was evolving as certain restrictions became quite binding and industry participants were arguing for regulatory relief. The final data set consists of 164 banks and 2,624 observations. Our expectation was that these institutions were probably in the best position to avoid adverse effects from regulation, thus making our findings conservative. Inefficiency could be less for these institutions than for smaller banks, because they may have more astute management; be more cost conscious; and be more involved in wholesale banking, whereas most regulations concentrate on the retail side of banking.[10]

The Bank Call Report was the major data source. Costs, defined as the sum of expenditures on labor, funds, and physical capital, the number of banking offices, and the type of bank holding company organization (that is, single or multibank) were obtained from Call Report data. We used a time trend to account for technical progress. We assigned state level wage trends for each year to each bank according to the location of its home office. We approximated the price of physical capital, P_K, from Call Report data as the ratio of physical capital expenditures, measured as additions to plant and equipment, furniture, and physical premises, to the book value of net bank premises, furniture, and physical equipment. We also calculated the price of funds from Call Report data as an average cost of funds. We obtained the input price for labor, P_L, from the Bureau of Labor Statistics.

Empirical results

We used the standard market price (MP) model and the more general SP model to estimate costs for the sample of U.S. banks.[11] We find that the standard model can be statistically rejected in favor of the more general SP model. Our cost estimates suggest that observed input prices differ from effective prices. As expected, we find that the price of physical capital was distorted downward relative to that of both labor and financial funding, suggesting that the regulatory-induced production constraints are binding. In particular, the cost of capital relative to labor is only 58.8 percent of what it would be in the absence of regulatory distortions. We also find that the cost of funds is biased downward slightly relative to that of labor.[12] The cost of funds relative to labor is 97.6 percent of what it would be absent distortions.

Table 1 shows a number of production characteristics and additional comparisons between the standard and generalized models. The calculated scale elasticity measure suggests the existence of economies of scale that are significant in a statistical sense. In particular, according to the first row in table 1, a 1 percent increase in the scale of output increases costs by only 0.981 percent. The results suggest a "U" shaped average cost relationship (the scale elasticity measure equaling a value of 1.0 at the minimum value of the average cost relationship), with 58 percent of the observations falling in the range in which statistically significant scale economies exist and 35 percent falling in the range of significant diseconomies. We also find significant scope economies for the two broad categories of outputs analyzed—loans and investment securities. Specifically, the second row of table 1 indicates that when loans and securities are

TABLE 1

Shadow and market price models, statistical results

Cost characteristic	Shadow price model	Market price model
Scale elasticity	0.981 (.0033)	.983 (.0033)
Scope economies	.280	.282
Technical change	–0.076 (.0033)	–0.069 (.0034)
Allocative efficiency	0.01	–

Technical notes: The scale elasticity measure is $\frac{\partial \ln C}{\partial \ln Q_i}$, where C and Q denote costs and output, respectively, with values less than 1.0 indicating potential per unit cost savings from increased output. These scale elasticities are computed by evaluating the model at the mean of the sample.

The scope economies measure is $\frac{\Sigma_i C(Q_i) - C(Q)}{C(Q)}$, where C and C_i denote the cost of joint production of the outputs and the cost of producing i on a stand-alone basis, respectively. Scope economies show the extent to which costs are lower (for example, 28 percent) as a result of jointly producing the outputs. For this measure, two output categories were considered—loans and investment securities.

The technical change measure, $\frac{\partial C}{\partial T}$ captures how much cost changed (for example, 7 percent) per year over the period analyzed as a result of technical change.

The allocative efficiency measure captures how much costs could be decreased if the inefficiency were eliminated.

Standard errors of the estimates are presented in parentheses. A translog function was used to model the cost structure. Therefore, when generating the scope measure, zero output values were replaced with small values to avoid arithmetic errors.

Source: Evanoff and Israilevich (1990).

produced jointly, costs are 28 percent lower than when they are produced separately. That is, there are cost benefits from jointly producing the two categories of output.[13]

We find the role of technological change to be significant, suggesting that technical advances over the period, proxied with a time trend, significantly aided the production process.[14] In particular, the general model implies that the cost of a given level of output decreased at a rate of 7.6 percent per year. The technological advances also resulted in changes in the production process by altering the mix of inputs used. Banking firms began economizing on labor relative to the other inputs (physical capital and financial funding). Additionally, technical advances tended to flatten the average cost curve, that is, to decrease the advantages or disadvantages resulting from the scale of operation. Finally, the more restricted standard cost model (which ignores regulatory distortions) understates the rate of technical progress. That model implies the cost advantages resulting from technical progress were approximately 10 percent less than those found with the more general cost model.[15] Thus, in addition to finding differences in market and effective input prices that will tend to alter banks' input use decisions, the generalized model finds differences in other characteristics of the bank production process.

Bank efficiency

We evaluate the extent of allocative inefficiency resulting from regulatory restrictions by deriving the difference between shadow costs assuming no regulatory distortions ($k_i = 1.0$) and shadow costs assuming the estimated factor price distortions, that is,

$$3) \quad I_A = \ln C^S(\hat{k}_i) - \ln C^S(k_i = 1) \forall i,$$

where I_A is allocative inefficiency and C^S is the shadow cost relationship. (The statistic I_A is displayed in the final row of table 1.)

Although our estimates suggest the perceived price of capital is distorted downward, we find the resulting inefficiency from regulatory distortions to be relatively small. According to the final row of table 1, the cost of distortions is less than 1 percent of total costs.[16] That is, on average, allocative distortions resulted in costs being approximately 1 percent higher than they otherwise would have been. This finding of limited allocative inefficiency is somewhat similar to the findings of previous studies, for example, Berger and Humphrey (1990) and Aly et al. (1990). Only Ferrier and Lovell (1990) found significant allocative effects. Their analysis, however, combines different types of financial institutions (credit unions, savings and loans, and commercial banks) and may be influenced by data measurement problems. They also find labor to be overused relative to capital, which is precisely the opposite of what we have argued should occur as a result of regulation.

We also analyze the extent of pure technical inefficiency for the sample of banks, investigating whether banks overutilize *all* inputs once the optimal *combination* of inputs is determined. We do this by comparing the estimated cost structure to the best practice cost structure, or the *cost frontier*. To find the cost frontier, or the level at which firms would be operating

if there was no pure technical inefficiency, we use an approach developed by Berger and Humphrey (1990), which compares the efficiency levels of high- and low-cost banking firms. We arrange the data in quartiles according to total cost per dollar of output and separately estimate SP models for the high- and low-cost banks. We then compare the costs of the average bank in the two groups, holding factor prices and market characteristics constant.[17] We find that technical inefficiency accounts for approximately 21 percent of costs. That is, elimination of this inefficiency could decrease costs by 21 percent. This effect is slightly smaller than that found in previous studies, but the difference may be due to sample structure—as stated earlier, one would expect the large banks in this sample to operate more efficiently.

Although we reject the more restrictive model relative to the more general one, our findings suggest that the biases induced by the misspecification are relatively minor for most cost characteristics. The exception is the measure of technical progress, which is understated by approximately 10 percent in the standard model.

Comparison of regulatory periods

Given the relatively low level of allocative inefficiency, one is tempted to say that regulatory distortions were minor over the period studied. This would make arguments for industry deregulation less persuasive, since the constraints are not shown to distort behavior appreciably. Additionally, in spite of the statistical significance of the differences found using the two models, one may question the net benefits of the SP specification because biases from the MP model appear relatively minor. While our results can be interpreted as representing the average distortion over the 17-year period, regulatory stringency was not constant over this period. For example, the 1980 Depository Institution Deregulation and Monetary Control Act and the 1982 Garn-St Germain Act relaxed constraints on industry prices, products, and geographic expansion—each considered a significant industry restriction, for example, see Evanoff (1985). Other studies have found that deregulation in the early 1980s did affect firm behavior, for example, LeCompe and Smith (1990). Below, we account for the changing regulatory environment and evaluate whether industry productive behavior varied over the period.

To account for the influence of industry deregulation, we divide the 17 years into the following three periods: 1972–79, characterized by significant regulation; 1984–87, considered the deregulated environment; and 1980–83, thought to be a period of adjustment in response to the newly relaxed restrictions. During the adjustment period, banks presumably adjusted their input mix. They may have closed offices previously opened as a substitute for explicit interest payments or altered their use of funds relative to the earlier period. We compare the productive behavior of large banks during the 1972–79 (restrictive) and 1984–87 (less restrictive) regulatory environments by separately estimating the SP model for the two periods. Table 2 presents a comparison of the resulting cost function characteristics.[18] We find substantial differences for the two periods. As expected, the price distortions and resulting inefficiency are significantly greater for the more restricted 1972–79 period than for the later period.[19]

We find that for the average bank in the sample, scale economies existed in the early period. According to the first row of table 2, the scale elasticity measure is significantly below one. However, the scale economies were fully exhausted after deregulation. One interpretation of this would be that the banks, faced with fewer production constraints and increased competition in the deregulated period, were able to alter their operations to capture the benefits from scale. That is, they could more effectively "grow their business" to exploit scale advantages, or they could take advantage of scale economies via mergers and acquisitions.

The findings concerning the role of technology are particularly interesting. Although technical change over the *entire* period was estimated to be approximately 7 percent (table 1), it appears that most of the cost savings were realized *after* deregulation. During the eight-year regulated period, technology decreased costs by only 5 percent, while over the significantly shorter deregulated period, it lowered costs by nearly 26 percent (see the third row of table 2).[20] What caused

TABLE 2

Cost characteristics for regulated and deregulated periods

Cost characteristic	1972–79	1984–87
Scale elasticity	0.981 (0.0045)	1.01 (0.0067)
Scope economies	.885	.891
Technical change	–0.050 (0.0045)	–0.258 (0.056)
Allocative efficiency	0.021	0.001
Observations	1,312	656

Note: See technical notes, table 1.
Source: Evanoff and Israilevich (1990).

the change? There is reason to believe it was a result of the deregulation.

Deregulation increased the banks' ability and incentives to take advantage of more efficient production techniques. We know that the technology was different in the two periods, because each period has a unique cost relationship. To evaluate how banks would have behaved in the later period with the old regulatory framework and technology (that is, the technology from the first period) still in place, we imposed the old technology on the data and recalculated technological change. We find that technology would have decreased costs in 1984–87 by approximately 9 percent, significantly *less* than the cost savings actually realized. Inefficiency would also have been significantly greater than that realized in the later period. In particular, the fourth row of table 2 shows that allocative inefficiency was greater than 2 percent in the earlier period, compared with 0.1 percent in the later period. It appears, therefore, that banks responded to deregulation by altering their production techniques to reap significant benefits from technology that could not be realized in the regulated environment. Finally, according to table 2, there was essentially no difference in economies of scope between the two periods. This is consistent with the results in table 1, where our estimates of scope economies were not affected by regulatory distortions.

Conclusion

We have analyzed costs for a sample of large banks, which may be more resilient than most banks to regulation. Nevertheless, we find statistically significant input price distortions, which appear to be due to regulatory constraints. We reject the standard market price model in favor of a more general one that allows for cost minimization subject to shadow factor prices, which can differ from market prices as a result of regulation. Our analysis incorporates the multiproduct production process and employs the intermediation approach to measuring bank output and costs—that is, banks serve as an intermediator of financial services. Findings from our analysis of the 1972–87 period suggest that for this sample of banks, scope economies and minor scale economies existed, technology played a significant role in reducing costs, and the standard market price model should be rejected relative to the more general shadow price model. However, for this time period, the distortions created by using the market price model appear relatively minor.

The advantages of the shadow price model relative to the market price model are highlighted in a comparison of the pre- and post-deregulated periods in banking. Our findings suggest that the banking environment changed significantly. Allocative inefficiency was a factor in the early time period, but was nearly nonexistent after deregulation. Banks apparently responded to the deregulated environment by altering their production process to fully exploit scale economies, and reaped significant returns from technological change. Scope advantages existed in each period.

We have evaluated the effect of regulation on the production process, particularly efficiency, of large commercial banks. The effect may be significantly different for alternative samples. Future studies of bank costs should consider the role of inefficiencies induced by regulation and determine whether the production process has changed over time. Our analysis suggests the change has been significant.

TECHNICAL APPENDIX

The generalized cost model

In the neoclassical cost model, firms are assumed to minimize costs in the Lagrangian-constrained cost function given by:

$$4)\quad L = P'X - \mu[f(X,Z) - Q],$$

where P and X are $(m \times 1)$ vectors of input prices and quantities, respectively; $f(X,Z)$ is a well-behaved neoclassical production function; Z is a vector of exogenous variables; Q is a vector of outputs; and μ is a Lagrangian multiplier. From the first-order conditions for cost minimization, the marginal rate of technical substitution between inputs i and j is equal to the ratio of prices of the two inputs. That is,

$$5)\quad \frac{f_i}{f_j} = \frac{P_i}{P_j} \text{ for } i \neq j = 1, \ldots, m,$$

where $f_i \equiv \partial f/\partial X_i$ is the marginal product of input i, and P_i is the price of input i. Given input prices, and the predetermined level of output as the only constraint, the optimal combination of inputs can be derived to minimize costs.

Now assume that additional regulatory constraints exist. The Lagrangian-constrained cost function to be minimized becomes:

$$6)\quad L = P'X - \mu[f(X,Z) - Q] - \sum_{h=1}^{n} \lambda_h R_h(P,X),$$

where R_h for ($h = 1, \ldots, n$) are constraints arising from regulation, and λ_h are Lagrangian multipliers. From the first-order conditions for cost minimization, the marginal rate of technical substitution between inputs i and j is equal to the ratio of effective prices of the two inputs. That is,

$$7)\quad \frac{f_i}{f_j} = \frac{P_i - \sum_{h=1}^{n} \lambda_h \partial R_h / \partial X_i}{P_j - \sum_{h=1}^{n} \lambda_h \partial R_h / \partial X_j} = \frac{P_i^*}{P_j^*} \text{ for } i \neq j = 1, \ldots, m,$$

where P_i^* is the effective or *shadow price* of input i.

In the absence of binding regulatory constraints, equation 7 reduces to the neoclassical condition, whereby the marginal rate of technical substitution equals the ratio of *market prices* of inputs:

$$8)\quad \frac{f_i}{f_j} = \frac{P_i}{P_j} = \frac{P_i^*}{P_j^*} \text{ for } i \neq j = 1, \ldots, m.$$

This special case is nested within the more general shadow price relationship (equation 7).

Since the shadow prices of the inputs are not directly observable, following Lau and Yotopolous (1971) and Atkinson and Halvorsen (1980, 1984), the shadow prices are approximated by

$$9)\quad P_i^* = k_i P_i \text{ for } i = 1, \ldots, m,$$

where k_i is an input-specific factor of proportionality. As noted by Atkinson and Halvorsen (1980, 1984), the shadow price approximations can be interpreted as first-order Taylor's series expansions of arbitrary shadow price functions. When regulation is nonbinding, all shadow prices equal the respective market prices, $k_i = 1$ for all i, and the shadow cost function reduces to the more restricted function.

Differing from the restrictive function only in the input-price variables, the shadow cost function is given by

$$10)\quad C^S = C^S(kP, Q, Z),$$

where kP is a vector of shadow prices of inputs. Applying Shephard's Lemma, the set of derived input demand functions is

$$11)\quad X_i = \frac{\partial C^S}{\partial (k_i P_i)}.$$

Using equation 11, the firm's total *actual* cost is

$$12)\quad C^A = P'X = \sum_{i=1}^{m} P_i \frac{\partial C^S}{\partial (k_i P_i)}.$$

The shadow factor cost shares are obtained by logarithmic differentiation of C^S:

$$13)\quad M_i^S = \frac{\partial \ln C_i^S}{\partial \ln (k_i P_i)} = \frac{k_i P_i X_i}{C^S} \text{ for } i = 1, \ldots, m.$$

Rearranging equation 13,

$$14)\quad X_i = \frac{M_i^S C^S}{k_i P_i} \text{ for } i = 1, \ldots, m,$$

and substituting equation 14 into equation 12 gives,

$$15)\quad C^A = C^S \sum_{i=1}^{m} \frac{M_i^S}{k_i}.$$

Taking logarithms,

$$16)\quad \ln C^A = \ln C^S + \ln \sum_{i=1}^{k} \frac{M_i^S}{k_i}.$$

Using equations 14 and 15, actual factor-cost shares can also be obtained,

$$17)\quad M_i^A = \frac{P_i X_i}{C^A} = \frac{M_i^S k_i^{-1}}{\sum_{i=1}^{m} M_i^S k_i^{-1}} \text{ for } i = 1, \ldots, m$$

Equations 16 and 17 comprise our model.

For estimation purposes, we specify the shadow cost function in translog form. Total shadow cost is specified to be linearly homogeneous in shadow prices. The level of k_i cannot be estimated, given that the equations for total actual cost and factor cost shares are homogeneous of degree zero in k_i. The shadow price factor for labor, k_L, is set equal to unity and the shadow price factors for the remaining inputs are estimated. Therefore, we test for relative price efficiency only, not absolute efficiency.

The total shadow cost function measure in translog form is

$$
\begin{aligned}
18)\quad \ln C^S = {} & \alpha_0 + \sum_i \beta_{Qi} \ln Q_i \\
& + 0.5 \sum_i \sum_j \beta_{Q_iQ_j} (\ln Q_i \ln Q_j) \\
& + \sum_i \gamma_{iQ_j} \ln Q_j \ln(k_i P_i) + \sum_i \beta_i \ln(k_i P_i) \\
& + 0.5 \sum_i \sum_j \gamma_{ij} \ln(k_i P_i) \ln(k_j P_j) + \phi_T \ln T \\
& + 0.5\phi_{TT} (\ln T)^2 + \sum_i \theta_{Q_iT} \ln Q_i \ln T \\
& + \sum_i \gamma_{iT} \ln(k_i P_i) \ln T + \beta_B \ln B + 0.5\beta_{BB} (\ln B)^2 \\
& + \sum_i \theta_{Q_iB} \ln Q_i \ln B + \theta_{TB} \ln T \ln B \\
& + \sum_i \gamma_{iB} \ln(k_i P_i) \ln B + \beta_H H + \sum_i \theta_{HQ_i} H \ln Q_i \\
& + \theta_{HT} H \ln T + \theta_{HB} H \ln B + \sum_i \gamma_{iH} \ln(k_i P_i) H; \\
& \forall i, j = K, L, F, \text{and } Q_i, Q_j = \text{the four outputs;}
\end{aligned}
$$

where $\gamma_{ij} = \gamma_{ji}$.

Linear homogeneity in shadow prices implies the following adding-up restrictions on parameters:

$$
\begin{aligned}
19)\quad & \sum_i \beta_i = 1 \text{ and } \sum_i \gamma_{iQ_j} = \sum_i \gamma_{iB} = \sum_i \gamma_{iT} = \sum_i \gamma_{iH} = 0 \\
& \sum_i \gamma_{ij} = 0; \\
& \forall i, j, \text{ and } Q_j.
\end{aligned}
$$

Shadow cost shares for the translog specification are derived by logarithmic differentiation of C^S in equation 18:

$$
\begin{aligned}
20)\quad M_i^S = {} & \frac{\partial \ln C^S}{\partial \ln(k_i P_i)} \\
= {} & \beta_i + \sum_j \gamma_{iQ_j} \ln Q_j + \sum_j \gamma_{ij} \ln(k_j P_j) + \gamma_{iT} \ln T \\
& + \gamma_{IB} \ln B + \gamma_{ih} H \\
& \forall i, j, \text{ and } Q_j.
\end{aligned}
$$

From equations 16, 18, and 20, total actual (observed) costs are

$$
\begin{aligned}
21)\quad \ln C^A = {} & \ln C^S + \ln(\sum_i [\beta_i + \sum_j \gamma_{ij} \ln(k_j P_j) + \sum_j \gamma_{iQ_j} \ln Q_j \\
& \sum_i \gamma_{iT} \ln T + \sum_i \gamma_{iB} \ln B + \sum_i \gamma_{iH} H] k_i^{-1}) \\
& \forall i, j, \text{ and } Q_j.
\end{aligned}
$$

Using equations 17 and 20, the actual (observed) cost shares are given by

$$
\begin{aligned}
22)\quad M_i^A = {} & [\beta_i + \sum_j \gamma_{ij} \ln(k_j P_j) + \sum_j \gamma_{iQ_j} \ln Q_j + \gamma_{iT} \ln T \\
& + \gamma_{iB} \ln B + \gamma_{iH} H] k_i^{-1} / \sum_i [\beta_i + \sum_j \gamma_{ij} \ln(k_j P_j) \\
& + \sum_j \gamma_{iQ_j} \ln Q_j + \gamma_{iT} \ln T + \gamma_{iB} \ln B \\
& + \gamma_{iH} H] k_i^{-1} \\
& \forall i, j, \text{ and } Q_j.
\end{aligned}
$$

Equation 21 and two of the share equations 22, appended with classical additive disturbance terms, constitute the set of equations to be jointly estimated.[21] Cost estimates were derived using the iterated seemingly unrelated regression technique.

