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ACCORDING TO many popular accounts, the severity of the recession that began in July 1990 was worsened by financial distress—or, at least, by financial discomfort—in a number of sectors of the economy. Much of this discussion centered on the so-called “credit crunch” in the banking sector.¹ As early as the spring of 1990, some months before the recession began, there were newspaper reports (mostly anecdotal) of banks cutting back on lending, sometimes with deleterious effects on retailers and other bank borrowers. In June the secretary of commerce called the credit crunch a serious problem,² and congressional hearings on the issue were held during the summer. As the recession arrived in July and then deepened during the fall, the view that a credit crunch was playing at least some role in the downturn became increasingly widespread among policymakers, including some at the Federal Reserve.

Despite these developments, there was, and still is, a notable lack of consensus about the importance of a credit crunch in the banking sector, its causes, and even the meaning of the term. Although it is too early to

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1. Some commentators have raised the possibility of a generalized credit crunch affecting all credit sources, not just banking. We briefly discuss this possibility below, but our paper focuses on the banking sector.

2. See Alan Murray, “Mosbacher Says ‘Serious’ Credit Crunch Grips U.S., Isn’t Limited to Real Estate,” *Wall Street Journal*, June 15, 1990, p. A3.

attempt a definitive evaluation of the credit crunch (as of the fall of 1991, it is still not certain whether the recession has ended), we try in this paper to shed some light on these issues. We begin by reviewing the recent behavior of bank lending, finding that lending has been weak recently, even relative to previous recessionary periods. This weakness has been most pronounced in the northeastern part of the country, though it has not been confined to that region.

Next we consider why the lending slowdown has occurred. It seems probable that demand factors, including the weakened state of borrowers' balance sheets, caused much of the slowdown. However, we also argue that a shortage of equity capital has limited banks' ability to make loans, particularly in the most affected regions. Thus we agree with Richard Syron, president of the Boston Federal Reserve, that the credit crunch might better be called a "capital crunch."³ We present evidence for the capital crunch hypothesis using both state-level data and data on individual banks.

The most difficult issue is whether the slowdown in bank lending has had a significant macroeconomic effect. Although it is likely that a bank credit crunch (or capital crunch) has occurred and has imposed costs on some borrowers, we are somewhat skeptical that the credit crunch played a major role in worsening the 1990 recession. There are several reasons that we take this view. First, our estimates of the effect of falling bank capital on lending are statistically significant but small, suggesting that in most regions the capital shortage has had only a modest effect on the availability of loans. Second, we find little relationship between bank capital-asset ratios and employment growth across states. Finally, it appears that all types of credit extension, not just bank lending, have slowed since the onset of the recession; this suggests that falling credit demand is a major factor in the lending slowdown.

In the last part of this report we also discuss the implications of the credit crunch for policy, particularly for banking reform and monetary policy. We argue that a credit crunch does not seriously affect the Federal Reserve's capacity to stabilize the economy but that it may make indicators of monetary policy more difficult to read.

3. See Syron (1991).

Recent Developments in Bank Lending

We define a bank credit crunch as a significant leftward shift in the supply curve for bank loans, holding constant both the safe real interest rate and the quality of potential borrowers.⁴ In order to get at the question of whether there has been a credit crunch, we begin in this section by documenting the behavior of bank lending during the recent recession and by comparing this behavior to previous recessionary episodes.⁵ In later sections we consider alternative explanations for the behavior of bank lending.

The basic data on bank lending during recessions are presented in table 1, which compares the growth rates of nominal loans and leases outstanding during the 1990 recession with their growth rates in five earlier recessions. Each entry in the table shows the annualized growth rate of a category of loans over the first three quarters of a particular recession. For example, the recent recession began in the third quarter of 1990 (1990:3); thus the table shows the growth rates of the various categories of loans between 1990:2 and 1991:1. (We choose to look at developments over three quarters because 1991:1 is the most recent quarter for which we have data on the current recession.) We measure loan changes beginning at the peak because most studies have found bank lending to be approximately coincident with the cycle,⁶ although beginning our measurements two or four quarters before the cyclical peak would not significantly affect our conclusions. The table presents data for the major domestic financial intermediaries as a group (domestically chartered commercial banks, savings and loans institutions, mutual sav-

4. As we discuss in the latter part of this report, we see no necessary connection between a credit crunch and credit rationing in a strict sense.