NOTES

[1]For a technical discussion, see Diewert (1974).

[2]We consider the impact on scale and scope economies and the role of technology.

[3]There is also significant disagreement on the existence of these economies; see Evanoff and Israilevich (1990). There has also been a common misinterpretation in the literature of precisely what constitutes scale efficiency, see Evanoff and Israilevich (1995). For an alternative analysis of the impact of regulation on bank efficiency, see DeYoung (1998) and accompanying articles. Other recent analyses of bank efficiency include Berger and Mester (1997) and Berger and Humphrey (1997).

[4]See Evanoff (1985) for further discussion of non-price competition.

[5]This ratio is the marginal rate of technical substitution between the inputs.

[6]That is, the predetermined level of output is the only constraint imposed on the firm.

[7]See Brewer (1988), Chase (1981), Lloyd-Davies (1975), Pyle (1974), and Startz (1979).

[8]Technically, these shadow price approximations can be interpreted as first-order Taylor's series expansions of arbitrary shadow price functions. It should be emphasized that we are testing for relative price efficiency (whether $k_l = k_k$) and not absolute efficiency whether all ks actually equal one.

[9]We are using an "intermediation approach" in defining bank outputs, that is, we measure output as the dollar value of produced assets and include the interest expense of funds in our measure of costs. This accounts for the most fundamental role of banks: to intermediate and transform liabilities into assets. This is in line with much of the recent bank cost literature, although an alternative "production approach" has been used by others when evaluating small commercial banks. For a discussion of the alternative approaches and their differences, see Berger, Hanweck, and Humphrey (1987).

[10]Rangan et al. (1988), Berger and Humphrey (1990), and Elyasiani and Mehdian (1990a) found large banks to be more efficient. Elyasiani and Mehdian attribute most of the differential to scale advantages, and Rangan et al. attribute it to pure technical efficiency differences. Neither study, however, tested for allocative efficiency. Using a nonparametric approach, Aly et al. (1990) did not find allocative efficiency to be related to bank size.

[11]Detailed estimates are available from the author upon request and are summarized in Evanoff and Israilevich (1990). The sample includes both unit and branch banks. This was done to preserve the attributes of the panel sample, as some states changed their restrictions on geographic expansion during the period studied. Analysis of a sample of branch banks produced similar results, albeit distortions of a smaller magnitude.

[12]With $k_L = 1.0$, the estimated factor price distortions were $k_{capital} = .588$ and $k_{funds} = .976$, with both estimates being statistically different from a value of 1.0.

[13]It is also most likely that this partially results from the substantial "fixed" costs. We should emphasize that cost complementarities and scope economies are not synonymous; scope is a broader concept. Additionally, estimates of scope economies should be interpreted cautiously, since these require evaluation of the cost function at values significantly distant from the sample. Empirically this has been shown to be a particular problem with the translog functional forms we have used here.

[14]Using similar data, an aggregate output measure, and production expenses only (excluding funding cost), an earlier study found a more significant influence from technology (Evanoff, Israilevich, and Merris, 1989). This suggests, as expected, that technical advances have aided the physical production process significantly more than the funds gathering process.

[15]In our empirical analysis, we simultaneously estimate a cost equation and input share equations. The finding of labor-saving technology for banks is derived from the input share equations.

[16]Again, contrasting these findings to those using an aggregate output measure and production costs suggests, as expected, that regulatory-induced inefficiencies affect the production process more than the funds collection process.

[17]See Berger and Humphrey (1990) for a complete description of the procedure. Our methodology differs slightly because we do not have to assume that the low-cost quartile firms are both technically and allocatively efficient. We can account for allocative inefficiencies by using the SP model. In theory, we believe this is preferred since even well managed (technically) efficient institutions can be adversely affected by regulation. However, quantitatively the difference may be small, given our finding of limited allocative inefficiency. Also, by using a panel data set, we do not encounter the problem of limited observations for the subsample of large banks. Detailed results from the estimates summarized here are available from the author on request.

[18]Further details are available from the author.

[19]Statistical tests indicated the two periods should be viewed separately.

[20]We also found that the effect of technology on input shares was significantly different between the two periods. While technology was funds-using in both periods, the effect was much larger in the deregulated period. Similarly, technology was significantly more capital-saving in the deregulated period, that is, when firms could compete directly via prices instead of employing alternative (capital-intensive) means to compete.

[21]One share equation is dropped because of the singularity of the variance-covariance matrix of the error terms for the three-equation system resulting from the adding-up conditions on the share equations. We arbitrarily drop the capital-share equation. The empirical results are invariant to the choice of share equation deleted and to the shadow price chosen for normalization.

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Access to FHLBank advances and the performance of thrift institutions

Lisa K. Ashley, Elijah Brewer III, and Nancy E. Vincent

Introduction and summary

The failure rate for thrifts (savings and loan associations and some savings banks) in the second half of the 1980s and early 1990s was substantially higher than in earlier decades. For example, the number of thrift failures averaged about 32 per year between 1980 and 1985, compared with about 136 per year between 1986 and 1992 (CBO, 1993). The Federal Home Loan Bank (FHLBank) System was the primary federal regulator of thrifts and was responsible for the supervision and examination of most of these failing institutions. The FHLBank System also lent funds to thrifts and became a reliable source of nondeposit funds to support the lending activities of safe and sound institutions. According to Bodfish and Theobald (1938) and as discussed in Barth and Regalia (1988), the FHLBank System lending program was not intended to "bail out" failing thrifts. However, many failed thrifts borrowed from the FHLBank System during the 1980s, and some borrowed a substantial amount several years prior to their closure. For example, of the 205 failed thrifts that were resolved (that is, liquidated or merged with regulatory assistance) in 1988, the year before Congress passed the Financial Institutions Reform, Recovery and Enforcement Act (FIRREA), 76 percent borrowed from their FHLBank three years before closure. In some cases, borrowings by these thrifts were as high as 35 percent of total assets. In their last year of operation, some of these thrifts financed about 72 percent of their total assets with FHLBank loans. By contrast, only 40 percent of their solvent counterparts borrowed from FHLBanks at the end of 1988, financing, in some cases, only 46 percent of total assets.

At the time of their closure, the estimated present-value cost to the now defunct Federal Savings and Loan Insurance Corporation (FSLIC) to resolve the 205 thrift failures exceeded $32 billion. Because of their poor financial condition, some of these thrifts could not provide adequate collateral (that is, eligible assets) to secure their FHLBank loans.[1] Hence, the FSLIC issued guarantees for some of the more poorly capitalized thrifts to secure the funds lent by FHLBanks (see Garcia and Plautz, 1988).[2] Given these developments, the question of whether FHLBank lending to financially distressed thrifts increased FSLIC losses during the 1980s naturally arises. Because FHLBanks' claim on thrift assets was senior to that of the FSLIC, lending to troubled thrifts increased the risk of loss to the FSLIC and potentially added to the cost of thrift failure resolutions. As a result, taxpayers and policymakers have an interest in understanding the economic role of the FHLBank System in the thrift debacle of the 1980s and how a given government regulatory structure can have unintended consequences.

The FHLBank System was created to provide long-term liquidity to residential real-estate-specialized lending institutions so as to improve the flow of mortgage credit. While this concept made sense after the Great Depression, it may not make sense in a financial market that has become more efficient with the introduction of a secondary market for mortgages and mortgage securitization. These developments raise the question whether there is a need for a government-sponsored liquidity facility for real-estate-specialized lending institutions. The question takes on added importance in view of evidence that smaller thrifts, which are likely to have fewer alternative

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sources of long-term liquidity, tend to use the FHLBank advance (loan) program less than larger thrifts. Also, it is important to note that FHLBank advances do not subject borrowing thrifts to the discipline that would be imposed by other creditors and market analysts. By insulating them from market discipline, FHLBank advance programs provide incentives for borrowing thrifts to take more risk. This is an important issue for policymakers, who are concerned about minimizing the loss exposure of the federal deposit insurance funds.

During the thrift debacle of the 1980s, FHLBank advances to individual thrifts varied considerably in terms of net worth and borrowings relative to the thrifts' total assets. We use data on these variations to test whether FHLBanks made credit available to the most troubled thrifts, defined as those with the largest gap between their regulatory accounting principle (RAP) capital and generally accepted accounting principle (GAAP) capital. RAP allowed thrifts to count, as part of capital, appraised equity capital, qualifying subordinated debentures, and net worth certificates issued by the Federal Home Loan Bank Board (FHLBB) to increase *recorded*, though not *economic*, net worth. In addition, thrifts were allowed to defer losses on the sale of assets that carried below-market interest rates.[3] These items capture the extent to which regulators granted thrifts regulatory forbearance by allowing them to "invent" assets that artificially inflated their capital. These modifications in the definition of capital were designed to give troubled thrifts time to initiate strategies that would return them to financial health. Thrifts with most of their reported capital in these forms might not be able to raise noninsured sources of funds in the private sector. FHLBank lending to thrifts with the largest gap between RAP and GAAP capital gave them time to attempt to recover, as well as time to "gamble for resurrection" by making large volumes of higher-risk, potentially high-profit investments. If the investments made good, the thrift would reap the profits, but if the investments soured and the thrift went broke, the FSLIC and not the thrift's owners would be liable for the losses. This incentive to gamble for resurrection is strongest when there is little equity left. Thus, it is likely that the magnitude and cost to taxpayers of the 1980s thrift debacle were increased by regulatory forbearance policies, including FHLBanks' provision of aid to financially distressed firms.[4]

In addition to examining whether financially distressed thrifts made greater use of FHLBank advances than financially sound thrifts, we consider whether the pattern of borrowings differed by FHLBank district. Because of the collapse of the oil industry and its associated effect on real estate prices in the early 1980s, many thrift institutions in the ninth district of the FHLBank System (Arkansas, Louisiana, Mississippi, New Mexico, and Texas) became insolvent.[5] In some states, congressional pressure persuaded thrift regulators to grant forbearance and increased access to the FHLBank advance program to aid poorly capitalized institutions. Finally, because we would expect financially distressed thrifts to benefit most from access to FHLBank funds and this benefit to be reflected in their stock returns, we examine whether changes in FHLBank advances are related to thrift stock returns.

We find that total advances to thrift institutions rose sharply over the 1980s, reached a peak in 1988, and declined in the latter part of the 1980s and early 1990s. The peak borrowing was reached in 1988, one year prior to the enactment of FIRREA, and the decline took place over the period when regulators were closing down failing thrifts. We find that, for each year from 1985 to 1991, thrifts with book-value capital less than or equal to zero borrowed proportionately more from FHLBanks than better capitalized thrifts. That is, there is a negative correlation between FHLBank advances and capital. Our results are consistent with those of Garcia and Plautz (1988), who used data for FSLIC-insured thrifts for the fourth quarter of 1986 to show that the growth of FHLBank advances was greater for troubled thrifts than other institutions.

To get a better sense of whether troubled thrifts relied more heavily on FHLBank advances than their financially stronger counterparts, we use annual data for all FSLIC-insured thrifts from 1985 to 1991 to examine the relationship between FHLBank advances and several measures of thrifts' financial condition. Because poorly capitalized thrifts held a greater proportion of risky assets than other thrifts and thrifts with a high proportion of risky assets tended to borrow more from FHLBanks, our finding that FHLBank advances increased with thrift undercapitization could reflect the risky assets in thrift asset portfolios. To control for this effect, we estimate the relationship between FHLBank advances and various financial factors, including risky asset ratios, book capitalization, and the extent to which book capital has been inflated by regulatory accounting practices. We find that the relationship between book capital and FHLBank advances, controlling for risky assets, is negative. That is, financially distressed thrifts tended to borrow more on average than financially stronger thrifts. We also find that FHLBank advances increase when assets are riskier. This contradicts the notion that FHLBanks lend to safe and sound institutions.

The variable measuring the extent to which thrifts were using regulatory cosmetic accounting techniques to artificially inflate their capital position is positively correlated with FHLBank advances. Thus, a thrift using a relatively high amount of regulatory accounting items tended to borrow more from an FHLBank than another thrift, even if they had the same book capital ratio. This finding is important because it suggests that regulators' modifications of rules to close down insolvent depository institutions can increase the value of access to government subsidies (such as FHLBank advances) and affect the behavior of the regulated institutions.

Finally, we use quarterly stock market return data for 99 publicly traded thrift organizations from 1985 to 1992 to determine whether borrowing from FHLBanks was viewed favorably by the stock market. This expands on the work of Brewer (1995) and Brewer and Mondschean (1994), which examined the impact of asset mix changes on common stock returns of financially distressed thrifts and their healthier counterparts. Both studies found that thrifts, depending on their financial condition, can exploit underpriced federal deposit insurance by shifting into riskier activities, because such shifts raise asset risk, increasing the value of deposit insurance and leading to higher common stock returns. Similarly, increases in advances from FHLBanks, using thrift good assets as collateral, allow thrifts to exploit federal deposit insurance by increasing the risk to the FSLIC. We would expect the stock returns of troubled thrifts to increase more than those of financially sound thrifts when they increase their borrowing from FHLBanks. Our stock return results suggest that having increased access to FHLBanks advances was associated with one-time increases in the common stock returns of troubled thrifts. Because FHLBank claims on thrift assets are senior to those of the FSLIC, lending to troubled thrifts increased the risk of the FSLIC's position. This shift benefited shareholders because, during the period under review, the regulators did not charge a risk-based deposit insurance premium. Our results indicate that the benefits from borrowing at FHLBanks were associated with higher stock returns.

Structure of the FHLBank System

The financial distress that thrifts experienced and the accompanying disruption in the mortgage market during the Great Depression prompted Congress to pass several bills to stabilize the savings and home financing industry. First, Congress passed the Federal Home Loan Act of 1932, creating the FHLBank System. This system, designed along the lines of the Federal Reserve System, consists of 12 FHLBanks, each serving a geographically distinct district. In addition, the Home Owner's Loan Act of 1933 created the FHLBank Board as a federal government agency with supervisory responsibility for the FHLBanks.

The main purposes of the FHLBank System were to provide liquidity to thrifts, thereby facilitating home ownership through greater availability of mortgages, and to be the primary federal regulator of thrifts. Similar to district Federal Reserve banks, FHLBanks are wholly owned by member institutions. Prior to 1989, members included all federal savings and loan associations and state chartered savings and loans that voluntarily chose and qualified to be members.[6] Each member institution is required to hold an equity stake in its district FHLBank.

In 1934, Congress enacted the National Housing Act, which established the FSLIC within the FHLBB, to promote confidence in the thrift industry through share capital (or deposit) insurance at thrifts. The initial deposit insurance was $5,000 per account, similar to that at commercial banks. This amount has been increased periodically, with the last change to $100,000 occurring in 1980.

This supervisory and regulatory structure remained in place until the late 1980s, when the deterioration in the financial condition of the S&L industry caused Congress to restructure the way the industry is regulated and insured and improve supervisory control. FIRREA, signed into law by President Bush on August 9, 1989, abolished both the FSLIC and the FHLBB. In their place, the act established the Federal Housing Finance Board (FHFB) as an independent agency, responsible for overseeing the operations of the 12 regional FHLBanks, relinquished control of the insurance functions to the Federal Deposit Insurance Corporation (FDIC), and transferred the thrift supervisory and regulatory functions of the FHLBB and the FHLBanks to a new Office of Thrift Supervision (OTS) in the Department of the Treasury.

The FHFB consists of a five-member board, including the Secretary of Housing and Urban Development, and is funded through assessments on the FHLBanks.[7] The board ensures that the FHLBanks carry out their housing finance mission, remain adequately capitalized, and are able to raise funds in the capital market. In addition, the FHFB must ensure that the FHLBanks operate in a safe and sound manner by following regulations governing their operations.

Financial condition of FHLBanks

At the end of 1996, total assets of the FHLBanks exceeded $292 billion, up 61 percent from the end of

TABLE 1

Financial characteristics of FHLBanks
($ in millions)

Year	Advances	Investments	Consolidated obligations	Capital stock	FHLB assets	Retained earnings	Total capital	Total assets	Capital ratio
1960	$1,981	$1,233	$1,266	$989	$3,316	$83	$1,072	$3,316	0.3233
1965	5,997	1,640	5,221	1,277	7,806	158	1,435	7,806	0.1838
1970	10,615	3,732	10,181	1,607	14,723	260	1,867	14,723	0.1268
1971	7,936	2,520	6,840	1,618	11,001	281	1,899	11,001	0.1726
1972	7,979	2,225	6,671	1,756	10,731	299	2,055	10,731	0.1915
1973	15,147	3,437	14,449	2,122	19,066	374	2,496	19,066	0.1309
1974	21,804	3,097	19,445	2,624	25,499	539	3,163	25,499	0.1240
1975	17,845	4,376	16,383	2,705	22,708	590	3,295	22,708	0.1451
1976	15,862	6,079	14,620	2,889	22,481	634	3,523	22,481	0.1567
1977	20,173	3,749	16,009	3,295	24,566	681	3,976	24,566	0.1618
1978	32,670	3,414	25,109	4,120	36,767	837	4,957	36,767	0.1348
1979	41,838	3,693	30,372	5,149	46,428	943	6,092	46,428	0.1312
1980	48,963	4,328	37,268	5,160	54,347	869	6,029	54,347	0.1109
1981	65,194	8,157	54,131	5,827	74,680	974	6,801	74,680	0.0911
1982	66,011	12,575	55,972	6,269	80,262	1,144	7,413	80,262	0.0924
1983	58,977	9,841	48,931	6,395	72,490	1,339	7,734	72,490	0.1067
1984	74,618	17,584	65,085	7,200	96,993	1,503	8,703	96,993	0.0897
1985	88,835	19,243	74,460	8,313	112,179	1,792	10,105	112,179	0.0901
1986	108,645	17,388	88,752	9,485	131,427	2,323	11,808	131,427	0.0898
1987	133,058	16,538	116,386	11,281	154,177	2,464	13,745	154,177	0.0892
1988	152,799	16,981	136,513	13,177	174,737	2,343	15,520	174,737	0.0888
1989	141,795	33,912	136,799	13,385	180,677	820	14,205	180,677	0.0786
1990	117,103	44,280	118,437	11,104	165,742	521	11,625	165,742	0.0701
1991	79,065	71,740	108,149	10,200	154,556	495	10,695	154,556	0.0692
1992	79,884	79,133	114,652	9,921	162,134	531	10,452	162,134	0.0645

Source: Federal Housing Finance Board.

1989 (see table 1). The FHLBanks are capitalized through the retention of earnings and the purchase of stock by member institutions. As of yearend 1996, the FHLBanks, on a consolidated basis, had a book capital (including par value of common stock and retained earnings) to total on-balance-sheet asset ratio of 5.5 percent.[8] This ratio is slightly higher than the target leverage ratio of 5 percent for depository institutions to be classified as well capitalized under prompt corrective action provisions of the FDIC Improvement Act of 1991. However, because all members of the FHLBank System, except federally chartered thrifts, can withdraw from membership, the permanence of this capital base is questionable at best. While a member's capital stock cannot be withdrawn immediately upon demand and an FHLBank cannot redeem stock if the redemption would cause the FHLBank to be undercapitalized, the temporary nature of the capital base could be of concern if the FHLBanks experience losses or membership becomes unattractive.

In addition to capital, funding for FHLBanks comes from debt issued as consolidated obligations of the 12 FHLBanks and consists of bonds and discount notes that are limited by statute to an amount not to exceed 20 times the total paid-in-capital stock and legal reserves of all FHLBanks. Although FHLBank System debt does not carry an explicit federal government guarantee, the fact that FHLBanks operate under a federal charter and government supervision creates a perception of an implicit government guarantee. FHLBank debt carries an AAA credit rating and coupon income is exempt from state and local income taxes.

FHLBank funds are used to make advances to member thrift institutions and to hold a portfolio of investment securities. Traditionally, FHLBanks held a portfolio of investment securities to earn interest income on proceeds from prepaid loans from member institutions, to invest members' overnight deposits, and to have a ready source of liquidity to satisfy unanticipated demands for advances by member institutions (see table 2). The types of investment securities that FHLBanks can hold are determined by their supervisory agency and include obligations of the U.S. Treasury, Federal National Mortgage Association, and Government National Mortgage Association; mortgages, obligations, or other securities sold by the Federal Home Loan Mortgage Corporation; and instruments a fiduciary or trust fund may invest in under the laws of the state in which the FHLBank is located. Holdings of investment securities grew about 130 percent between the end of 1985 and the end of 1990.