5. Throughout, we use only loans outstanding, and exclude securities held, when measuring credit extension by banks. This choice is based on the conventional presumption that bank loans are "special," in the sense of being imperfect substitutes for other forms of credit, but that banks are in no way special in their ability to hold open-market securities. Measuring bank credit as the sum of loans and securities, as a few authors have, seems to us to miss the point.

6. An exception is the 1973–75 recession, in which the decline in loan growth significantly lagged the decline in economic activity.

Table 1. The Growth of Lending over Six Recessions, by Year of Cyclical Peak

Percent

Type of loan	1960	1969	1973	1980	1981	1990
<i>All financial intermediaries</i>						
Total loans	7.5	4.4	12.2	3.5	5.4	-3.6
Commercial-industrial loans	3.6	10.1	19.2	4.8	17.0	-2.4
Real estate loans	8.9	4.0	10.4	4.9	2.6	-3.7
1-4-family	8.6	3.3	9.9	5.7	1.6	-2.3
Other	10.6	5.8	11.9	2.5	5.6	-7.1
Consumer and other loans	7.6	0.2	10.0	-1.0	2.3	-4.3
<i>Domestically chartered commercial banks</i>						
Total loans	4.4	4.1	14.6	3.1	9.3	1.7
Commercial-industrial loans	3.6	10.1	19.2	4.8	16.8	-1.1
Real estate loans	1.6	2.9	15.4	5.8	7.7	5.9
1-4-family	-0.9	2.0	15.0	6.4	5.9	10.5
Other	6.9	4.2	16.0	4.8	10.7	0.1
Consumer and other loans	6.8	-1.3	9.7	-1.0	2.6	-1.7
<i>Macroeconomic conditions</i>						
Nonagricultural employment						
growth	-1.3	0.6	2.4	-0.9	-1.3	-1.3
Inflation	1.8	4.9	10.3	11.0	7.2	5.8

Source: Nominal loan data are from the Flow of Funds and have been seasonally adjusted by X11. All financial intermediaries include all commercial banks, savings and loans, mutual savings banks, and credit unions. Nonagricultural employment growth and inflation (measured by the CPI-X, which excludes the inappropriate influence of mortgage interest rates that exists in the standard CPI) are from the Federal Reserve Board and have been seasonally adjusted. Percentage growth rates are annualized and measured from the quarter preceding the cyclical peak until three quarters later.

ings banks, and credit unions) and for domestically chartered commercial banks as a separate group. To put the loan growth data in its macroeconomic context, table 1 also reports annualized employment growth and inflation rates over the corresponding time periods.⁷

Table 1 indicates that lending activity by banks and other financial institutions was weak during the 1990-91 period, weaker even than in the other recessions. Indeed, loans outstanding actually declined during this recession. In part, the decline in lending reflects the ongoing shrinkage of the savings and loan industry (S&L loans outstanding fell by more than 20 percent between 1989:2 and 1991:1). But, as table 1 shows, lending by domestically chartered commercial banks was also far from vigorous, as total bank loans grew only 1.7 percent (at an annual rate) during

7. By the employment metric, 1990 looks like a particularly bad recession. However, it should be noted that declines in employment occurred earlier in this recession than normal, which conceivably might reflect unusual financial pressures on firms.

the first three quarters of the 1990 recession, and loans outstanding other than for real estate actually fell in nominal terms. For banks, only mortgage loans for 1–4-family residences showed significant growth after the 1990 peak, probably reflecting both acquisitions from thrifts and the relatively favorable treatment of these loans under the new risk-weighted capital standards.

Table 1 follows the conventional practice of measuring loans in nominal terms. An alternative—and most economists' first instinct—would be to measure changes in loans outstanding in real terms. Since inflation during the 1990 recession was lower than in the three previous recessions (see table 1), measuring growth rates of lending in real terms would reduce the contrast between lending growth in 1990 and that in earlier recessions. Notice, for example, that in real terms bank lending in the 1980 recession contracted by considerably more than in the 1990 episode.

Estimating loan growth in real terms, however, can also mislead. The problem is exemplified by the early stages of the Great Depression, when rapidly falling prices led to an increase in the real value of loans outstanding. Yet the 1930s were hardly a period of easy credit. Ideally what we would like to measure is the real value of *new credit extensions*, which is well approximated by the change in the real value of loans outstanding only if the effective maturity of bank loans is very short.⁸ If the effective maturity of loans (by which we mean the maturity implied by the ongoing relationship of borrower and lender rather than the contractually stated maturity) is very long, then the real value of new credit extensions is actually better approximated by the nominal growth rate of loans outstanding.⁹ We will continue to use nominal growth rates when measuring loans and other balance sheet items, but readers may use the inflation rates in table 1 to make their own adjustments.