During the 1980s, advances averaged about 84 percent of the FHLBank System's total assets, ranging from 78 percent to 90 percent over the decade. FHLBanks are required to secure the funds advanced to member institutions. The collateralization feature gives FHLBanks prior claim to assets in the event of a thrift failure. The collateral is in the form of first mortgages, U.S. government securities (Treasury and agency securities), deposits at FHLBanks, and real estate assets approved by FHLBanks. While U.S. government securities and deposits at FHLBanks represent high-quality collateral, mortgages could be low-quality collateral if underwriting standards are poor, leading to substandard loans. Although borrowing institutions have different risk profiles and the quality of their collateral may vary, FHLBanks offer advances at a flat rate independent of risk. Furthermore, FHLBanks offer advances at lower interest rates than the thrifts could obtain on their own. This is possible because FHLBanks, in turn, are able to jointly issue consolidated

TABLE 2

Investment portfolios of FHLBanks
(percent of total investments)

Type of security	1985	1987	1989	1991	1992
Treasury securities	5.57	4.76	2.79	1.62	4.05
Federal agency securities	0.33	0.53	0.55	0.00	15.16
Federal funds	75.76	71.27	62.93	44.53	34.49
Bankers' acceptances	0.37	0.22	0.34	0.00	0.00
Certificates of deposit	0.97	1.71	0.97	0.00	0.00
FHLBank consolidated securities fund[a]	16.96	20.19	20.60	0.00	0.00
Securities repurchase agreements	0.00	0.00	0.00	15.17	12.33
Commercial paper[b]	0.00	0.00	5.88	9.75	0.00
Mortgage-backed securities	0.00	0.00	6.23	21.33	29.06
Other securities	0.03	1.74	0.00	7.69	4.91
Total dollar investments *(billions)*	19.3	17.4	32.0	72.4	79.7
Percent of total assets	17.0	11.0	18.0	46.0	49.0

[a]The consolidated securities fund is a centralized portfolio management system for securities owned by FHLBanks operated by the Office of Finance. It invests primarily in short-term money market instruments.

[b]Beginning in 1996, commercial paper also contains bank notes.

Source: Federal Housing Finance Board.

obligations, or debt securities to the market, paying rates lower than similar securities issued by depository institutions. The market is willing to accept lower investment rates due to the tax-exempt status of the consolidated obligations and because it is pricing in an implicit government backing of the securities.

FHLBank advances support the home mortgage market

Proponents of the FHLBank System felt that thrifts needed the liquidity provided by the FHLBank advance program because of the maturity mismatch between their liabilities and assets. A typical thrift makes long-term, fixed rate mortgage loans, financed by short-term, effectively variable rate deposits, which can make for challenging financial management. A sudden increase in market rates, for example, can create several difficulties for a thrift. Because incoming mortgage interest income is based on fixed-rate mortgage loans, it cannot re-price such mortgages at the higher market rates of interest. Due to the long-term nature of such assets, the thrift could miss out for several years on the higher market interest rates that an institution with a shorter term asset structure would enjoy. Furthermore, if the increase in market interest rates is sharp and unexpected and the thrift is not able to increase its deposit rates quickly, it could experience substantial deposit outflows as its customers transfer their funds into instruments with more attractive returns. Such a deposit outflow would make it difficult for the thrift to fund new, higher-yielding mortgage loans. Even if the thrift reacts to the increased market interest rate by offering competitive rates to its depositors, it then has to pay out more than it is receiving in income from older mortgage loans. The advances provided by FHLBanks can ease some of these difficulties by supporting the lending activities of the thrift industry.

The statement of policy on advances in the Code of Federal Regulation indicates that:

"[T]he primary credit mission of the Federal Home Loan Banks is to provide a reliable source of credit for member institutions. ... Advances generally shall be made to creditworthy members upon application for any sound business purpose in which members are authorized to engage. Such purposes include, but are not limited to, making residential mortgage, consumer, and commercial loans, covering savings withdrawals, accommodating seasonal cash needs, restructuring liabilities, and maintaining adequate liquidity." (U.S. Federal Home Loan Bank System, 1987, 531.1)

By providing member institutions with access to advances with maturities varying from overnight to 20 years (see table 3), FHLBanks can stabilize the flow of residential mortgage loans issued by thrifts during periods of deposit outflows. The availability of FHLBank advances enhances the liquidity of mortgages and mortgage-related assets, such as mortgage-backed securities. Since thrifts and other depository institutions face fluctuations in their deposits, they need to hold a sufficient amount of liquid assets. Mortgage loans and other long-term assets are illiquid, but they can be used as collateral to borrow from FHLBanks. The availability of FHLBank loans allows member institutions to hold a more illiquid and, presumably, a more profitable asset portfolio than otherwise. Furthermore, FHLBank advances provide a means to move surplus funds from regions of the country with excess funds to regions where demand for mortgage financing exceeds the local institutions' supply of funds.

Figure 1 shows the trend in advances over the 1970–92 period and table 4 reports on FHLBank lending activity in selected years from 1960 to 1992. As noted earlier, advances to FHLBank members rose sharply during the early 1980s, reached a peak in 1988,

TABLE 3

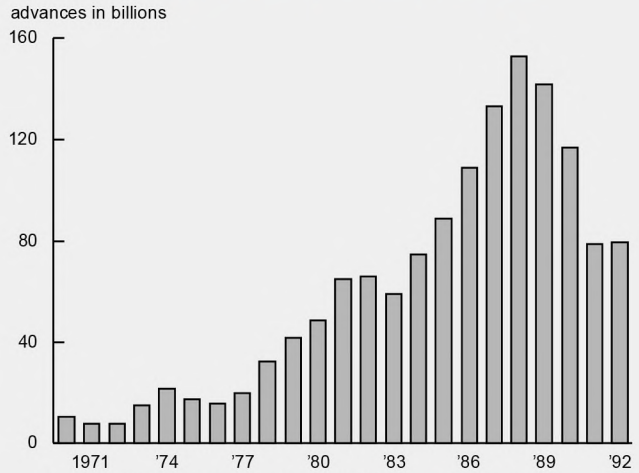
Maturity distribution of FHLBank advances
($ in millions)

Years	1985	Percent of total	1987	Percent of total	1989	Percent of total	1992	Percent of total
1	40,687	46	50,803	38	33,783	28	33,184	41
2	13,777	16	20,235	15	30,202	25	14,127	18
3	11,189	13	15,057	11	18,196	15	11,824	15
4	5,630	6	14,187	11	15,872	13	6,075	8
5	5,797	6	10,597	8	7,657	6	6,750	8
Longer than 5	11,771	13	22,175	17	14,731	12	7,946	10
Total	**88,851**		**133,055**		**120,443**		**79,906**	

Source: Federal Home Loan Bank System, *Financial Reports*, 1985, 1987, 1989, and 1992.

FIGURE 1

Total FHLB advances outstanding



Sources: United States League of Savings Institutions, *Savings Institutions Sourcebook*, 1987; FHLBank System, *Financial Reports*, Washington, DC, 1987–92; and Office of Thrift Supervision, *Savings and Home Financing Source Book*, Washington, DC, 1989.

TABLE 4

FHLBank lending activity
($ in millions)

Year	Advances: Made	Advances: Repaid	Advances: Outstanding	Percent, FHLBank members' assets
1960	1,943	2,097	1,981	2.9
1965	5,007	4,335	5,997	4.7
1970	3,255	1,930	10,615	6.2
1971	2,714	5,392	7,936	3.9
1972	4,792	4,750	7,979	3.4
1973	10,013	2,845	15,147	5.7
1974	12,763	6,106	21,804	7.5
1975	5,468	9,425	17,845	5.4
1976	8,114	10,097	15,862	4.1
1977	13,756	9,445	20,173	4.5
1978	25,166	12,800	32,670	6.3
1979	29,166	19,998	41,838	7.3
1980	36,585	29,460	48,963	7.9
1981	53,941	37,709	65,194	10.0
1982	53,744	52,928	66,011	9.5
1983	44,724	51,758	58,977	7.8
1984	91,239	75,598	74,618	8.4
1985	133,651	119,417	88,835	9.4
1986	181,661	161,833	108,645	9.3
1987	194,381	170,000	133,058	10.6
1988	187,536	167,809	152,799	11.5
1989	218,876	229,874	141,795	11.3
1990	149,459	174,157	117,103	—
1991	175,673	213,710	79,065	—
1992	263,088	262,186	79,884	—

Sources: United States League of Savings Institutions, *Savings Institutions Sourcebook*, 1987; FHLBank System, *Financial Reports*, Washington, DC, 1987–92; and Office of Thrift Supervision, *Savings and Home Financing Source Book*, Washington, DC, 1989.

and declined during the late 1980s and early 1990s. FHLBank advances offer member institutions several advantages over other sources of funds. First, advances are immediately available. Second, member institutions have a fair amount of flexibility in choosing the maturity and volume of their advances. Third, advances do not carry the withdrawal risk associated with deposits. Fourth, unlike deposits, no reserve requirements or deposit insurance premiums are associated with advances.[9] The results of a recent study of the FHLBank loan program indicated that in addition to the traditional use of advances as a source of liquidity, advances are a particularly attractive source of funds for poorly capitalized thrifts. Using data for the fourth quarter of 1986, Garcia and Plautz (1988) show that deposit outflows are offset by increased advances. This study also found that advances to low-capital firms nationwide and in states with the largest number of troubled thrifts (for example, California, Louisiana, Oklahoma, Oregon, and Texas) rose more quickly than the national average.

FHLBank advances aid poorly capitalized thrifts

Proponents of the FHLBank System argue that FHLBank advances are necessary to provide lending institutions that specialize in real estate access to nondeposit sources of funds because such institutions have few, if any, alternative nondeposit sources of funds. This is especially a concern for small thrifts, which may not participate in the repurchase agreement, commercial paper, or brokered deposits markets. However, in 1988, advances to institutions with less than $500 million in total assets accounted for only 13 percent of all advances (see table 5). On the other hand, thrifts with total assets in excess of $500 million relied heavily on advances in 1988, with some 89 percent borrowing from FHLBanks, accounting for 87 percent of total FHLBank advances. Furthermore, FHLBank advances, which represented 11 percent, on average, of the borrowers' total assets in 1988, were being used to replace more costly funding sources rather

TABLE 5

FHLBank thrift borrower characteristics
(December 31, 1988)

Asset size	Number of institutions	Percent that borrow	Advances to borrower assets, percent	Percent of all outstanding advances
Thrifts	2,991	62	11	
Less than $500 million	2,542	57	8	13
$500 million or more	449	89	12	87

Source: Federal Reserve Board of Governors, *Savings and Loan Regulatory Reports*, December 31, 1988.

than to fund additional mortgage lending (see Garcia and Plautz, 1988, and Mays and DeMarco, 1989).

During the thrift debacle of the 1980s, FHLBank advances were increasingly used to provide assistance to failing thrifts that were losing deposits, particularly uninsured deposits. FHLBanks made advances to thrifts that would have found it more difficult and more costly to raise funds through other sources. At times, they even made advances to thrifts that lacked the necessary collateral in exchange for a guarantee of repayment provided by the FSLIC (see Garcia and Plautz, 1988). Finally, when a thrift had exhausted all collateral options and FSLIC guarantees were not available, advances were made by the Joint Lending Program of the Federal Reserve Banks, the FHLBanks, and the FSLIC.[10]

Table 6 shows the proportion of yearend total assets financed with advances for thrifts nationwide and for thrifts in the six states (California, Florida, Illinois, Louisiana, Oklahoma, and Texas) that accounted for the largest share of the total cost of failure resolutions from 1985 to 1991.[11] Both nationwide and in five of the six states, insolvent thrifts, that is, thrifts with GAAP capital less than or equal to zero, borrowed proportionately more from FHLBanks than solvent institutions. From these limited data, insolvent thrifts appeared to use more FHLBank advances than the rest of the industry.

The tendency of FHLBanks to aid troubled thrifts raises several issues. First, FHLBanks are providing subsidized aid. Rates on advances, which are fixed at the time of borrowing, vary by maturity and date of commitment but not by risk of the borrowing thrift. The rates on advances are set by each FHLBank as a fixed spread over the System's expected cost of funds.[12] According to Garcia and Plautz (1988), these rates should be comparable to the rates that a large, well-capitalized thrift could obtain on its own account. While a large, well-capitalized thrift may be paying a "fair" price for advances, a financially distressed association would be obtaining funds at below market rates.

Second, during the 1980s, aid to financially distressed thrifts by FHLBanks provided the funds necessary for the government to engage in capital forbearance. This practice allowed weak (high-risk) thrifts to continue to operate without the capital constraints imposed on strong (low-risk) thrifts. Supporters of forbearance policies argued that thrifts weakened by technical liquidity problems—cash outflows exceeding inflows—should be given the chance to recover.[13] As these temporary problems went away, the thrifts could use their new profits to build equity and reserves against future losses. However, in the late 1980s, forbearance was bestowed on thrifts experiencing credit quality problems that far exceeded issues of technical liquidity.

The practice of forbearance exempted some thrifts from regulatory capital requirements for extended periods of time. Other thrifts benefiting from forbearance were allowed to invent value for assets that artificially inflated their regulatory net worth. These included nonstandard considerations of appraised equity capital, income capital certificates, net worth certificates, and deferred losses. FHLBanks supported forbearance by extending advances to many failing thrifts as they lost deposits, particularly uninsured deposits.

Lack of reserves in the FSLIC fund prevented thrift regulators from resolving institutions commonly known to be beyond hope of recovery. The Competitive Equality Banking Act of 1987, among other things, required the FHLBB to give thrifts time to initiate strategies for a return to capital adequacy.

However, the evidence shows that capital forbearance was a gamble for the FSLIC and its cost turned out to be significant (see DeGennaro and Thomson, 1996). The policy encouraged thrift management to gamble for resurrection by making large volumes of high-risk, potentially high-profit loans. If the gamble paid off, the thrift would reap the profits; if it backfired,

TABLE 6

Federal Home Loan Bank thrift advances, December 31 of each year
(Percent of total assets)

	Capital ratio	1985	1986	1987	1988	1989	1990	1991
Total industry	≤ to 0%	6.75	8.05	9.37	10.82	9.52	7.40	4.04
	0–3%	4.82	5.16	6.91	7.78	7.86	6.79	5.51
	>3%	2.77	3.24	4.13	4.29	3.67	3.14	2.83
	Total industry	3.78	4.25	5.34	5.54	4.93	3.79	3.04
California	≤ to 0%	9.81	8.09	3.29	3.48	3.14	8.21	2.17
	0–3%	5.30	5.90	5.08	6.81	6.26	5.20	1.13
	>3%	3.54	3.79	4.54	5.08	5.25	5.77	5.37
	Total state	4.70	4.70	4.40	5.15	5.11	5.82	4.91
Florida	≤ to 0%	6.38	7.48	9.56	10.85	8.00	9.28	2.47
	0–3%	5.40	5.63	8.58	9.95	7.49	3.90	2.76
	>3%	3.37	4.34	5.45	6.14	4.99	3.95	4.49
	Total state	4.21	4.92	6.43	7.20	5.80	4.67	4.00
Illinois	≤ to 0%	3.51	4.19	6.09	6.29	4.78	6.01	6.18
	0–3%	3.67	3.38	4.15	4.33	3.62	3.19	1.08
	>3%	1.24	2.07	2.45	2.06	1.92	1.68	1.28
	Total state	2.33	2.76	3.50	3.12	2.57	1.92	1.38
Louisianna	≤ to 0%	12.32	10.85	13.10	15.77	12.13	6.73	1.87
	0–3%	4.60	4.33	5.05	5.40	2.24	0.90	1.56
	>3%	2.33	2.62	3.65	5.32	3.54	1.32	0.56
	Total state	5.49	5.25	6.43	8.81	6.53	2.81	0.75
Oklahoma	≤ to 0%	5.99	8.74	11.57	7.87	9.07	9.72	0
	0–3%	8.31	7.60	10.69	10.67	11.35	7.95	0.71
	>3%	5.50	5.20	5.45	9.11	5.24	6.92	4.97
	Total state	6.07	6.77	8.84	9.48	8.03	7.58	3.85
Texas	≤ to 0%	6.26	9.97	11.30	13.86	10.24	5.86	0
	0–3%	3.88	4.38	6.40	10.64	14.77	6.69	0.40
	>3%	4.31	4.26	5.80	7.03	5.02	5.49	4.80
	Total state	4.52	6.01	8.36	10.45	9.19	5.75	4.08

Notes: These figures are averages of the ratio of FHLBank advances to total assets. Thrifts are divided into three groups: 1) Thrifts with negative book equity according to generally accepted accounting principles; 2) low-capital thrifts, with positive net worth below 3 percent of assets; and 3) well-capitalized thrifts, with net worth above 3 percent of assets.

Source: Federal Reserve Board of Governors, *Savings and Loan Regulatory Reports*, 1985–91.

the FSLIC would be liable for the losses. This incentive arises from the combination of deregulation, inadequate regulatory supervision, and deposit insurance premiums that are not based on risk, and it is strongest when there is little equity left. Thus, the magnitude and cost of the thrift debacle in the 1980s were likely increased by forbearance practices that included, among other things, FHLBanks providing aid to financially distressed firms.

Table 7 provides financial characteristics of the 205 thrifts that were resolved by the FSLIC in 1988, the year before Congress passed FIRREA. Barth, Bartholomew, and Labich (1989) report that a substantial number of these resolved thrifts had been insolvent since the early 1980s. The delay in closing insolvent thrifts increased the value of access to deposit insurance and allowed thrifts to shift more risk to the deposit insurer. As table 7 shows, the thrifts resolved in 1988 held more commercial real estate loans, acquisition and development loans, non-mortgage loans (business and consumer), and direct investments—all generally viewed as riskier asset classes than residential mortgage loans—than the industry average in each of the three years prior to failure. At the same time, FHLBank advances as a fraction of total assets were higher at resolved thrifts than at non-resolved thrifts, rising from 6.4 percent at the end of 1985 to 10.6 percent in the last year before closure in 1988. These numbers suggest that FHLBank advances grew as thrift capital declined; advances also grew with the extent to

TABLE 7

FHLBank advances and other financial characteristics of 1988 resolutions (Percent of total assets)

	1985		1986		1987	
Financial ratios	**1988 failures**	**Industry**	**1988 failures**	**Industry**	**1988 failures**	**Industry**
Mortgage loans						
Residential	34.84	50.84	33.06	48.27	32.78	48.86
Commercial	13.76	8.52	12.65	8.48	11.96	8.31
Land	9.50	2.53	8.55	2.40	6.00	1.98
Others	12.54	11.44	12.17	12.03	11.76	13.58
Nonmortgage loans	7.18	5.48	7.45	5.65	6.91	5.66
Direct investment	4.72	1.29	5.06	1.36	5.35	1.37
Junk bonds	0.15	0.10	0.16	0.10	0.15	0.10
Advances	6.39	3.78	8.33	4.25	10.65	5.34
RAP	1.61	5.26	–5.57	4.82	–19.41	3.60
GAAP	–0.84	4.13	–8.10	3.77	–22.14	2.65
TAP	–2.56	3.30	–9.74	2.98	–23.55	1.83
Return on assets	–0.48	0.04	–2.08	–0.13	–2.84	–0.30

Notes: Data are for 205 thrifts resolved in 1988. RAP is regulatory accounting principle capital; GAAP is generally accepted accounting principle capital; and TAP is tangible accounting principle capital.

Source: Federal Reserve Board of Governors, *Savings and Loan Regulatory Reports*, yearend 1985, 1986, and 1987.

which regulatory accounting practices artificially inflated capital. The result of these practices was the delayed closure of insolvent thrifts.[14] We examine this issue further using a regression equation that relates FHLBank advances to several factors, including the impact of regulatory accounting practices on thrift capital.

Developing a model to explain FHLBank advances

Our empirical analysis uses a regression model which relates a thrift's ratio of FHLBank advances to total assets to the riskiness of its asset portfolio, book capital relative to total assets, return on assets, regulatory forbearance, and the district in which the thrift is located. A formal discussion of our regression model is presented in technical appendix 1.

The riskiness of a thrift's asset portfolio is measured using the institution's holdings of commercial real estate, residential mortgage loans, and acquisition and development loans. Insolvent or high-risk thrifts tend to hold more commercial real estate loans and may finance such loans with advances from FHLBanks. Acquisition and development loans, which are loans to finance the purchase of land and the improvements required to convert it to developed building lots, have been found to add to resolution costs. However, Benston (1985) finds that changes in a thrift's capital are positively correlated with changes in acquisition and development loans. Based on the findings of Barth, Bartholomew, and Labich (1989) and Brewer and Mondschean (1994), we predict that such loans would be positively correlated with advances.

The capital ratio, defined as the ratio of GAAP net worth to total assets, should be negatively correlated with advances. A decline in capital relative to total assets increases the cost of alternative sources of funds, making advances more attractive because the advance rate does not vary with a thrift's financial condition. Thus, thrifts with low capital ratios will tend to borrow more from their FHLBanks than those with higher capital ratios. Earnings are relevant because current profitability, defined as the ratio of net income to total assets, may be a good indicator of a thrift's future performance. Current profitability also measures an institution's ability to maintain capital. A decline in current profitability can be indicative of a relatively weak financial condition, and is likely to increase the cost of nondeposit sources of funds.

The extent to which regulators have permitted cosmetic increases of capital through the use of various balance sheet "tricks" may be correlated with the ratio of FHLBank advances to total assets. Table 8 provides a list of items thrift regulators included in capital during the 1980s. To the extent that regulatory accounting practices delay the closure of troubled thrifts, we would expect these thrifts to exploit the advantages of access to flat-rate FHLBank advances. We measure regulatory forbearance as the difference between RAP-defined capital and GAAP-defined

TABLE 8

Items used to artificially raise recorded capital

1. Losses from the sale of assets with below market yields can be deferred (1981). Generally accepted accounting principles (GAAP) do not permit this type of account to be included in capital.
2. The Federal Home Loan Bank Board (FHLBB) allowed qualifying mutual capital certificates to be used by savings and loans to increase reported net worth (1980).
3. Income capital certificates are sold (for cash or interest-bearing notes) to the Federal Savings and Loans Insurance Corporation to increase reported net worth (1981). This item was included in GAAP net worth in 1984.
4. Net worth certificates are authorized by the Garn-St Germain Depository Institutions Act of 1982 to increase reported net worth (October 1982).
5. Contra-asset accounts, including loans in process, unearned discounts, and deferred fees and credits, are included in net worth (June 1982).
6. Appraised equity capital (excess over book value of appraised value of office land, buildings, and improvements, as permitted by the FHLBB) is included in net worth (1982).
7. Qualifying subordinated debentures having remaining term to maturity or term to redemption exceeding one year are included in net worth (1982).
8. Equity can be increased by the amount of goodwill and other intangible assets resulting from a merger. Goodwill is the difference between the market value of a firm's net worth and the value based on tangible assets only. Goodwill represents the value of a franchise, including name recognition, an established reputation, and loyal customers. For many thrifts, goodwill was booked as capital when they acquired other enterprises at greater than tangible asset value.

Source: Barth (1991).

capital.[15] We expect forbearance to be positively correlated with the ratio of FHLBank advances to total assets.

One of the major distinctions between RAP capital and GAAP capital is the treatment of gains and losses on the sale of mortgage loans, mortgage-related securities, and debt securities. GAAP requires immediate recognition of gains and losses, while RAP allows a thrift to defer and amortize such gains and losses. Brewer (1989) reports that GAAP-insolvent institutions tend to hold more deferred losses per dollar of assets than solvent institutions. In the empirical specification, we examine the relationship between FHLBank advances and the tendency to defer loan losses.

Another accounting issue is the treatment of goodwill. Goodwill consists principally of the amount over book value paid by a thrift to acquire other thrifts. To encourage healthy thrifts to purchase financially distressed thrifts, regulators allowed the acquiring thrift to record the excess of the acquisition price over the market value of the capital of the troubled thrift as goodwill and to amortize it as an expense for up to 40 years.[16] This would inflate the thrift's recorded capital, helping to maintain its aura of safety. To the extent that thrift regulators used the advance program "to pay acquirers off" for taking over failing thrifts, we would expect FHLBank advances relative to total assets to increase with the ratio of goodwill to total assets.

As pointed out by Kane (1989) and Romer and Weingast (1992), interference in the regulatory process by members of Congress on behalf of thrifts in their districts delayed closure and, thus, gave thrifts time to engage in more risk-taking activities. According to Romer and Weingast (1992), this political interference was especially pronounced in the Dallas FHLBank district, as Texas bankers and real estate developers complained to their lawmakers that regulators were "unfairly" restricting real estate loans and refusing to allow lenders to restructure bad loans. This resulted in the well-known meeting between Edwin Gray, then chairman of the FHLBB, and Jim Wright, Speaker of the House of Representatives, to work out an agreement to give thrifts time to recover from their financial distress.[17] Because of this political interference, lending by FHLBanks to thrift institutions is likely to vary across the 12 FHLBank districts. To capture differences in lending across districts, we included in the regression equation an indicator variable for each FHLBank district.[18] The indicator variables absorb the effects of all factors that are common to thrifts in the same FHLBank district.

Our regression equation also includes several variables that are a composite of the asset risk variables and the Dallas FHLBank district indicator variable. These composite variables capture the impact of various political maneuvers in the Dallas FHLBank district on advances to thrift institutions. This allows us to determine whether thrifts in the Dallas FHLBank district with higher-risk asset portfolios tended to finance a greater proportion of their assets with FHLBank advances than those with lower-risk asset portfolios.[19]

Empirical results

The equation in technical appendix 1 examines the relationship between FHLBank advances relative to total assets and a set of correlates. Column 1 in table 9 represents the basic model, excluding the

TABLE 9

Relationship between advances and financial characteristics of FSLIC-insured thrifts (1985–91)

Variable	Basic controls	Deferred losses and goodwill	Composite variables (controlling for Dallas FHLBank district)	Deferred losses, goodwill, and composite variables
Intercept	–0.1106	–0.0776	–0.0789	–0.0776
	(–21.53)***	(–20.49)***	(–9.49)***	(–9.24)***
Boston	0.0150	0.0159	–0.0234	–0.0202
	(4.84)***	(5.12)***	(–2.70)***	(–2.30)**
New York	–0.0272	–0.0259	–0.0643	–0.0608
	(–11.06)***	(–10.50)***	(–7.70)***	(–7.18)***
Pittsburgh	–0.0293	–0.0198	–0.0586	–0.0553
	(–11.77)***	(–7.94)***	(–6.95)***	(–6.47)***
Atlanta	–0.0169	–0.0162	–0.0563	–0.0532
	(–7.93)***	–7.54)***	(–6.72)***	(–6.26)***
Cincinnati	–0.0278	–0.0270	–0.0659	–0.0627
	(–7.90)***	(–12.88)***	(–12.42)***	(–7.43)***
Indianapolis	–0.0199	–0.0188	–0.0575	–0.0541
	(–8.23)***	(–7.76)***	(–6.26)***	(–6.38)***
Chicago	–0.0290	–0.0280	–0.0659	–0.0627
	(–13.50)***	(–13.03)***	(–8.05)***	(–7.56)***
Des Moines	–0.0116	–0.0104	–0.0490	–0.0456
	(–4.56)***	(–4.11)***	(–5.89)***	(–5.42)***
Topeka	0.0180	0.0192	–0.0208	–0.0173
	(6.04)***	(6.45)***	(–2.46)**	(–2.03)**
San Francisco	–0.0284	–0.0277	–0.0678	–0.0648
	(–10.95)***	(–10.60)***	(–7.98)***	(–7.52)***
Seattle	0.0259	0.0268	–0.0127	–0.0095
	(6.78)***	(7.05)***	(–1.42)	(–1.06)
Time-1990	–0.0133	–0.0123	–0.0129	–0.01129
	(–7.76)***	(–7.12)***	(–7.61)***	(–7.00)***
Commercial real estate (loans/total assets)	0.0926	0.0945	0.1113	0.1120
	(11.56)***	(11.81)***	(13.61)***	(13.72)***
Commercial real estate × Dallas	—	—	–0.1141	–0.1090
			(–4.06)***	(–1.22)***
Residential mortgage (loans/total assets)	0.0002	0.0025	0.0088	0.0103
	(0.06)	(0.82)	(3.15)***	(3.69)***
Residential mortgage × Dallas	—	—	–0.0568	–0.0524
			(–4.54)***	(–4.15)***
Acquisition and development (loans/total assets)	0.0193	0.0177	0.0841	0.0837
	(1.14)	(1.04)	(4.50)***	(4.50)***
Acquisition and development × Dallas	—	—	–0.1241	–0.1242
			(–3.84)***	(–3.83)***
Return on assets	–0.1467	–0.1355	–0.1486	–0.1381
	(–1.53)	(–1.41)	(–1.57)	(–1.45)
Size	0.0143	0.0137	0.0143	0.0137
	(37.89)***	(34.89)***	(37.51)***	(35.37)***
Capital ratio	–0.0382	–0.0392	–0.0405	–0.0414
	(–1.78)*	(–1.81)*	(–2.04)**	(–2.05)**
Forbearance	0.2430	0.4189	0.2334	0.4048
	(4.50)***	(3.52)***	(4.50)***	(3.50)***
Deferred loan loss to total assets	—	–0.2559	—	–0.2500
		(–2.03)**		(–2.03)**
Goodwill to total assets	—	0.1776	—	0.1686
		(6.09)***		(5.46)***
Number of observations	20,373	20,373	20,373	20,373
Adjusted R^2	0.22	0.23	0.23	0.23
F-statistic	244.38	231.02	223.22	212.30

* Indicates significance at the 10% level; ** indicates significance at the 5% level; and *** indicates significance at the 1% level.

Notes: This table provides the regression results of the relationship between the ratio of FHLBank advances to total assets and selected financial characteristics of FSLIC-insured thrifts. The basic controls are FHLBank indicator variables, commercial, residential, and acquisition and development loan ratios, return on assets, size of a thrift, the capital ratio, and the forbearance variable. The city variables are indicator variables for FHLBank districts. The indicator variable takes on a value of 1 if the thrift is located in that FHLBank district and 0 otherwise. The omitted indicator variable is the Dallas FHLBank district. Thus, the coefficients on the FHLBank district indicator variables are all relative to the Dallas FHLBank district. The mortgage loan variables are multiplied by the Dallas FHLBank district indicator variable (Dallas) to create some composite variables to be used in several of the empirical specifications. Dallas is equal to 1 if a thrift is located in the Dallas FHLBank district, zero otherwise. Time-1990 is equal to 1 if year is greater than or equal to 1990, zero otherwise. ROA is net income divided by total assets; size is the natural logarithm of total assets; capital ratio is generally accepted accounting principle capital divided by total assets; and forbearance is the difference between regulatory accounting principle capital and generally accepted accounting principle capital divided by total assets. The numbers in parentheses below the coefficient estimates are t-statistics.

Source: Authors' calculations.

separate effects on advances of deferred loan losses, goodwill, and the composite variables. Column 2 adds the separate effects of deferred loan losses and goodwill to the basic regression equation in column 1. Column 3 expands the basic equation to include the composite variables that interact the FHLBank of Dallas indicator variable with the asset risk measures. Column 4 adds the separate measures of regulatory forbearance (deferred loan losses and goodwill) to the empirical specification in column 3.

The results in table 9 column 1 indicate that the capital ratio and the forbearance variable are both correlated with thrift advances. Advances decline as capital increases, supporting the hypothesis that advances were particularly attractive to poorly capitalized institutions. The coefficient on the capital ratio, –0.0382, means that a 1 percentage point decrease in the capital ratio was associated with an approximately 0.4 percentage point increase in the ratio of FHLBank advances to total assets. Thrifts that relied heavily on regulatory accounting tricks to inflate their capital tended to borrow more from FHLBanks than other institutions. The coefficient suggests that a 1 percentage point increase in the difference between RAP capital and GAAP capital resulted in a 2.43 percentage point increase in the ratio of FHLBank advances to total assets. This is statistically significant at conventional levels.

The positive coefficients on commercial real estate loans and acquisition and development loans indicate that as the fraction of assets in these categories increased, institutions borrowed more. The results in table 9 also suggest that more profitable and smaller institutions tended to borrow less. The size effect is statistically significant at conventional levels, while the profitability effect is not. Finally, thrifts in the Dallas district tended to borrow more than thrifts in other FHLBank districts, except for thrifts in the FHLBank districts of Boston, Topeka, and Seattle. For example, thrifts in the Chicago district had, on average, an FHLBank advances-to-total-assets ratio that was 2.90 percentage points lower than that of thrifts in the Dallas district.

Table 9, column 2 includes measures of regulatory accounting tricks used to inflate recorded capital at thrifts. Holding everything else constant, thrifts that relied more heavily on deferred loan losses to inflate capital tended to borrow less, while those with relatively more goodwill tended to borrow more. The coefficient on the deferred loan loss variable suggests that a 1 percentage point increase in this variable was associated with a 2.56 percentage point decrease in the FHLBank advances-to-total-assets ratio. Thus, a thrift with a lower ratio of deferred loan losses to total assets than another thrift borrowed less from FHLBanks, even if the two institutions had the same gap between RAP capital and GAAP capital. Although the sale of assets with below market yields generates losses for a thrift, it is an alternative to FHLBank borrowing. The results in table 9 also imply that a 1 percentage point increase in the goodwill ratio was associated with a 1.78 percentage point increase in the FHLBank advances-to-total-assets ratio.

Column 3 of table 9 reports the results of including the composite variables (that is, the product of the Dallas FHLBank indicator variable and the risk variables) in the basic regression equation. The total impact on the advances ratio of thrifts in the Dallas district of, say, changes in residential mortgage loans is the sum of the coefficients on the residential mortgage loan ratio, 0.0088, and the residential mortgage loan ratio composite term, –0.0568. Similar calculations are performed to determine the impact on the advances ratio of thrifts in the Dallas district of changes in the other mortgage loan categories. For thrifts outside the Dallas district, the coefficients on the mortgage loan ratios capture the impact on those thrifts' advances ratio.

When the composite terms are added to the basic specification, the coefficient estimates on the capital, forbearance, earnings, and size variables are qualitatively similar to those reported in column 1 of table 9. For example, the capital ratio continues to be negatively correlated with the advances ratio, though the coefficient estimate is –0.0405 in this empirical specification compared with –0.0382 in the basic model in column 1. The results in column 3 suggest that thrifts in the Dallas FHLBank district with relatively higher assets devoted to, for example, residential mortgage loans tended to borrow less than other institutions (0.0088 – 0.0568 = –0.048). This implies that a 1 percentage point increase in the residential mortgage loan ratio was associated with a 0.05 percentage point decrease in the advances ratio. This result is inconsistent with the stated purpose of FHLBank advances to support the residential real estate market. Table 9, column 4 combines additional measures of regulatory capital forbearance with the specification used in column 3. The results are similar to those reported in column 3. Overall, low capital institutions borrowed more, and thrifts engaging in regulatory accounting practices made heavy use of the FHLBank lending facility.

The effects of FHLBank advances on common stock returns

Next, we examine whether changes in FHLBank advances were correlated with common stock returns and, if so, whether the correlation was positive for

TABLE 10

Thrift stock returns and changes in FHLBank advances by failure category
(Q1 1985 through Q4 1992)

Variable	Coefficient estimates
Intercept	–4.2627 (–5.2919)***
1/previous period market value of equity	35,668 (4.1004)***
Failed	–12.3484 (–7.1177)***
Average thrift	–1.9579 (–2.5135)***
Marginal effect of failing thrift	2.3473 (2.786)***
Return on assets	11.4836 (4.312)***
Adjusted R^2	0.20
F-statistic	3.905
Number of observations	2,372

*** Indicates significance at the 1% level.

Notes: This table provides the results of a pooled cross series regression relating thrift common stock returns to changes in FHLBank advances, using a two-factor market model. Individual thrift stock market and interest rate variables are omitted. Failed is equal to 1 if a thrift is seized by thrift regulators during the sample period; average thrift is the change in FHLBank advances divided by previous period market value of equity; marginal effect of failing thrift is the change in FHLBank advances divided by previous period market value of equity times the failed indicator variable. The market value of equity is calculated by multiplying the number of shares outstanding at the end of each quarter by the price of the thrift's common stock at the end of the quarter. The numbers in parentheses below the coefficient estimates are t-statistics and have been computed using a procedure suggested by White (1990).

Source: Authors' calculations.

thrifts that were expected to benefit from borrowing at subsidized rates from FHLBanks. We know that during the thrift crisis, the FSLIC assisted insolvent thrifts by using regulatory accounting practices or granting a temporary reprieve from closure. These policies raised the amount by which assets had to fall before regulators would resolve a thrift, increasing access to federal deposit insurance. FHLBank advances were instrumental in allowing financially distressed thrifts to continue to operate. Furthermore, because the FHLBanks' claim to thrift assets was senior to that of the FSLIC, increases in advances increased the FSLIC's risk of loss, raising the value of access to federal deposit insurance (see Brickley and James, 1986). As a result, we would expect an increase in advances to lead to a one-time positive return to shareholders. This effect should be most important for institutions with a relatively high proportion of FHLBank advances on their balance sheets. To investigate this hypothesis, we examined whether the impact of changes in FHLBank advances on thrifts' common stock returns varied across failure groups. A formal discussion of our approach is presented in technical appendix 2.

The results of estimating equation 4 in technical appendix 2 are reported in table 10. The coefficient for failing thrifts measuring the change in FHLBank advances relative to previous quarter market value of equity is the sum of the average thrift coefficient and the marginal effect of failing thrift coefficient and is 0.3905. This coefficient implies that failing thrifts experienced one-time common stock return increases, following an increase in advances from FHLBanks. Are the implied differences in common stock returns large? To answer this question, we need to know what changes in the variable are plausible. One way to establish this is by looking at the impact of a one standard deviation change in a variable. For a normally distributed variable, there is a 68 percent chance that the variable will be within one standard deviation of its mean. A one standard deviation increase in the change in FHLBank advances relative to previous quarter market value of equity was associated with a 253 basis point common stock return increase for failing thrifts. In contrast, the coefficient of –1.9579 suggests that non-failing thrifts experienced a decrease in common stock returns. In other words, the stock market responded positively to increases in advances from FHLBanks only for failing thrifts. This supports the view that such advances provided financially distressed institutions with a subsidy and that value-maximizing troubled thrifts had an incentive to take advantage of this subsidy.

Conclusion

This article examines the FHLBank System and its role in the thrift debacle of the 1980s. The FHLBank System was established to extend funds to thrifts in support of their mortgage lending activity. The perception that thrifts needed a specialized lending institution was based on their unique liquidity problems. While FHLBanks provide thrifts with access to nondeposit sources of funds, they can provide an opportunity for financially distressed institutions to borrow at relatively attractive interest rates. FHLBanks can raise funds at lower cost than non-government entities because of their perceived well-capitalized position, the tax-exempt status of their debt obligations at the state and local levels, and their implicit government guarantee. We have found that during the 1985 to 1991 period, financially distressed thrifts tended to borrow more from FHLBanks than other institutions. In addition,

the regulatory practice of allowing troubled thrifts to artificially inflate their recorded capital tended to be associated with higher levels of borrowing from FHLBanks.

Our results suggest that FHLBank advances were used more by financially distressed thrift institutions than by other firms. Thus, the provision of aid to these institutions may have added to the cost of resolving failed thrifts during the 1980s and early 1990s, contributing to one of the most expensive bailouts in U.S. history. This implies that the FHLBank System advance program can have unintended consequences. The system was created to provide long-term liquidity to lending institutions specializing in residential real estate, so as to improve the flow of mortgage credit. While this concept made sense after the Great Depression, it may not in today's financial market. In the more than 60 years since the FHLBank System was created, the financial markets have become more efficient with the introduction of a secondary market for mortgages and widespread use of mortgage securitization programs. These developments raise the question whether there is a need for a government-sponsored liquidity facility for real-estate-specialized lenders. The question takes on added importance in view of our finding that the smallest thrifts tended to make less use of FHLBank advances than other thrifts. Furthermore, FHLBank advances do not subject borrowing thrifts to the discipline that would be imposed by other creditors and market analysts. By insulating them from market discipline, FHLBank advance programs provide incentives for thrifts to take more risk.

Finally, our results provide empirical evidence that when the advance rate is flat and at the level that a large, well-capitalized institution can obtain in the financial markets, value-maximizing troubled thrifts will tend to borrow more, leading to one-time common stock return increases. Thus, access to FHLBank advances provides benefits to financially distressed institutions and these benefits tend to be reflected in the common stock returns of publicly traded thrifts.