A different breakdown of the recent slowdown in lending, this time by geographic region, is presented in table 2. As most accounts of the

8. The change in the real value of loans outstanding is the sum of the real value of new credit extensions and the change in the real value of preexisting loans. The second term is zero only if loans have instantaneous maturity.

9. If nominal loans have infinite maturity, the real value of credit extensions is $\Delta L/P$, where L is nominal loans and P is the price level. Real credit extensions relative to the real value of existing loans equals $(\Delta L/P)/(L/P)$, which is the same as $\Delta L/L$, the growth in nominal loans outstanding.

Table 2. The Growth of Commercial Bank Lending by Region, 1990:2–1991:1
Percent

Census region	Total loans	Commercial and industrial	Real estate			Consumer and other	Percent of all loans
			Total	1-4 family	Other		
New England	-13.6	-18.4	-7.6	-5.4	-11.1	-20.6	6.2
Mid-Atlantic	-2.1	-4.8	3.9	12.7	-3.4	-5.9	22.9
East North Central	1.8	-0.3	7.4	9.5	5.1	-3.2	15.9
West North Central	4.7	-1.2	9.1	13.6	4.8	4.5	6.6
South Atlantic	1.2	-5.8	4.8	10.8	-0.3	0.9	18.7
East South Central	1.5	-1.1	4.6	8.2	0.8	-0.7	4.6
West South Central	-0.2	-1.8	-0.8	6.0	-6.2	2.5	6.3
Mountain	2.6	-10.7	1.8	9.3	-4.3	10.4	3.8
Pacific	6.8	4.3	12.7	15.9	10.3	-2.4	14.9

Source: Data are for nominal loans and leases, net of unearned income, and are taken from the call reports. Growth rates have been annualized. Because of the cost of extracting long time series from the call reports, data are not seasonally adjusted.

credit situation have stressed, there is indeed a strong regional aspect to the contraction of bank credit. New England, in particular, has experienced a sharp fall in bank loans outstanding, continuing a trend begun before the onset of the recession. The slowdown has not been restricted to New England, however: total nominal loans declined in the Mid-Atlantic and West South Central regions as well, and commercial and industrial (C&I) loans fell in every region except the Pacific region. For comparison, note from table 1 that aggregate nominal C&I loans did not decline in any of the five earlier recessions.

Although we have emphasized changes in the quantity of loans outstanding, it would also be interesting to know what has happened to the price of loans, as reflected in loan interest rates and credit terms. Unfortunately, there are at least two serious practical difficulties in measuring the true cost of a bank loan to the borrower. First, the cost of a bank loan is multidimensional, involving, for example, collateral and compensating balance requirements as well as a contractual interest rate. Second, it is difficult to control for systematic changes in the quality of the borrower receiving the loan. Thus reported measures of the cost of credit should be interpreted cautiously.

However, for the record, the behavior of credit terms in this recession has been similar to that in previous recessions. Nominal loan rates fell slightly over the first two quarters of the recession before dropping more sharply in 1991:1, a pattern that is generally consistent with what

has happened in previous downturns.¹⁰ For example, a survey by the National Federation of Independent Business reports that interest rates paid by small businesses on short-term loans were 12.0 percent in 1990:1, 11.9 percent in 1990:2–1990:4, and 11.2 percent in 1991:1.¹¹ According to the Federal Reserve's Survey on the Terms of Business Lending, the effective rate on short-term C&I loans was 9.93 percent in 1990:1, 9.77 percent in 1990:4, and 8.43 percent in 1991:1. The prime rate was stable at 10.0 percent during most of 1990 but fell to 9.0 percent in March 1991.¹² With respect to credit terms other than the interest rate, the Federal Reserve's Senior Loan Officer Opinion Survey on Bank Lending Practices reports a tightening of credit standards during 1990 that appears about normal for a recessionary period.¹³

Why Has Bank Lending Slowed?

Tables 1 and 2 are consistent with the popular view that bank lending has been weak, even for a recession, and that the sharpest contractions have taken place in the northeastern part of the country. Slow growth in lending could be the result of weak demand for credit, weak supply, or both. In this section we first briefly discuss credit demand, then consider some potential factors operating on the supply side (that is, within the banking sector itself).