TECHNICAL APPENDIX 1

FHLBank advances and thrift financial characteristics

Following Mays and DeMarco (1989), we relate the ratio of FHLBank advances to total assets to a set of variables representing a thrift's financial characteristics and economic environment. To allow for the role of capital forbearance on a thrift's use of FHLBank advances, we include a variable measuring the extent to which a thrift has been allowed to "invent" assets to artificially inflate its capital. An empirical specification relating the ratio of FHLBank advances to total assets ($A^k_{j,t}$) of thrift j in period t and FHLBank district k to a set of correlates can be written as:

$$1)\quad A^k_{j,t} = \beta_0 + \sum_{k=2}^{12} \beta_{0,k}\, FREG_k + \beta_1\, RISK_{j,t} + \beta_2 BVA_{j,t} + \beta_3 ROA_{j,t} + \beta_4 FB_{j,t} + \in_{j,t},$$

where $RISK_{j,t}$ is a vector that contains the various measures of risk of the asset portfolio of thrift j in period t; $BVA_{j,t}$ is the ratio of book value of capital to total assets; $ROA_{j,t}$ is the return on assets; $FB_{j,t}$ is a variable that captures regulatory forbearance; $FREG_k$ ($k = 2, \ldots, 12$) is an indicator that equals one if the thrift is located in the kth FHLBank district and zero otherwise; and $\in_{j,t}$ is an error term.

The risk index of a thrift's asset portfolio, $RISK_{j,t}$, is captured by a thrift's holdings of commercial real estate loans, residential mortgage loans, and acquisition and development loans. All mortgage variables are divided by total assets. Barth and Bradley (1989) find that, within the mortgage category, insolvent institutions rapidly increased their commercial real estate lending during the 1980s. Barth, Bartholomew, and Labich (1989) indicate that acquisition and development loans, which are loans to finance the purchase of land and the improvements required to convert it to developed building lots, have a positive and statistically significant effect on resolution costs. Table 9 reports the results of our pooled cross-section time-series regressions using yearend data for all FSLIC-insured institutions from 1985 to 1991. The dependent variable is yearend advances to total assets for each institution. The t-statistics reported in table 9 have been computed using a procedure suggested by White (1980).

Thrift stock returns and FHLBank advances

To determine the effect of FHLBank advances on common stock returns, we need to quantify the benefits of access to an FHLBank lending facility. We would expect these benefits to be reflected in the common stock returns of publicly traded thrifts. The behavior of stock returns provides reasonable and readily available information because there is a direct relationship between stock returns and the value of the underlying assets and the value of various types of subsidies. The first step in the development of the empirical model, following Stone (1974), is to relate the common stock return of thrift *j* in period *t*, $RET_{j,t}$, to the rate of return on a stock market index in period *t*, $RMKT_t$, and an interest rate factor in period *t*, $RTBOND_t$:

$$2)\quad RET_{j,t} = \beta_0 + \beta_1\, RMKT_t + \beta_2\, RTBOND_t + \in_{j,t},$$

where $\in_{j,t}$ is a stochastic error term. The asset pricing model in equation 2 has been used by Lloyd and Shick (1977), Lynge and Zumwalt (1980), Chance and Lane (1980), Flannery and James (1984), Kane and Unal (1988), and Kwan (1991) to investigate the interest rate sensitivity of bank and thrift stock returns.

The asset pricing model argues that returns on individual stocks are related, in part, to the return on a market portfolio, a perfectly diversified portfolio of all assets. The variability of the individual stock returns that is related to changes in the return on the market portfolio is market risk. This market risk is characterized by the stock's "beta" value. An "average" stock whose return fluctuates one-for-one with the market return has a beta equal to one. Stocks with greater than average market-related risk have betas higher than one, while low market-risk stocks have betas less than one.

Thrift stock returns are also sensitive to movements in interest rates, because thrifts typically fail to match the interest rate sensitivity of their assets and liabilities. As a result, movements in interest rates affect the market value of each side of the thrift's balance sheet differently and, consequently, both its net worth and stock value.

In addition, stock returns of thrifts might be affected by the extent to which the thrifts make use of loans from FHLBanks. Because the rate charged for advances does not vary according to the financial condition of the borrowing institution, it is possible that some thrifts are paying too high a price and some too low a price to borrow funds. Garcia and Plautz (1988) indicate that advances may not be priced below the rate that a large, well-capitalized thrift could obtain on its own in the deposit market. However, since this is a flat rate, it would seem most likely that the rate charged financially distressed thrifts is below the level the market would charge given the associations' financial condition and collateral. Thus, flat-rate FHLBank advances provide a financially distressed thrift with a subsidy. The common stock returns of such thrifts should reflect this subsidy. Equation 2 can be expanded to account for this subsidy. The expanded model, which is based on a version of the model in Brewer (1995), can be written as:

$$3)\quad RET_{j,t} = \beta_0 + \beta_1\, RMKT_t + \beta_2\, RTBOND_t + \beta_3 \frac{1}{MV_{j,t-1}} + \beta_4 \frac{\Delta FHLB_{j,t}}{MV_{j,t-1}} + \in_{j,t},$$

where $\Delta FHLB_{j,t}$ is the change in *j*th thrift FHLBank advances at time *t*; and $MV_{j,t-1}$ is the market value of equity of the *j*th thrift in period *t*–1.

With flat-rate FHLBank advances, value-maximizing thrifts have an incentive to borrow from their FHLBank to take advantage of the subsidy. How stock returns change with variations in FHLBank advances depends on whether the thrift is in financially distress. As noted earlier, financially distressed institutions are most likely to receive FHLBank advances at rates below those they could obtain in the deposit market. Therefore, we would expect the change in FHLBank advances to have a positive impact on the stock returns of financially distressed thrifts. To investigate this further, we created two groups. The first group includes all thrifts that failed at some point during the sample period. The second group includes only the surviving thrifts. This separation allows us to examine whether changes in FHLBank advances have a different impact on common stock returns of thrifts, depending on their financial condition.

Since thrifts invest primarily in mortgages, we assume that the primary factor affecting the market's valuation of a thrift's assets is changes in the market value of mortgages. The holding period returns associated with long-term U.S. government bonds (*RTBOND*), obtained from Ibbotson Associates (1996) bond index , are used to measure changes in the market value of mortgages. The interest rate factor is based on the returns on U.S. government bonds to ensure that the estimated relationship between thrift stock returns and changes in interest rates is free from contamination resulting from changes in default premia. The long-term

returns index is used because the bulk of thrift assets are long term. The return on a stock market index, *RMKT*, is included in the equation to assess a thrift's systematic market sensitivity.

The other important factors affecting common stock returns are associated with changes in the FHLBank advances relative to market value of equity in the previous period, ($\Delta FHLB_{j,t}/MV_{j,t-1}$), and return on assets in period *t*, ROA_t. We include return on assets to capture the impact of other firm-specific factors on thrift stock returns.

We can now write the following empirical specification:

$$4)\quad RET_{j,t} = \beta_0 + \sum_{j=1}^{N}\beta_{1,j}\, W_j\, RMKT_t + \sum_{j=1}^{N}\beta_{2,j} W_j\, RTBOND_t + \beta_3 \frac{1}{MV_{j,t-1}} + \beta_4 \frac{\Delta FHLB_{j,t}}{MV_{j,t-1}} + \beta_{4,1} \frac{\Delta FHLB_{j,t}}{MV_{j,t-1}} \times FAILED + \beta_5\, ROA_{j,t} + \beta_6\, FAILED + \omega_{j,t},$$

where $\beta_{1,j}$ is the stock market beta coefficient of the *j*th thrift ($j = 1, \ldots, N$); $\beta_{2,j}$ measures the effect of interest rates on the stock returns of the *j*th thrift given its relation to the market index; W_j is a cross-sectional dummy variable that equals one for the *j*th thrift and zero otherwise; *FAILED* is a binary variable that equals one for a failed thrift and zero otherwise; and $\omega_{j,t}$ is a stochastic error term. Both the stock market and the interest rate coefficients are held fixed over time, but allowed to vary across thrifts. Estimation of equation 4 allows us to investigate the equity market response to changes in FHLBank advances. The variable *FAILED* serves as a proxy for financially distressed firms. The coefficient on ($\Delta FHLB_{j,t}/MV_{j,t-1}$)×*FAILED*, $\beta_{4,1}$, measures how much more the common stock returns of failing thrifts change relative to those of non-failing thrifts as a result of a change in advances from FHLBanks. The sum of β_4 and $\beta_{4,1}$ measures how much more the common stock returns of failing thrifts change with changes in advances from FHLBanks. If access to FHLBank advances is a valuable option for failing thrifts, then an increase in FHLBank advances should lead to an increase in their common stock returns (that is, the sum of β_4 and $\beta_{4,1}$ should be positive).

Notes: The data used in the estimation of equation 4 are for 99 thrift organizations whose stocks were traded on the New York Stock Exchange, American Stock Exchange, or over the counter and which filed FHLBB *Report of Condition* data for each quarter from January 1985 to December 1992. A few of the 99 thrifts were resolved by thrift regulators prior to the end of the sample period. These institutions are included in the sample period for the quarters before resolution and excluded for the period after resolution. Stock market data are from Interactive Data Services, Inc. For multiple thrift holding companies, the assets of individual thrift subsidiaries were summed in constructing the balance-sheet variables used in the regression equations. At the end of 1987, the 99 thrifts had $456 billion in total assets, representing about 47 percent of the industry's total assets. Twenty-five had total assets of more than $5 billion; 48 had total assets of $1 billion to $5 billion; and the 26 remaining thrifts had total assets of less than $1 billion.

Common stock returns over a quarter are calculated by compounding daily common stock returns within a quarter. The market value of common stock is calculated by multiplying the number of shares outstanding at the end of each quarter by the price of the thrift's common stock at the end of the quarter. The holding period return on a long-term U.S. government bond portfolio (from the monthly index by Ibbotson Associates, 1996) is used to measure changes in the market value of mortgages. Monthly returns are compounded to produce quarterly returns. The stock market portfolio is the value-weighted portfolio (NYSE and AMEX) from the Center for Research in Security Prices (CRSP) database.

NOTES

[1]See Garcia and Plautz (1988) for an excellent discussion of the collateralization requirements of the FHLBank System and how troubled S&Ls were able to get around these requirements.

[2]The FSLIC's policies and procedures for guaranteed advances specify that guarantees will be provided for advances only if the insured S&L is a supervisory case that 1) is book-value insolvent, 2) is cash insolvent, 3) is losing money so that it will soon become book-value insolvent, 4) has insufficient collateral to obtain an advance without a guarantee, and 5) has agreed to be merged when the FSLIC can find a suitable merger partner. See Garcia and Plautz (1988) for an excellent discussion of this program.

[3]In October 1984, the FHLBB placed a sunset provision on the use of deferred losses on the sale of mortgages with below-market interest rates. After October 24, 1984, thrifts were prohibited from amortizing losses on sales of new mortgages. However, they were still allowed to defer losses on loans made prior to October 24, 1984. See Hill and Ingram (1989) for a discussion.

[4]Hunter, Verbrugge, and Whidbee (1996) found significant evidence of forbearance in the regulation of de novo thrifts in the 1980s.

[5]An alternative explanation is that the problems in the Dallas FHLBank district were because of the failure of the FHLBank's supervisory staff to adequately control the high-risk behavior of member thrifts. See Cole (1993, 1990) for a discussion of this issue. Another explanation is that congressional pressure persuaded thrift regulators, not only in the Dallas FHLBank district but in other FHLBank districts, to grant forbearance and increased access to the FHLBank advance program to aid poorly capitalized institutions.

[6]Although insurance companies and mutual savings banks were eligible for membership, few, if any, of these institutions applied for membership.

[7]The President of the United States appoints the other four directors. By law, the four appointed directors must have backgrounds in housing finance or a demonstrated commitment to providing specialized housing credit, and one director must have a background with an organization that has a two-year record of representing consumer or community interests on banking services, credit needs, financial consumer protection, or housing.

[8]Retained earnings represent only about 3 percent of total equity capital.

[9]See Mays and DeMarco (1989) for an excellent discussion of these issues.

[10]This special lending arrangement truly provided "last resort" liquidity for insolvent thrifts. The Federal Reserve Banks and FHLBanks would share the loan, except for 10 percent advanced by the FSLIC up to $700 million, in a special borrowing arrangement with the U.S. Treasury. The loans were guaranteed and collateralized by the FSLIC, and subsequent to FIRREA, by the Resolution Trust Corporation. Lincoln Savings and Loan was the first institution to use the program on April 17, 1989.

[11]See Barth, Bartholomew, and Labich (1989).

[12]The permissible spread over the FHLBank System's expected cost of funds is limited by its supervisory agency. See Mays and DeMarco (1989) for a discussion of this point.

[13]Kaufman (1972) used the term technical liquidity problems to refer to a situation in which a thrift institution, as a result of an unanticipated rise in interest rates, generates insufficient current accounting earnings on assets to finance competitive deposit rates.

[14]In their analysis of de novo thrifts, Hunter, Verbrugge, and Whidbee (1996) found that capital was a key factor contributing to the delay in closing failed thrifts.

[15]See Goldberg and Hudgins (1996).

[16]See Barth (1991) for an excellent discussion of this issue.

[17]See Hunter, Verbrugge, and Whidbee (1996) for a discussion of the so-called Gray effect, that is, the tendency of the regulators to keep failed thrifts open in hopes of a miraculous recovery.

[18]We excluded one of the FHLBank district indicator variables to avoid the "dummy variable trap." By including an intercept term and separate indicator variables for each district, we would have a problem of perfect multicollinearity, whereby the sum of the district indicator variables is equal to one and is perfectly correlated with the intercept term. To avoid this dummy variable trap, researchers omit one of the indicator variables (see Greene, 1997, p. 230).

[19]See Romer and Weingast (1992) for a discussion of the role politicians played in prolonging this crisis in the Dallas FHLBank district.

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Trends in homeownership: Race, demographics, and income

Lewis M. Segal and Daniel G. Sullivan

Introduction and summary

For most Americans, a home is more than shelter. It is also their most valuable asset and an important savings vehicle.[1] Moreover, a high rate of homeownership is often thought to create better citizens, enhance the stability of communities, increase the value of other property, and even improve the performance of children in school.[2] Perhaps for these reasons, a wide array of public policies have been undertaken to encourage homeownership. These include favorable treatment of homeownership under the tax code, the creation of the thrift industry, the establishment of the Federal Housing Administration's (FHA) lending programs, and the chartering of government-sponsored enterprises to facilitate mortgage securitization.

The U.S. homeownership rate, as shown in figure 1, has recently reached new highs. However, the increase during the last two years follows two decades of stagnant or falling homeownership rates, which were in sharp contrast to the previous 30 years during which the U.S. homeownership rate increased by over 20 percentage points. The lack of growth in homeownership after the mid-1970s was taken by some analysts and policymakers to imply the need for down payment assistance programs, lower down payments for FHA mortgages, and looser underwriting standards for the secondary mortgage market, among other policies.[3] Similarly, the recent jump in homeownership rates might be taken as evidence that certain housing policies are beginning to have a positive effect.

Public policy concern has been especially great over the large and, until recently, growing gap between white and black homeownership rates. As shown in table 1, while the overall homeownership rate declined by only 0.8 percentage points between 1977 and 1995, the black homeownership rate fell by 2.6 percentage points to 40.7 percent.[4] In contrast, the white homeownership rate actually increased by 0.4 percentage points to 67.9 percent, implying a 1995 gap of 27.2 percentage points. Although that gap shrunk by nearly 3 percentage points from 1995 to 1997 as black homeownership grew a significant 3.5 points, the homeownership rate for blacks remains more than 23 percentage points below that for whites.

Policymakers are concerned that some or all of the gap between white and black homeownership rates may be due to discriminatory "steering" by real estate agents or to discriminatory lending practices.[5] Concern over possible discrimination has motivated the passage of legislation such as the Fair Housing Act, the Equal Credit Opportunity Act, the Community Reinvestment Act (CRA), and the Home Mortgage Disclosure Act. Though these laws have been in place in some form for many years, one might argue that recent amendments and stepped-up enforcement efforts might have increased their impact in the last few years.[6] Thus, one might argue that the increased effectiveness of CRA and fair lending laws is behind the recent homeownership gains of black households and the drop in the white–black homeownership gap.

However, it is dangerous to draw conclusions on the effectiveness of policy from trends in raw homeownership rates. Many major demographic and economic trends unrelated to narrowly focused housing policies significantly affect the homeownership rate. In particular, forces such as the aging of the baby boom generation, the decline in marriage rates, and the growth and distribution of real incomes can cause

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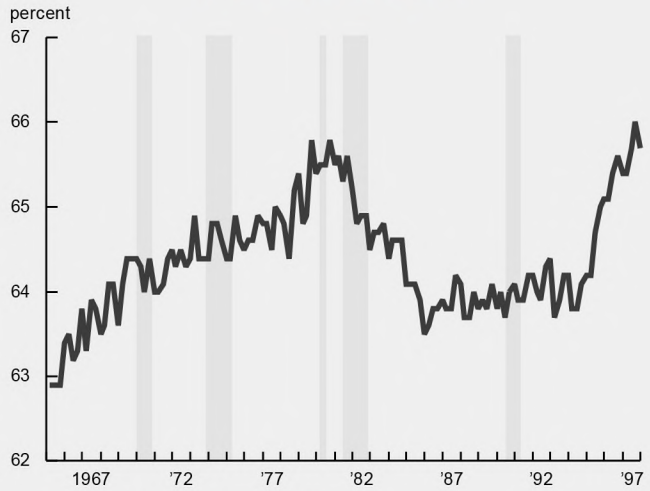
FIGURE 1

U.S. homeownership rate



Note: Shaded areas indicate recessions.
Source: U.S. Department of Commerce, Bureau of the Census.

the homeownership rate to rise or fall independently of policymakers' actions. Thus, trends in overall homeownership rates or the white–black homeownership gap that are due to major economic and demographic trends may be mistakenly interpreted as reflecting the consequences of narrow housing policy choices.

In this article, we use the Census Bureau's *March Current Population Survey* (CPS) data from 1977 to 1997 to look at homeownership trends within more narrowly defined groups that may be free of compositional shifts due to changing demographic and income trends. Rates for groups that are stable in terms of demographics and income give us a clearer indication of the effects of housing policies. We also use logistic regression analysis to compute overall adjusted homeownership rates that are simultaneously free of the effects of trends in several demographic and income variables. By removing the effects of changes in demographic and income variables, we are better able to judge the impact of narrowly defined housing market policies. Similarly, we compute an adjusted white–black homeownership gap that uses logistic regression analysis to remove the effects of racial differences in demographics and income, providing a clearer picture of the trend over time in the other forces that affect the white–black gap.

Our adjusted rates may enable subsequent research to better disentangle the complex set of forces that determine the homeownership rate. In addition to the possible public policy initiatives mentioned above, these forces include the level of interest rates, which, in addition to directly affecting housing costs, partially determines the ability of households to qualify for mortgages; the tax code, which most analysts argue encourages homeownership through its exemption from taxation of the implicit rental income from owner-occupied housing;[7] and financial innovations of the last 20 years, such as the growth of mortgage securitization and home equity loans, which might be expected to loosen the financing constraints that keep some from owning homes.[8]

Although the aggregate homeownership rate varies only slightly over the period we study, homeownership rates for several subgroups of the population have changed in remarkable ways. For instance, younger households have generally seen substantial declines in homeownership rates, with the opposite being the case for older households. The rate for households with heads between 35 and 39 years of age dropped by 7 percentage points, while the rate for those with heads between 55 and 74 rose by 5.5 percentage points. Thus, no simple picture of the narrow forces determining homeownership emerges from looking within specific age groups. Apparently, these forces affect young and old households differently or other demographic and income shifts obscure the effect of such forces even within age groups.

We find that ownership rates for smaller households rose while those for larger households declined.

TABLE 1

Homeownership rates: Whites and blacks (percent)

Year	Overall	White	Black	White minus black
1977	64.6	67.5	43.3	24.2
1995	63.8	67.9	40.7	27.2
1997	64.8	68.5	44.2	24.3
Percentage point change				
1977–95	–0.8	0.4	–2.6	3.0
1995–97	1.0	0.6	3.5	–2.9
1977–97	0.2	1.0	0.9	0.1

Source: Authors' tabulations of 1977, 1978, and 1983–97 *March Current Population Surveys*.

For instance, households without children had a nearly 3 percentage point higher homeownership rate in 1997 than in 1977, while those with four or more children had a more than 10 percentage point decline. The divergent trends in homeownership with respect to household size imply that a homeownership rate calculated at the individual level has actually declined noticeably relative to one calculated at the household level. Thus, policymakers impressed with the positive effects of homeownership on children's educational outcomes may have an overly optimistic sense of the trend in the number of children living in ownership settings.

Another remarkable change has been the greatly increased importance of education as an indicator of homeownership. In 1977, the difference between homeownership rates for those without a high school degree and those with postgraduate education was less than 6 percentage points. By 1997, however, the gap had increased to over 20 percentage points; the rate for those without a high school degree dropped by more than 8 points and the rate for those with more than a college degree rose by more than 7 points. This trend resembles the spreading of the wage and income differentials associated with education. Separately examining homeownership rates for different deciles of the income distribution reveals a further connection with increasing income inequality. Homeownership rates actually increased for most income deciles between 1977 and 1997, but the 7 point drop for the lowest income decile kept the overall rate little changed. These results suggest that policymakers concerned with increasing homeownership may want to focus their efforts on policies targeting households with low levels of education and income.

Our quantitative analysis using logistic regression models finds that the increasing age of the population raised homeownership rates by more than 1 percentage point between 1977 and 1997. However, this effect was more than offset by other demographic changes, especially the decline in the fraction of household heads that are married. In fact, the combined effect of the demographic variables (including region, but not education or income) was to lower homeownership rates by more than 2 percentage points. Finally, changes in income and education had an almost precisely offsetting positive effect on homeownership rates over the full sample period. Our measure of the adjusted homeownership rate grew by 0.2 percentage points from 1977 to 1997, about the same as the unadjusted rate. The pattern over time was somewhat different, however. In particular, our adjusted rates show a smaller decline over the 1977 to 1995 period and about half as large an increase from 1995 to 1997.

Significant changes in policies or other narrow forces affecting the housing market are not necessary to explain most of the history of adjusted homeownership rates. The slight decline in homeownership between 1977 and 1995 can be explained by demographic factors, such as the decline in marriage rates. Similarly, we estimate that the normal response to the growth in real incomes from 1995 to 1997 was enough to explain about half of the jump in the homeownership rate over that period.

We also find that the increase in household income inequality during the last 20 years has had a significant effect on the homeownership rate. If the economy had generated the same total increase in real income over the period but in a more uniform manner, homeownership rates would have risen more. Specifically, if all households had experienced the same proportional increase in income as was found in the aggregate personal income statistics, we estimate that the homeownership rate would have risen by an additional 1.2 percentage points.

Cross-sectional differences between white and black households in demographics and income explain approximately two-fifths of the observed difference in homeownership rates. As we noted, in 1997, the white–black ownership gap was approximately 24.3 percentage points (68.5 percent versus 44.2 percent). After adjusting for differences in demographic and income variables, the gap shrinks to 13.0 percentage points. The large gap in homeownership rates remaining even after adjustment for demographic and income factors is consistent with earlier research on this topic.[9] Our analysis cannot determine to what extent the remaining gap is due to discrimination, different tastes for homeownership, or differences in other determinants of homeownership that are not measured in the CPS. One such factor may be inherited wealth. Several studies have shown that blacks inherit less wealth than whites, and wealth may affect homeownership through its effect on permanent income and by easing the down payment constraint.[10]

Changes in background income and demographic factors do not explain much of the change over time in the white–black homeownership differential. Black educational attainment moved closer to that of whites, which tended to help close the gap, but blacks had a more rapid decline in marriage rates and a less pronounced age increase, which tended to widen the gap by about the same amount. Thus, the change in our adjusted white–black gap over the full 1977 to 1997 period was similar to the change in the raw gap. Moreover, the pattern over time in adjusted and unadjusted rates was relatively similar. In particular, we

still find a remarkable 2.5 percentage point decline in the white–black homeownership differential from 1995 to 1997. Thus, our results leave open the possibility that the regulatory changes of the mid-1990s are narrowing the white–black gap in homeownership rates.

Below, we use the CPS data to examine trends in demographic and income variables as well as homeownership rates for specific demographic and income groups. In the following section, we employ a logistic regression procedure to compute aggregate homeownership rates adjusted for demographic and income changes. Then, we present adjusted estimates of the white–black homeownership difference and its trend over time.

Cross-sectional determinants of homeownership

We use March CPS data to examine trends in homeownership rates for a number of specific demographic and income groups.[11] By examining the trends within groups, we can identify developments that are obscured in the aggregate homeownership rate by shifts in population between groups with different homeownership propensities. We also note how changes in the demographic and income characteristics of the population are likely to affect the aggregate homeownership rate. This, of course, depends on both the magnitude of differences in homeownership rates between groups and the size of compositional shifts.

After briefly discussing the March CPS data, we examine breakdowns of the population by a number of demographic and income variables. For each variable, we note the homeownership trends within groups and the likely effect on aggregate homeownership rates of changes in the relative size of the groups defined by the variable.

CPS data

Our analysis is based on the *March Current Population Survey* (CPS) micro data for 1977 through 1997. The CPS is a monthly, nationally representative survey of approximately 50,000 households conducted by the Census Bureau.[12] Perhaps best known as the source for the monthly unemployment rate, the CPS is also a primary source for the Census Bureau's estimates of the homeownership rate. In addition, the CPS records extensive demographic and educational information on the members of surveyed households. We focus on the March files because of the detailed income data that are only collected in that month. Unfortunately, we discovered errors in the source data for the years 1979 to 1982 that prohibit their use in this article.[13]

Many of the household characteristics we examine are actually characteristics of the household head. However, the Census Bureau's definition of "householder" changes over time. Thus, to ensure comparability over time, we redefine the household head in the way the Census did before 1980. That is, if the householder is married with a spouse present, we choose the household head to be the male marriage partner. This allows us to define the age, race, sex, marital status, and level of education of a household in a consistent way. We limit our analysis to households with heads between the ages of 18 and 74 to ensure enough data to analyze in each age group with similar homeownership rates. Eliminating older households causes our unadjusted rates to be slightly lower than the official statistics and to have a slightly lower trend. However, the basic patterns remain the same.

Race of household head

We have already noted the more than 20 percentage point difference in homeownership rates between white and black households. As panel A of figure 2 shows, the white–black ownership gap increased in the late 1980s, but after strong growth in black homeownership in the last two years of the sample, the gap was significantly narrowed. As table 2 shows, from 1977 to 1997, the white homeownership rate increased by 1.0 percentage point while the rate for blacks increased by 0.9 percentage points, leaving the gap virtually unchanged.

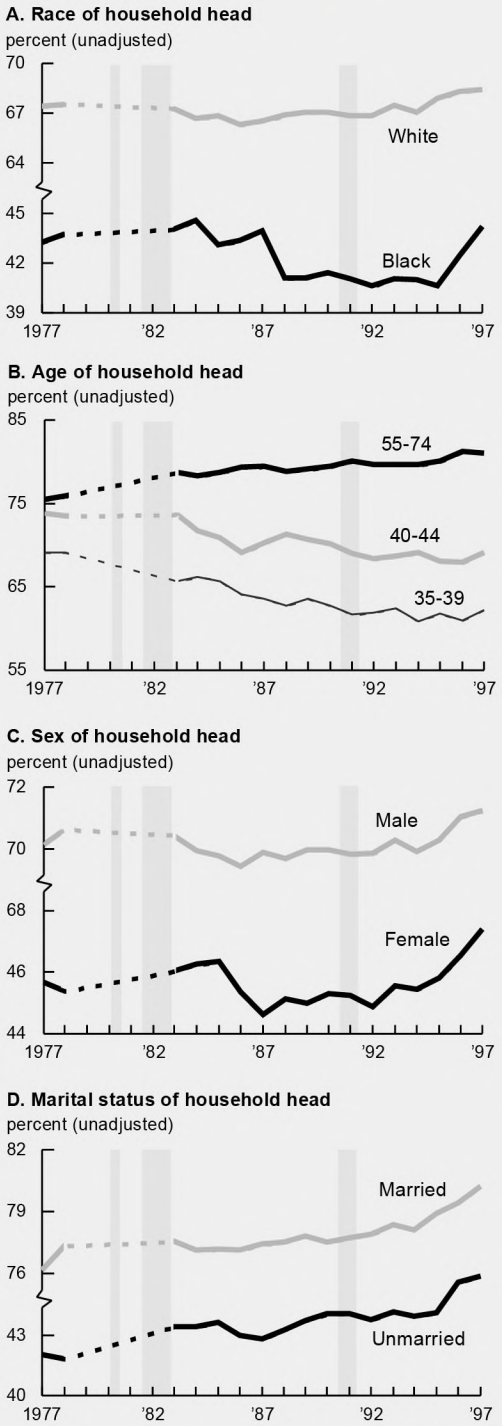
The fact that both the white and black homeownership rates increased by more than the overall rate (of 0.2 percentage points) is one indication of the importance of demographic shifts. In this case, the greater population growth in the black and other race categories more than offset increasing homeownership rates within these groups. As table 2 (on page 59) shows, from 1977 to 1997, the fraction of households headed by whites declined 4.3 percentage points from 87.9 percent to 83.6 percent. Households headed by blacks increased by 1.7 percentage points and households headed by other minorities increased by 2.6 percentage points. Given the ownership rate differentials, the shift in racial composition has the effect of lowering the aggregate ownership rate over the period we analyze.

Age of household head

Not surprisingly, there is a life cycle component to homeownership. For instance, in 1977 only 19.8 percent of household heads aged 18–25 owned their homes, compared with 75.5 percent of the 55–74 year olds. As shown in panel A of figure 3, for both 1977 and 1997, homeownership rates increase rapidly with age until household heads are approximately 40.

FIGURE 2

Homeownership rates by race, age, sex, and marital status



Note: Shaded areas indicate recessions. Dashed line represents period with missing data.

Source: Authors' calculations based on U.S. Department of Commerce, Bureau of the Census, *Current Population Survey*, March 1977–78 and 1983–97.

Thereafter, the increases are more gradual. In the case of the 1977 data, homeownership rates begin to decline with age for household heads over 65. In the most recent data, however, homeownership holds steady or increases with age until at least age 75. There are many possible explanations for the generally increasing age profile. Young households might not have sufficient financial capital to purchase, they may prefer to remain mobile for employment possibilities, or they may be unsure about future demands for housing due to uncertainty about marriage and children.

Comparing the two lines in panel A of figure 3, one can see that homeownership rates have generally fallen relative to 1977 for household heads under about 55 and have generally risen for older household heads. For instance, as shown in table 2 (on page 59), the homeownership rate for household heads between 35 and 39 years of age fell a rather dramatic 7.0 percentage points, while rates for those between 55 and 74 rose by 5.5 percentage points. As panel B of figure 2 shows, this divergence of homeownership rates for younger and older households has been fairly continuous over the last 20 years. Whatever forces have affected homeownership must have affected younger and older households differently.

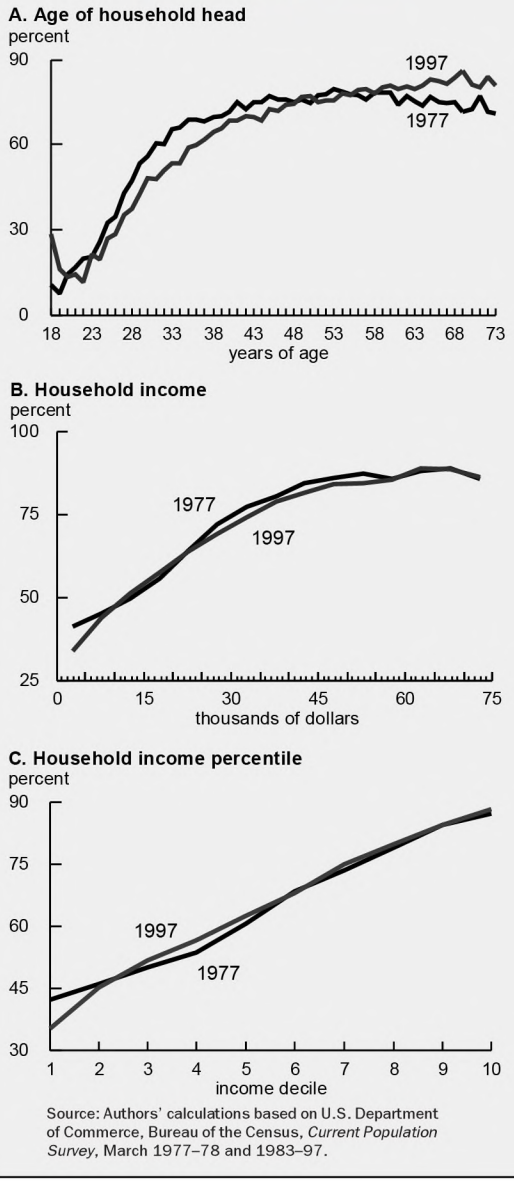
Table 2 also displays a decline in the fraction of household heads at the extremes of the age distribution and an increase in the fraction in the 35 through 55 age groups. Since homeownership rates are relatively high in the over 55 age category, the drop in this group's fraction of the population would tend to lower the overall homeownership rate. We will see in the next section, however, that the quantitatively more important effect is the drop in the fraction of the population in the under 30 age group for which homeownership rates are very low. This change, which corresponds to the movement of the baby boom generation into the prime homeownership ages, has tended to increase the aggregate homeownership rate.

Sex and marital status of household head

The difference in homeownership rates between female-headed and male-headed households is comparable to the white–black differential, although it has received less attention. Panel C of figure 2 shows that in recent years, female-headed households' homeownership rates have risen slightly faster than male-headed rates. However, table 2 shows that even in 1997, the male-headed rate of 71.3 percent was nearly 24 percentage points higher than the female-headed rate. Because of the way we define the household head, female household heads cannot be married with a spouse present. Thus, the gap between male-headed

FIGURE 3

Homeownership rates by age, income, and income percentile



Source: Authors' calculations based on U.S. Department of Commerce, Bureau of the Census, *Current Population Survey*, March 1977–78 and 1983–97.

and female-headed homeownership rates is closely related to the gap shown in panel D of figure 2 between the homeownership rates of heads that are married with spouse present and those that are not. The gap between married and unmarried homeownership rates, 34.4 percentage points in 1997, is even larger than that between female- and male-headed households or between white- and black-headed households.

As table 2 shows, homeownership rates for both male-headed and female-headed households rose 1 percentage point or more faster than the aggregate rate over the 1977 to 1997 period. Even more dramatically, rates for both unmarried and married household heads increased by about 4 percentage points, while the aggregate rate barely changed. The trends within groups defined by sex of head and, especially, marital status of head suggest a growing tendency toward homeownership that is obscured in the aggregate rate by a shift in the population toward household types with lower homeownership rates. Table 2 shows that the fraction of female-headed households increased by 4.6 percentage points and the fraction of unmarried household heads increased by 11.2 percentage points. Given the differences in homeownership rates between the groups, both of these shifts would tend to significantly reduce aggregate homeownership rates.

Household size and composition

Another important household characteristic is the number of members and the split between adults and children. In general, households with fewer members have seen rising homeownership rates, while those with more members have seen falling rates. In particular, as panel A of figure 4 shows, households without children have seen rising rates of homeownership, to the point where their homeownership rate now exceeds that for households with one child or three or more children. As table 2 shows, the latter group has experienced a decline of over 10 percentage points in its homeownership rate, while households with no children have seen an increase of nearly 3 percentage points. Somewhat similarly, when stratified by the number of adults, the homeownership rate has been increasing for households with one or two adults but falling for households with more adults, such as those in which extended families reside.

The divergent trends in homeownership rates for large and small households means that the trend in homeownership looks significantly less strong when viewed at the individual rather than household level. That is, the standard, household-based measure counts all households equally, rather than giving greater weight to the households with more people. In fact, when we weight the homeownership rate by the number of individuals in the household, we find that homeownership rates declined by 1.8 percentage points over our sample period to a level of 68.2 percent in 1997. This is in contrast to the 0.2 percentage point increase in the standard, household-based rate. When we weight the rate by the number of children, we find an even greater decline, from 67.4 percent in 1977 to 62.3 percent in 1997.

Table 2 shows that the population of households has shifted toward those with fewer members. The fraction without children grew 1.9 percentage points

and the fraction with a single adult increased dramatically from 22.2 percent in 1977 to 27.3 percent in 1997. Households with four or more adults declined by about the same amount.[14] Given the recent increases in homeownership among households without children, the shift toward households with fewer children

TABLE 2

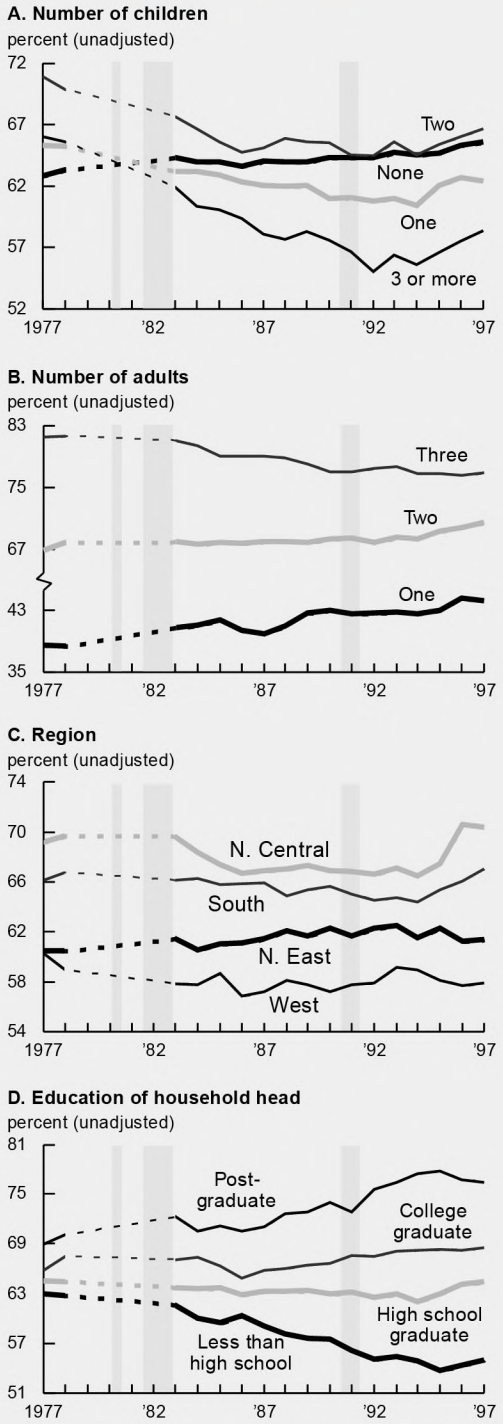
Homeownership rates and percent of population
(percent)

	Homeownership rates			Percent of population		
	1977	1997	Change, 1977–97	1977	1997	Change, 1977–97
Overall	64.6	64.8	0.2			
Race of household head						
White	67.5	68.5	1.0	87.9	83.6	4.3
Black	43.3	44.2	0.9	10.7	12.5	1.7
Other minority	49.6	51.9	2.3	1.4	3.9	2.5
Age of household head						
18–24	19.8	17.5	–1.3	8.6	5.3	–3.3
25–29	42.6	34.6	–8.0	12.1	9.2	–2.9
30–34	61.4	51.1	–10.3	11.3	11.4	0.1
35–39	69.3	62.3	–7.0	9.4	13.3	3.9
40–44	73.9	69.1	–4.8	8.6	12.5	3.9
45–54	76.9	75.2	–1.7	18.7	20.5	1.8
55–74	75.5	81.0	5.5	30.4	26.6	–3.8
Sex of household head						
Male	70.2	71.3	1.2	77.4	72.8	–4.6
Female	45.7	47.4	1.7	22.6	27.2	4.6
Marital status of household head						
Married, spouse present	76.1	80.3	4.2	66.2	55.0	–11.2
Unmarried or spouse absent	42.1	45.9	3.8	33.8	45.0	11.2
Children						
None	62.9	65.7	2.8	62.0	63.9	1.9
One	65.3	62.5	–3.4	16.6	16.3	–0.3
Two	71.0	66.7	–4.3	13.5	13.1	–0.4
Three	68.1	61.2	–7.4	5.4	4.9	–0.5
Four or more	61.6	51.0	–10.6	2.5	1.8	–0.7
Adults						
One	38.6	44.4	5.8	22.2	27.3	5.1
Two	66.9	70.5	3.6	50.7	51.0	0.3
Three	79.8	76.2	–3.6	14.5	14.3	–0.2
Four or more	83.5	78.5	–5.0	12.6	7.5	–5.1
Region						
North East	60.6	61.4	0.8	22.7	19.3	–3.4
North Central	69.3	70.4	1.1	26.4	23.6	–2.8
South	66.2	67.1	0.9	31.9	35.5	3.6
West	60.3	57.9	–2.4	19.0	21.6	2.6
Education of household head						
Less than high school	63.1	55.0	–8.1	33.4	15.3	–18.1
High school graduate	65.6	64.9	–0.7	34.3	33.2	–1.1
Some college	62.5	63.8	1.3	14.8	25.7	10.9
College graduate	65.9	68.6	2.7	9.7	16.6	6.9
Postgraduate	68.9	76.4	7.5	7.9	9.3	1.4

[a]Households of a given type as a percentage of all households.
Source: Authors' tabulations of 1977, 1978, and 1983–97 *March Current Population Surveys*.