Credit Demand and Borrowers' Balance Sheets

It is normal for the demand for credit to fall during a recession, reflecting declines in demand for new construction, producers' investment goods, and consumer durables. According to table 1, however, lending during the recent recession has been unusually weak. Thus a demand-

10. The prime rate has fallen in each of the past six recessions except 1973. The C&I loan rate, as reported by the Survey on the Terms of Business Lending, fell by 4.25 percent over the first three quarters of the 1980 recession and by 2.86 percent over the first three quarters of the 1981 recession, compared with a decline of 1.54 percent over the first three quarters of the latest recession (earlier data are not available).

11. National Federation of Independent Business (1991, p. 13).

12. *Federal Reserve Bulletin*, July 1991, table 1.33.

13. See Schreft and Owens (1991).

side explanation of the fall in lending must say why credit demand has behaved differently in this recession.

A possible answer focuses on the generally weak state of borrowers' balance sheets. As documented elsewhere, many borrowers significantly increased their leverage during the past decade,¹⁴ while falling prices for real estate and other assets have adversely affected potential borrowers' net worth. Further, the recession has put additional pressures on cash flows.¹⁵ For a given set of ultimate investment opportunities, borrowers who are less creditworthy (such as those who have higher leverage or lower collateral) will have a lower effective demand for external finance at given values of the safe real interest rate. Thus, it may be that in the recent downturn the normal recessionary decline in credit demand has been exacerbated by a greater-than-normal decline in the creditworthiness of potential borrowers.

Some support for the view that demand factors have been important comes from the fact that nonbank credit extensions also weakened substantially in the 1990 recession, a point we return to later in the paper. If a reduced *supply* of bank loans had caused the lending slowdown, we would have expected alternative forms of credit to grow more quickly as borrowers substitute away from banks.

For some questions, such as whether to regulate and reform the banking system, it is important to know whether the unusual slowdown in bank lending arises from problems with borrower creditworthiness or from problems in the banking system. However, as we discuss later, for purposes of macroeconomic stabilization the distinction is less important, as the effects on the macroeconomy are similar in either case.

We now turn to consider a number of factors operating on the supply side of the loan market, including the availability of loanable funds, securitization of bank assets, the zeal of bank examiners, and the possible shortage of bank equity capital. Although each factor may have played a role, we argue that a shortage of equity capital is the most important factor reducing loan supply.

14. Bernanke, Campbell, and Whited (1990) discuss the case of corporate borrowers.

15. According to Department of Commerce data cited by Rodrigues (1991), the ratio of interest payments to before-tax cash flow for nonfinancial corporations was nearly 23 percent at the end of 1990, the highest value of the decade. This ratio was less than 18 percent in 1980.

Availability of Loanable Funds

In order to lend, banks must have funds: the bank's capital, its checking and saving deposits, or its managed liabilities, like large certificates of deposit (CDs). According to the so-called credit view of monetary policy, which has had some revival in recent years, one channel through which changes in bank reserves (induced by open market operations) can affect real activity is by affecting the quantity of funds that banks have to lend.¹⁶ In the days when all bank liabilities faced reserve requirements, the ability of the Federal Reserve to affect the quantity of funds available to banks was limited only by the ability of the banking system to shift from high-reserve ratio to low-reserve ratio liabilities. Now that managed liabilities are exempt from reserve requirements, the credit view requires the stronger hypothesis that banks face an imperfectly elastic market demand for their managed liabilities, or alternatively that banks are unwilling to finance marginal loans entirely from managed liabilities.¹⁷

Many observers argue that tight monetary policy contributed to the onset of the 1990 recession, and some have also argued that monetary policy has not sufficiently eased since the recession began. Could a shortage of loanable funds, induced by tight monetary policy, be the reason that bank lending has slowed? An observation that counters this suggestion is that banks do not appear to have been very aggressive in seeking funds. For example, according to Flow of Funds data from the Federal Reserve, the ratio of large time deposits to total bank deposits in domestically chartered commercial banks fell from 0.192 in 1989:2, to 0.184 in 1990:2, to 0.164 in 1991:1. By contrast, during the 1973–75 and 1981–82 recessions, during which tight monetary policy arguably played an important role, this ratio jumped sharply.¹⁸ The interest rates on CDs

16. See Bernanke and Blinder (forthcoming) and Kashyap, Stein, and Wilcox (1991) for discussions of and evidence supporting the credit view. Romer and Romer (1990) present opposing evidence.