FIGURE 4

Homeownership rates by household size, region, and education



Note: Shaded areas indicate recessions. Dashed line represents period with missing data.

Source: Authors' calculations based on U.S. Department of Commerce, Bureau of the Census, *Current Population Survey*, March 1977–78 and 1983–97.

may not have a dramatic effect on aggregate homeownership. However, homeownership rates for households with two or more adults remain more than 25 percentage points lower than those for households with two or more adults. Thus, the shift toward fewer adults per household would tend to decrease homeownership.

Region of household

Panel C of figure 4 reveals that there has been a stable ranking of Census regions by homeownership. The highest rates are found in the North Central region, where over 70 percent of household heads were homeowners in 1997, while the lowest rates are found in the West, where under 60 percent of households owned their homes. The North Central region's lead shrunk following the recession of 1981–82, which was especially severe in many of those states. More recently, the growth in homeownership rates has been especially strong in the North Central and South regions. This strength mirrors the relatively strong growth in output and employment in those regions in the 1995 to 1997 period.[15]

The effect of the changing regional composition of households is ambiguous. On the one hand, the biggest increase in the fraction of households has been in the South, where homeownership rates are above average, and the biggest decline has been in the North East, where rates are below average, shifts that would tend to raise the aggregate rate. On the other hand, the West, which has the lowest homeownership rates, has gained in share of households, while the North Central region, which has the highest rates, has declined in share of households, shifts which would tend to reduce the aggregate rate.

Education of household head

Panel D of figure 4 shows the substantial increase in importance of education as an indicator of homeownership rates. In 1977 rates for the various educational groups were relatively close. For instance, table 2 shows that the rate for those with postgraduate education, 68.9 percent, was only 5.8 percentage points higher than the rate for those who did not graduate from high school. By 1997, however, the gap in rates between these groups had increased to 21.4 percentage points, driven in approximately equal measure by increasing rates for those with postgraduate education and decreasing rates for those without high school diplomas. Although the gap between groups toward the center of the educational distribution increased less dramatically, the difference in homeownership rates between those with a college degree and those without college increased from only 0.3 percentage points in 1977 to 3.7 percentage points in 1997.

Changes in the distribution of educational attainments would clearly tend to increase aggregate homeownership rates. One-third of 1977 household heads had less than a high school education; by 1997 the fraction was below one-sixth. Moreover, there were significant increases in the proportion of the population with some college, college degrees, and postgraduate education. These changes have the effect of raising homeownership levels.

Household income

Panel B of figure 3 shows that homeownership rates rise with real income. The pattern for 1997 is remarkably similar to that for 1977 except at the lowest income levels, where the rate of homeownership has dropped quite significantly. The fact that homeownership rises with income means that the increase in real incomes over the sample period would tend to raise the aggregate homeownership rate. Note, however, that homeownership increases with income at a decreasing rate. Thus, a given increase in total income will tend to have a large effect if it is concentrated at the low end of the income distribution. For instance, an extra $1,000 of income will make little difference to the chance that a household head with income above $50,000 (in 1982 dollars) is a homeowner, but it will have a more significant effect on the chance that a household head with income of $10,000 will own a home. Thus, the fact that the increase in household incomes over the last two decades has been greatest at the high end of the income distribution will have tended to hold down the increase in homeownership relative to a situation in which income gains had been more evenly distributed.

Table 3 summarizes the relationship between income and ownership by income decile. In 1977, slightly more than 42 percent of household heads in the lowest income decile owned homes. Ownership rates increase monotonically through the income distribution to above 60 percent for the median group and almost 88 percent for the highest decile. The most significant change between 1977 and 1997 occurred in the lowest income decile. While ownership rates were generally up for the higher deciles, those for the lowest decile fell a dramatic 7 percentage points. For the highest 90 percent of households, there was an increase in ownership of 1 percentage point over the 20-year period, significantly more than the increase in the aggregate rate which was held down by the large decline in homeownership among the 10 percent of households with the lowest incomes.

The bottom portion of table 3 shows the change in homeownership rates for groups with approximately constant real incomes. Specifically, it categorizes households according to the decile into which they would have fallen in the 1987 real income distribution. Again, the most significant change is that the lowest income group had the largest decline in homeownership. Finally, the fraction of individuals in the highest 1987 income deciles increased, which would tend to increase homeownership rates.

Effects of demographics and income growth on homeownership

The demographic and income trends detailed in the last section imply divergent predictions for the aggregate homeownership rate. On the one hand, the movement of the baby-boom generation into the prime homeownership ages, the increase in the level of education, and the increase in real incomes suggest that, in the absence of changes in government policy or other changes in narrow housing market conditions, homeownership rates should have risen over the last 20 years. On the other hand, the decline in the proportion of households headed by married people, the increase in households headed by women, and the increase in the number of nonwhite households would tend to have decreased the overall homeownership rate.

Below, we quantify the importance of the above factors and present estimates of how the homeownership rate would have changed if these factors had remained constant. The resulting standardized or adjusted homeownership rates provide a better indication of any trends in homeownership that may be due to government policies narrowly affecting the housing market or to such factors as tax policy, interest rates, or financial innovation. To compute these adjusted rates, we select 1987, the middle year of our sample, as the standard for demographic and income levels. For a given year, we then ask what the homeownership rate would have been, given the homeownership rates for individual demographic and income groups then prevailing, if the proportions of those groups in the population had been the same as in 1987.

We begin by standardizing the homeownership rate only for changes in the age distribution, a case that has been frequently emphasized in policy discussions. Consider the data shown in table 2 for the age of household heads. In 1977, homeownership rates ranged from 19.8 percent for household heads between the ages of 18 and 24 to 76.9 percent for household heads between 45 and 54. The overall homeownership rate in 1977, 64.6 percent, is the average of the rates shown in the first column of table 2 weighted by the actual 1977 proportions shown in the fourth column. To compute the adjusted rate, we weight the average

TABLE 3

Homeownership rates by income level
(percent)

	Level			Change		
	1977	1995	1997	1977–95	1995–97	1977–97
Income decile						
1	42.3	32.3	35.3	–10.0	3.0	–7.0
2	46.0	44.4	45.2	–1.6	0.8	–0.8
3	50.1	50.4	51.8	0.3	1.4	1.7
4	53.7	54.1	56.7	0.4	2.6	3.0
5	60.6	63.0	62.5	2.4	–0.5	1.9
6	68.7	67.4	68.1	–1.3	0.7	–0.6
7	73.5	73.0	75.2	–0.5	2.2	1.7
8	79.1	80.5	80.1	1.4	–0.4	1.0
9	84.5	83.9	84.6	–0.6	0.7	0.1
10	87.7	89.1	88.6	1.4	–0.5	0.9
2–10	67.1	67.3	68.1	0.2	0.8	1.0
1987 income decile						
1	42.1	32.4	35.1	–9.7	2.7	–7.0
2	46.1	44.8	45.0	–1.3	0.2	–1.1
3	50.5	51.2	51.3	0.7	0.1	0.8
4	53.9	54.4	56.7	0.5	2.3	2.8
5	62.4	63.6	62.0	1.2	–1.6	–0.4
6	70.3	67.9	67.6	–2.4	–0.3	–2.7
7	75.9	73.1	74.4	2.8	0.7	3.5
8	81.3	79.7	79.3	1.6	–0.4	1.2
9	86.3	84.1	83.6	–2.2	–0.5	–2.7
10	88.0	88.6	88.0	0.6	–0.6	0.0
2–9	65.3	64.3	64.8	–1.0	0.5	–0.5

Source: Authors' tabulations of 1977, 1978, and 1983–97 *March Current Population Surveys*.

of the rates for individual age ranges by the proportion of the groups in the 1987 population.[16]

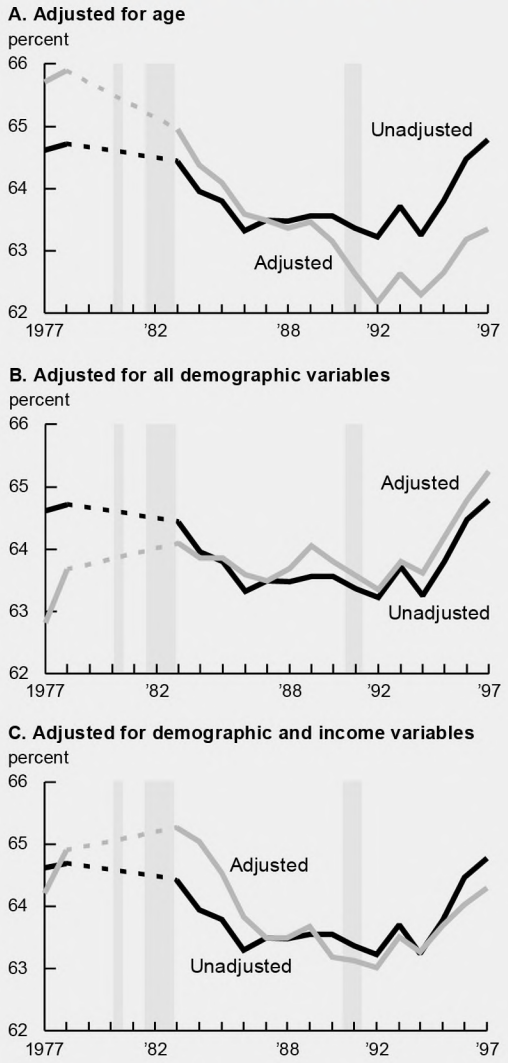
The results are plotted in panel A of figure 5, along with the unadjusted rates. Relative to unadjusted rates, age-adjusted rates were higher before 1987 and lower afterwards. As table 4 shows, the age-adjusted homeownership rate fell 3.0 percentage points from 1977 to 1995, while the unadjusted rate fell only 0.8 percentage points. Then, from 1995 to 1997, the age-adjusted rate rebounded by 0.7 percentage points, slightly less than the gain shown in the unadjusted rate. Over the whole period, the age-adjusted rate decreased by nearly 2.5 percentage points, whereas the unadjusted rate was essentially unchanged.

The relatively substantial decline in age-adjusted homeownership rates has been frequently noted by analysts who argue that homeownership rates are likely to begin to fall significantly once the effects of the maturation of the baby boom generation are fully felt.[17] Age-adjusted rates are also cited by those who argue that the trend in homeownership has been disappointing enough to warrant policy changes designed to make homeownership more accessible to more households. However, as we have previously noted, several other demographic changes may have acted to decrease homeownership rates. To obtain a clearer indication of the narrow forces affecting the housing market, one must control for these factors as well.

To adjust homeownership rates for changes in several background factors simultaneously, we employ a generalized adjustment procedure based on logistic regression analysis. The procedure, which is described in detail in the technical appendix, is to estimate a statistical model (the logistic regression model) for each year, relating household characteristics to homeownership probabilities. Then, to get the adjusted

FIGURE 5

Adjusted homeownership rate



Notes: Shaded areas indicate recessions. Dashed line represents period with missing data. Rates are standardized to the 1987 distribution of the variables for which rates are adjusted. See text and technical appendix for details of computation.

Source: Authors' calculations based on U.S. Department of Commerce, Bureau of the Census, *Current Population Survey*, March 1977–78 and 1983–97.

rate for, say 1977, we use the model estimated using 1977 data to predict the homeownership probability for each household in the 1987 sample and compute the mean over 1987 households of this predicted probability. The result is an estimate of the homeownership probability that would have prevailed in 1977 if the distribution of background factors had been as it was in 1987. Thus, changes in such adjusted rates reflect changes in factors that affect homeownership conditional on the background factors, not changes in the background factors themselves.

TABLE 4

Actual and adjusted percentage point change in homeownership rates

	1977–95	1995–97	1977–97
Actual	–0.8	1.0	0.2
Adjusted for:			
Age	–3.0	0.7	–2.3
All demographic and regional variables[a]	1.5	1.0	2.5
All demographic, regional, education, and income variables	–0.3	0.5	0.2

[a]Age of household head, sex of head, marital status of head, household size and composition, race of head, and region.

Notes: Rates are standardized to the 1987 distribution of the variables for which rates are adjusted. See text and technical appendix for details of comparison.

Source: Authors' tabulations of 1977, 1978, and 1983–97 *March Current Population Surveys*.

The results of adjusting for a fuller set of demographic and regional factors are shown in panel B of figure 5. These demographically adjusted rates control for the age, race, sex, and marital status of the household head, the number of children, the number of adults, and the census region of the household. The result of adjusting for all these factors simultaneously is essentially the opposite of adjusting for age alone. The demographically adjusted homeownership rates are mostly lower than unadjusted rates before 1987 and higher afterwards. Thus, on net, demographic change has acted to suppress growth in homeownership. As shown in table 4, demographically adjusted homeownership rates increased by 2.5 percentage points from 1977 to 1997, with the jump from 1995 to 1997 being the same as in the unadjusted rate. Evidently, the negative effects of factors such as the decrease in marriage rates of household heads were stronger than the positive effects of the aging of the baby-boom generation.

The increase in demographically adjusted homeownership rates shown in panel B of figure 5 implies that nondemographic factors must, on net, be acting to increase homeownership rates. Some of these factors, however, are likely part of larger trends in the economy that have little to do with public policy with respect to housing markets or changes in the availability of mortgage financing. In particular, education levels and real incomes generally have increased over the last 20 years for reasons that have little to do with housing policy. Both of these factors would be expected to increase homeownership rates.

The adjusted rates shown in panel C of figure 5 control for all the demographic and regional variables in panel B, as well as for changes in the education and income distribution. As shown in table 4, the combined effects of demographic, regional, educational, and income changes approximately cancel each other. Over the entire 1977 to 1997 period, the adjusted rate grew by the same 0.2 percentage points as the unadjusted rate. The time path, however, was somewhat different. Though the adjusted rate was lower than the unadjusted in 1977, over most of the early 1980s it was higher. Throughout the late 1980s and early 1990s, the two rates were relatively close, but the increase from 1995 to 1997 was only half as much for the adjusted rate as for the unadjusted.

Overall, the results shown in panel C of figure 5 and the last row of table 4 suggest that remaining factors, such as housing policy, financial innovation, or fluctuations in interest rates, that have affected homeownership rates since 1977 must have been approximately constant or nearly offsetting. The adjusted rate in 1997 was almost the same as 20 years earlier. The sharp increase in the last two years of the sample period also appears somewhat less remarkable on the basis of adjusted data. Evidently, normal responses to the increase in real incomes account for about half the increase since 1995.

Table 5 provides an indication of the importance of changes in individual demographic, regional, educational, and income factors to the homeownership rate. The figures are based on the same variables and basic statistical model underlying the last row of table 4. However, rather than applying the statistical model for each year to the same 1987 population, we applied the same 1987 statistical model to data in various years. Thus, we evaluated the effects of changes in background factors on the homeownership rate over time using a common cross-sectional benchmark.[18] As shown in table 5, the cross-sectional statistical model for 1987 predicts that the aging of the population from 1977 to 1997 increased homeownership by 1.2 percentage points. The increase in homeownership rates caused by the aging of the population is less than one might infer on the basis of the results in table 4, which show that adjusting only for age lowers the growth in homeownership rates by 3.5 percentage points. The results from figure 4 are likely to be misleading because age is correlated with other factors affecting homeownership, notably income. Thus, the estimated relationship between age and homeownership that is the basis for the age-adjusted rates likely reflects both the true effects of age and the effects of variables that are correlated with age. By simultaneously controlling for all demographic and income characteristics, the analysis presented in table 5 is able to isolate the true effect of an older population.

The aging of the population, while important, is quantitatively less significant for homeownership rates than the decrease of 2.5 percentage points attributed to the decline in marriage rates among household heads over the sample period. Changes in the racial composition of the population and decreases in the typical size of households together acted to bring down the homeownership rate by another 1 percentage point. Increasing levels of education predict a 1.2 percentage point increase in homeownership. Finally, the increase in real incomes was enough to generate another 1.6 percentage point increase in the rate of homeownership. The effect of this factor was especially important from 1995 to 1997, accounting for a 0.5 percentage point increase in homeownership rates.

TABLE 5

Percentage point change in homeownership due to changes in demographic, regional, educational, and income distributions

	1977–95	1995–97	1977–97
Effect[a] of changes in distribution of:			
Demographic and regional variables	–2.0	–0.1	–2.1
Age	0.9	0.3	1.2
Sex of household head	0.1	0.0	0.1
Marital status of head	–2.2	–0.3	–2.5
Household size and composition	–0.3	–0.0	–0.3
Race	–0.6	–0.0	–0.7
Region	0.1	0.0	0.1
Education and income variables	2.5	0.5	2.8
Education change	1.2	0.0	1.2
Income change	1.0	0.6	1.6
Effect[b] of hypothetical proportional income growth	2.2	0.6	2.8

[a]Approximation to effect of changes in variable on homeownership rates based on linearization of logistic regression function for 1987. See text and technical appendix for details of computation.

[b]Predicted change in rates assuming constant 1987 demographic characteristics with proportional income growth.

Source: Authors' computations based on 1977, 1978, and 1983–97 *March Current Population Surveys*.

Real incomes grew substantially over the 20-year period we study, but as is widely known, the growth was far from uniform.[19] In general, there was more growth at the upper end of the income distribution than at the bottom. For example, 90th percentile real income increased by about 22 percent, while the 10th percentile was essentially unchanged. As noted earlier, ownership rates increase with income at a decreasing rate. In particular, a given increment of income will raise ownership probabilities for those with high incomes less than for those with low incomes. This suggests that the increase in income inequality lowered growth in homeownership rates.

To quantify the effects of increased income inequality, we used our statistical model to ask what would have happened to homeownership rates if all household incomes had grown at the same rate. Because the CPS has limited information on households with very high incomes, we used the personal income totals of the National Income and Product Accounts, which show that personal income per household deflated by growth in the consumer price index was about 17 percent over the period we study. We then computed the income that individuals in the 1987 sample would have had in each year if their income had grown at the same pace as aggregate personal income. We used our statistical model to estimate the effect this would have had on homeownership rates.[20] The results shown in the last row of table 5 suggest that equal growth of incomes would have raised the homeownership rate by about 2.8 percentage points, substantially more than the 1.6 percentage point increase we estimate was associated with the actual change in income. Thus, the increase in income inequality from 1977 to 1997 can be viewed as having decreased homeownership rates by about 1.2 percentage points relative to a case in which there was the same total increase in income, but no increase in relative income inequality.

Effects of demographics and income growth on the white–black gap

As we noted previously, the significant gap between white and black homeownership rates has been the cause of much concern to policymakers and others who fear some or all of this gap could be attributable to racial discrimination by real estate agents or lenders. In this context, the especially rapid increase in black homeownership rates since 1995 is encouraging and could be interpreted as evidence that increased attention to the CRA, Fair Lending Act, and other laws are having beneficial effects on blacks' access to housing and credit.

However, there are significant differences between whites and blacks in many of the factors found in our analysis to influence homeownership rates. In this section, we investigate how much of the gap in homeownership is attributable to differences between whites and blacks in these background factors. We also show how the adjusted white–black gap has varied over time. Since housing market regulations are unlikely to have influenced any of the changes in the background factors, the adjusted gap is the appropriate measure to examine for signs of their effectiveness. Finally, we show how much of the change over time in the white–black homeownership gap is attributable to differential changes between whites and blacks in the background factors.

To adjust for differences in background factors between whites and blacks, we employ a procedure similar to that used earlier to adjust the overall homeownership rate for differences in background factors over time. Specifically, as is described in detail in the technical appendix, we estimate statistical models (logistic regression models) separately for whites and blacks in each year of the sample. We then use each of those models to predict homeownership probabilities for the sample of whites in 1987. The resulting average rates then reflect the distribution of background factors of a common group of households—whites in 1987. Thus, differences across groups or across time in the adjusted rates reflect differences in forces other than the background factors controlled for in the statistical models.

We use the same three sets of background factors as in the previous section. Table 6 shows the actual difference between white and black homeownership rates and the difference after adjusting for age alone, all demographic factors (other than race), and all demographic factors plus education and income.

In 1977, the actual difference between white and black homeownership rates was 24.1 percentage points. After controlling for age, the difference drops to 23.3 percentage points, suggesting that a small portion of the unadjusted white–black difference in homeownership is attributable to differences in the fractions of whites and blacks in age groups with different homeownership rates. Age-specific homeownership rates declined slightly more sharply for blacks than whites over most of the sample period, causing the age-adjusted white–black gap to increase 0.9 percentage points between 1977 and 1995. The nearly 3 percentage point increase in unadjusted black homeownership between 1995 and 1997 is found, however, in the age-adjusted rates as well.

TABLE 6

Actual and adjusted white–black homeownership rate differences
(percent)

	Period			Change		
	1977	1995	1997	1977–95	1995–97	1977–97
Actual	24.1	27.2	24.3	3.1	–2.9	0.2
Adjusted for:						
Age	23.3	24.2	21.2	0.9	–3.0	–2.1
All demographic and regional variables[a]	17.9	18.7	16.0	0.8	–2.7	–1.9
All demographic, regional, education, and income variables	12.7	15.5	13.0	2.8	–2.5	0.3

[a]Age of household head, sex of head, marital status of head, household size and composition, race of head, and region.

Notes: Rates are standardized to the 1987 distribution of the variables for which rates are adjusted. See text and technical appendix for details of comparison.

Source: Authors' tabulations of 1977, 1978, and 1983–97 *March Current Population Surveys*.

Controlling for all demographic and regional factors, as in the third row of table 6, reduces the white–black difference somewhat more significantly—to 17.9 percentage points in 1977. However, the pattern over time is very similar to that in the rates that are only adjusted for age, with the gap rising 0.8 percentage points from 1977 to 1995 and 2.7 percentage points from 1995 to 1997. This pattern differs in the 1977–95 period from the unadjusted gap, which showed a 3.1 percentage point increase.

Adding education and income levels to the list of controls reduces the gap still further. The pattern over time is displayed in figure 6. Panel A shows the unadjusted and adjusted rates for whites and blacks. While adjustment for all demographic, regional, educational, and income differences slightly reduces the change over time in the white homeownership rate, it raises the black homeownership rate in most years by more than 10 percentage points. In most years, this amounts to between 40 percent and 50 percent of the full gap between whites and blacks. For instance, in 1977, the gap after adjusting for all demographic, regional, educational, and income variation was 12.7 percentage points, a little over half the 24.1 percentage point difference in the unadjusted rates.

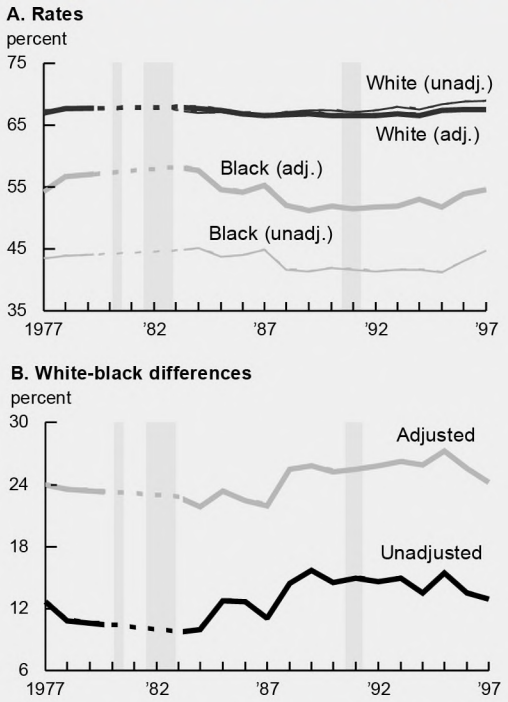
Even after adjusting for income and demographic factors, a large gap remains between white and black homeownership rates. This result, which has also been found by other researchers, is consistent with the finding that wealth levels are higher for whites than for blacks, even after controlling for income and demographics.[21] In part, this appears to stem from differences in the size and frequency of inheritances. In addition, there may be other differences between whites and blacks in the distributions of characteristics not included in the CPS data. Of course, it may also be that the gap in adjusted rates is due in part to discrimination or differences in tastes for homeownership.

Panel B of figure 6 shows more clearly how the unadjusted and adjusted gaps between white and black homeownership rates have evolved over the sample period. In both cases, the gap grew significantly between 1977 and 1995. The adjusted gap grew by 2.8 percentage points versus 3.1 percentage points on an unadjusted basis. The decline in the gap after 1995 was somewhat smaller in the adjusted data, but still a very significant 2.5 percentage points. Over the sample period, both measures changed remarkably little, with the adjusted gap growing 0.2 percentage points versus 0.3 percentage points for the unadjusted data.

Table 7 quantifies the effect of differences in the individual background factors on the gap between white and black homeownership rates. As with the calculations in table 5, the calculations in table 7 are based on the estimated statistical model for a single base year, 1987, applied to data for each year. In table 7, however, we restricted the statistical model further to blacks in 1987 and applied it separately to whites and blacks in each year.[22] The rates we obtain for whites and blacks in each year reflect what homeownership rates would have been if the background factors had had the same effects on homeownership as they did for blacks in 1987. Thus, differences in a given year between the white and black rates are due solely to differences in the background factors. The contribution of each factor to the white–black

FIGURE 6

Adjusted white–black homeownership rates



Notes: Shaded areas indicate recessions. Dashed line represents period with missing data. Rates are standardized to the 1987 distribution of the variables for which rates are adjusted. See text and technical appendix for details of computation.

Source: Authors' calculations based on U.S. Department of Commerce, Bureau of the Census, *Current Population Survey*, March 1977–78 and 1983–97.

homeownership gap in 1977, 1995, and 1997 is as shown in the first three columns of table 7 (given an approximation as described in the technical appendix).[23]

As shown in table 7, the most important difference in background factors affecting the white–black homeownership gap is that in income. Differences in the distribution of white and black incomes explain a little over 9 percentage points of the gap in all three years, with the contribution of this factor changing little over time. The generally higher levels of education among whites also have the effect of increasing the gap between white and black homeownership rates, but this factor diminished in importance over time as black educational attainment improved. Specifically, differences in education explained 1.7 percentage points of the homeownership gap in 1977, but only 0.8 percentage points in 1997. Two other factors that tend to increase the gap in homeownership have increased in importance over time. The lower rates of marriage among black household heads contributed 5.7 percentage points to the gap in 1977 and 6.2 percentage points in 1997 and the lower ages of black household heads contributed 3.0 percentage points to the gap in 1977 and 4.1 percentage points in 1997. Differences in the proportion of households headed by women and in the regional distribution of households tend to decrease the gap in homeownership rates by about 1.5 percentage points and 2.5 percentage points, respectively.

Altogether, our analysis indicates that a substantial portion of the white–black difference in

TABLE 7

Effect of differences in demographic, regional, educational, and income distributions on white–black homeownership
(percent)

	Level			Change		
	1977	1995	1997	1977–95	1995–97	1977–97
Effect[a] of differences in:						
Demographic and regional variables	–1.2	0.0	0.2	1.2	0.1	1.3
Age	3.0	4.1	4.1	1.1	0.0	1.1
Sex of household head	–1.3	–1.5	–1.5	–0.2	–0.1	–0.3
Marital status of head	5.7	6.2	6.2	0.5	0.0	0.5
Household size and composition	–0.3	–0.1	–0.2	0.2	–0.1	0.2
Region	–2.6	–2.4	–2.2	0.2	0.2	0.4
Education and income variables	11.0	10.1	10.2	–0.9	0.1	–0.8
Education	1.7	0.9	0.8	–0.8	–0.0	–0.8
Income	9.4	9.2	9.3	–0.1	0.1	–0.1

[a]Approximation to effect of changes in variable on homeownership rates based on linearization of logistic regression function for blacks in 1987. See text and technical appendix for details of computation.

Source: Authors' computations based on 1977, 1978, and 1983–97 *March Current Population Surveys*.

homeownership rates is attributable to differences in demographic, regional, educational, and income factors. However, an even larger proportion of the difference remains unexplained by the factors we considered. The remaining gap may be due to differences in background factors not measured in the CPS data, to discrimination, or perhaps to differences in preferences for homeownership between whites and blacks. Our analysis is not able to distinguish between these possibilities.

Our results also show that only a small portion of the significant increase in the white–black homeownership gap that occurred from 1977 to 1995 is explained by changes in background factors. Moreover, relatively little of the rapid decline in the gap that has occurred since 1995 is attributable to changes in the background factors. Thus, increased attention to anti-discrimination measures in the last several years may have had some positive impact on black homeownership rates.

Conclusion

After adjusting for a wide range of demographic and income factors, we find that the long-term trend in homeownership is very similar to that found in the raw data. From 1977 to 1997, both unadjusted and adjusted homeownership rates increased very slightly. The aging of the baby boom generation, the increase in educational attainment, and the growth in real incomes all caused homeownership rates to increase significantly. However, the sharp drop in the fraction of married household heads, the decline in the size of the typical household, and the fall in the share of white households together had an almost precisely offsetting effect. We also find that the increase in income inequality over the period held back growth in homeownership relative to the rate that would have been seen with a more equal distribution of the same total income gains.

Though our adjusted rates increased by almost the same amount as the unadjusted rates over the full 20-year period, they declined less over the 1977 to 1995 period and increased less in the last two years. It follows that the set of forces that more narrowly affect homeownership, such as interest rates, financial innovations, and public policies toward housing must have been approximately balanced over the period. In particular, our adjusted rates suggest that there was no sharp deterioration in the conditions that support homeownership in the 1980s and early 1990s, unlike what one might be tempted to conclude on the basis of raw or age-adjusted rates. Rather, growth in homeownership during this period was held back by demographic changes, such as the decline in the fraction of married household heads. Similarly, the gains in homeownership in the last two years appear to be largely related to more rapidly growing real incomes, rather than a response to any special change in housing policy or other factors peculiar to housing markets.

Our analysis also suggests that about 40 percent of the difference between white and black homeownership rates can be explained by differences in demographic and income factors known to affect homeownership. We cannot determine how much of the remaining difference is due to discrimination, different preferences for homeownership, or differences in background characteristics that are not measured in the CPS. In future research, we hope to use data sets such as the Panel Study of Income Dynamics to determine how much of the white–black homeownership gap is due to differences in wealth, a factor that has been found to differ between whites and blacks even after controlling for income and demographic differences.

Finally, very little of the trend over time in the white–black differential in homeownership is explained by changes in demographic and income variables. In particular, relatively little of the dramatic drop in the gap since 1995 reflects changes in factors we consider. Thus, it may be that the recent amendments to the CRA and fair lending laws or their more vigorous enforcement are having a positive effect on black homeownership rates.

Adjustment methodology and decompositions

From the CPS, we have data on homeownership and background characteristics for a sample of households in each year. Let N_t denote the sample in year t and for each $i \in N_t$, let h_i denote the indicator variable that equals one if the household owns its home and zero otherwise, and let the vector x_i denote the relevant background characteristics. Finally, let w_i be the CPS household weight, a factor calculated by the Census Bureau to produce nationally representative estimates of means of household-level variables. Then we calculate the aggregate homeownership rate in year t as

$$h_t = \frac{\sum_{i \in N_t} w_i h_i}{\sum_{i \in N_t} w_i} = \sum_{i \in N_t} w_i' h_i ,$$

where $w_i' = w_i / \sum_{i \in N_i} w_i$ is the proportion of the total year t sample weight accounted for by member i. Similarly, for a particular subsample N_{dt}, let $w_{di}' = w_i / \sum_{i \in N_{dt}} w_i$ denote the proportion of the subsample weight accounted for by i. Then, the homeownership rate at time t for that subsample is calculated as

$$h_{dt} = \sum_{i \in N_{dt}} w_{di}' h_i .$$

If the proportion of the total year t sample weight accounted for by N_{dt} is denoted as $w_{dt}' = \sum_{i \in N_{dt}} w_i / \sum_{i \in N_t} w_i$, then the aggregate homeownership rate can be written as $h_t = \sum_d w_{dt}' h_{dt}$, where the sum is taken over all possible values of the variable d.

The standard procedure for adjusting the aggregate homeownership rate for changes in the proportion of the sample accounted for by different values of d is to pick a base year, which in our case is 1987, and then reweight the above sum using base year weights:

$$\tilde{h}_t = \sum_d w_{d87}' h_{dt} .$$

We refer to $\tilde{h}_t$ as the d-adjusted homeownership rate. Notice that it can also be written as

$$\tilde{h}_t = \sum_{i \in N_{87}} w_i' \tilde{h}(i,t),$$

where $\tilde{h}(i,t) = h_{dt}$ if $i \in N_{d87}$. That is, the adjusted rate for year t is the weighted average over the base year sample of a particularly simple statistical model fit to the year t sample. That model says that the probability of homeownership just depends on the group, d, to which the sample member belongs. Our generalization of the standard adjustment procedure allows the statistical model to be richer.

In particular, we fit a logistic regression model in which the predicted probability for a household with characteristics x in year t is

$$h(x,t) = \frac{e^{x\beta_t}}{1+e^{x\beta_t}} .$$

We estimate the parameter vector, β, by (weighted) maximum likelihood from the year t sample. We then apply this model estimated for each year to the base 1987 sample using the same expression, $\tilde{h}_t = \sum_{i \in N_{87}} w_i' h(x_i, t)$, for the adjusted rate. Thus, the changes in the adjusted rate, say from 1977 to 1997, presented in table 4 are:

$$\tilde{h}_{97} - \tilde{h}_{77} = \sum_{i \in N_{87}} w_i' [h(x_i, 97) - h(x_i, 77)].$$

The calculations in table 4 are based on the above procedure where the x_i are various sets of dummy variables. The age-adjusted figures simply have a dummy variable for each age group shown in table 2. In this case, the logistic regression model has the property that the predicted probabilities for each group match the subsample proportion of homeowners. Thus, our procedure reproduces the standard age-adjustment procedure. To adjust for all demographic and regional variables, we let x_i contain dummy variables for each of the levels of the groups of workers in the demographic and regional categories in table 2. Finally, to adjust for all variables including income and education, we add dummy variables for the categories shown for those variables in table 2.

Table 4 displays changes in the *h(x, t)* function applied to the same base period sample weights. It is also informative to see directly the effects of changes in the distribution of background characteristics. For such a calculation, it is natural to use the base period statistical function, *h(x,* 87*)*. Indeed there is an approximate decomposition of the change in the actual homeownership rate into changes due to changes in the *h(x, t)* function and changes due to changes in the background factors:

$$h_{97} - h_{77} \cong (\tilde{h}_{97} - \tilde{h}_{77})$$
$$+\left[\sum_{i \in N_{97}} w_i' h(x_i, 87) - \sum_{i \in N_{77}} w_i' h(x_i, 87)\right].$$

Because the function *h(x,* 87*)* is nonlinear in *x*, it is not possible to uniquely decompose the portion of the change in homeownership rates due to changes in the background characteristics into portions associated with changes in any single component of *x*. However, we can provide an approximate such decomposition by linearizing *h(x,* 87*)* around the (weighted) sample mean, $\bar{x}_{87}$, which results in the following approximation:

$$\sum_{i \in N_{97}} w_i' h(x_i, 87) - \sum_{i \in N_{77}} w_i' h(x_i, 87) \cong$$
$$h(\bar{x}_{87}, 87)(1 - h(\bar{x}_{87}, 87))[\bar{x}_{97} - \bar{x}_{77}]\beta_{87}.$$

On the right hand side of the above expression, there is a unique portion associated with the change in any set of components of *x*. For example, if $x_i = \left[x_i^{1\prime}\ x_i^{2\prime}\right]'$ then the right hand side of the above expression can be written as

$$h(\bar{x}_{87}, 87)(1 - h(\bar{x}_{87}, 87))\{[\bar{x}_{97}^1 - \bar{x}_{77}^1]\beta_{87}^1$$
$$+[\bar{x}_{97}^2 - \bar{x}_{77}^2]\beta_{87}^2\},$$

and the portion due specifically to changes in the distribution of x_i^1 is $h(\bar{x}_{87}, 87)(1 - h(\bar{x}_{87}, 87))[\bar{x}_{97}^1 - \bar{x}_{77}^1]\beta_{87}^1$. This is the basis for the calculations in table 5 in which we break the right hand side of the above expression down into components associated with each group of variables shown in the table.

In order to adjust the difference between white and black homeownership rates for differences in background characteristics, we extend the above procedures by estimating a separate logistic regression model for each race in each year:

$$h(x, r, t) = \frac{e^{x\beta_{rt}}}{1 + e^{x\beta_{rt}}},$$

where *r* is *w* for whites and *b* for blacks. Then the adjusted rates shown in table 6 are based on the above models applied to the 1987 white sample:

$$\tilde{h}_{rt} = \sum_{i \in N_{w87}} w_i' h(x_i, r, t),$$

where N_{rt} is the sample of households of race *r* in year *t*.

The decomposition of the white–black difference shown in table 7 is based on a linearization of *h*(*x*, *b*, 87) around the sample mean of the 1987 black distribution, $\bar{x}_{b87}$, which leads to

$$\sum_{i \in N_{wt}} w_i' h(x_i, 87) - \sum_{i \in N_{bt}} w_i' h(x_i, 87) \cong$$
$$h(\bar{x}_{b87}, b, 87)(1 - h(\bar{x}_{b87}, b, 87))[\bar{x}_{wt} - \bar{x}_{bt}]\beta_{b87}.$$

The left hand side is the difference in white and black rates due to differences in the distribution of background characteristics as measured by the 1987 black statistical model. The linear approximation shown on the right hand side has a unique portion associated with each set of components of *x* and is the basis for table 7.

NOTES

[1]See, for example, Hurst, Luoh, and Stafford (1998).

[2]See, for example, Galster (1983), Rossi and Weber (1996), Green and White (1994), and DiPasquale and Glaeser (1998).

[3]See, for example, the discussion in Green (1995).

[4]The figures shown in table 1 and in subsequent tables and figures do not exactly match the "official" rates shown in figure 1 because, as we explain below, we have focused our analysis on households with heads aged 18–74.

[5]For evidence of steering, see Yinger (1986). For contrasting views of the evidence on discriminatory lending practices, see Munnell et al. (1996) and Horne (1997).

[6]Evanoff and Segal (1996) discuss this interpretation of the data.

[7]See, for example, Chatterjee (1996), who emphasizes the increased risk burden that households may take on in exchange for the tax benefits of homeownership.

[8]On the increase in mortgage securitization, see, for example, Saunders (1997).

[9]See, for example, Gyourko and Linneman (1996).

[10]See Avery and Rendall (1997), Blau and Graham (1990), Menchik and Jianakoplos (1997), and Hurst, Luoh, and Stafford (1996) for a discussion of white–black wealth differences.

[11]Throughout, we refer to the race, age, sex, and marital status of the household head, the size and composition of households, and the Census region of the household as demographic factors.

We group education levels with income because of the important role of human capital in determining wage and salary income.

[12]Until 1996, there were approximately 60,000 households in the survey.

[13]Contacts at the Census Bureau believe that in these years a small number of individuals not answering the homeownership question were all recorded as homeowners. This causes the aggregate rate calculated from the March surveys to be about 1 percentage point too high. (This error affects certain Census publications, but not the quarterly homeownership rates shown in figure 1.) Unfortunately, it is impossible to determine which households' data were imputed. Thus, we omitted the 1979–82 data.

[14]Through 1979, the CPS defined an adult as age 14 and up; in 1980, the definition changed to age 15 and up. Thus, the reported statistics slightly understate the degree of change.

[15]See, for example, Federal Reserve Bank of Chicago (1997).

[16]The results of this procedure are relatively insensitive to the grouping of ages into intervals as long as some care is taken to avoid combining groups for which homeownership rates are radically different. This consideration is what motivates using narrower age ranges at lower ages. Homeownership, as seen in figure 3, panel A, increases rapidly with age from 20 to 40, but changes much less for higher ages. We obtained very similar results using a fourth-order polynomial in age and the logistic regression procedure described in the technical appendix.

[17]See, for example, Myers, Peiser, Schwann, and Pitkin (1992).

[18]Because the same 1987 base year is used in both calculations, the estimated effect on homeownership of changes in background factors as shown in table 5 is not exactly equal to the difference between the actual and adjusted rates shown in table 4. Moreover, as discussed in the technical appendix, because the logistic regression model on which the computations are based is nonlinear in the background factors, we must employ a linear approximation to quantify the effects of changes in individual factors, such as age and income. Nevertheless, the results in table 5 provide a reasonable indication of the importance of the individual factors in driving the aggregate homeownership rate.

[19]See, for example, Federal Reserve Bank of New York (1995).

[20]We used the linearized version of our model that underlies all of the calculations in table 5.

[21]For previous work on the white–black cross-sectional homeownership difference, see Gyourko and Linneman (1996). For work on wealth differentials, see Avery and Rendall (1997), Blau and Graham (1990), Menchik and Jianakoplos (1997), and Hurst, Luoh, and Stafford (1996).

[22]Using the estimated statistical model for black households in 1987 is motivated by a standard decomposition of racial wage differences into a part due to differences in the background variables and a part due to differences in the statistical models. Using the black statistical model makes this decomposition exact.

[23]Positive numbers indicate factors that increase the size of the difference between white and black homeownership rates, while negative numbers indicate factors that, on their own, would tend to make white rates lower than blacks rates.

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