17. Banks may not wish to finance new loans entirely out of managed liabilities because requiring borrowers to hold deposit balances with the bank may reduce the bank's monitoring costs.

18. An alternative explanation for the fall in large time deposits, suggested to us by Ron Johnson, is that large brokered time deposits are now more likely to be broken up into

have also come down, even more so than other interest rates have. Secondary-market rates for six-month CDs exceeded six-month Treasury bill rates by 100 basis points or more in 1988 and 1989, but by only 71 basis points, on average, in 1990. As of April 1991, the differential was down to 45 basis points.¹⁹ Banks' reluctance to bid for funds—which indicates that a shortage of funds is not the constraining factor—has contributed to the slowdown in M2 growth over the past year, although a greater role in the slowdown has been played by the decline in thrift deposits. Overall, evidence is lacking for the view that a shortage of funds is a principal cause of the lending slowdown.

Securitization of Bank Loans

A second supply-side factor that may help explain the apparent slowdown in bank lending is the upward trend in the securitization of bank loans. Banks now regularly initiate loans with the intention of selling off all or part of their holdings to other investors. Loans that are securitized in this manner do not appear on banks' balance sheets and thus would not be counted in standard measures of bank loans (as in tables 1 and 2). Conceivably, the apparent slowdown in bank lending could be a mirage, the result of an innovation in the way that banks finance their lending.

In general, banks securitize three types of assets: consumer credit (like auto loans and credit card receivables), mortgages, and commercial and industrial loans. Although data on bank originations in each category are scanty, a few words can be said about each type of securitized asset.

First, securitized consumer credit remains a fairly small category, though it is growing rapidly. In March 1991, total outstanding of securitized consumer credit, including all originators, were nearly \$82 billion, up from nearly \$66 billion in the peak month of the cycle, July 1990.²⁰ By comparison, outstanding on-balance-sheet bank loans are about \$2 trillion and bank consumer loans are approaching \$400 billion. If all securitized consumer credit were attributed to banks (an overstatement),

smaller deposits to gain the benefit of deposit insurance. It is true that the ratio of total time deposits (large plus small) to total deposits in commercial banks has been essentially constant over the recent period.

19. *Federal Reserve Bulletin*, July 1991, table 1.35.

20. *Federal Reserve Bulletin*, July 1991, table 1.55.

the "consumer and other" category of bank loans in table 1 would show an annualized growth rate of about 1.3 percent between 1990:2 and 1991:1, rather than a decline of 1.7 percent. This difference is not insignificant, but it does not change the overall impression of slow growth in bank lending.

In contrast to securitized consumer credit, the value of outstanding securitized mortgages is very large (and growing rapidly). According to the Flow of Funds accounts, outstanding "pools" of securitized mortgages exceeded \$1 trillion in 1990, an amount that exceeds bank holdings of mortgages and that is more than a quarter of the entire mortgage market. These pools predominantly comprise government-guaranteed mortgages for 1-4-family residences. We do not know what portion of these mortgage pools were initiated by banks. However, as table 1 shows, bank holdings of 1-4-family mortgages grew more quickly than all other loan holdings during the recent recession, so there is little indication of restricted bank lending in the residential mortgage market in any case.

We should care about bank lending *per se*, as opposed to total credit extension, only if banks are somehow special in their ability to evaluate and monitor borrowers. The case for banks' specialness is difficult to make for consumer installment credit or residential mortgage lending, which are relatively standardized activities. By contrast, C&I lending epitomizes what theory would identify as a special function of banks. Thus, the degree to which banks are able to securitize C&I loans is of particular interest.

The available data on bank sales of C&I loans are summarized in table 3. The data are nominal, in billions of dollars, and only selected quarters are shown for the pre-1988 period. The data on loans bought and sold, developed by Gary Gorton and George Pennacchi and updated by us from the call reports, are flow measures of activity in the loan sales market: the first column gives the volume of loan sales reported by domestic commercial banks for the previous quarter (the figures are *not* annualized), and the second column gives reported loan purchases by domestic banks. The third column in the table measures the stock of outstanding loans sold, as obtained from the Federal Reserve's Senior Loan Officer Survey. Unlike the call reports, the survey does not cover all banks; those administering the surveys estimated that its coverage of loan sales was about 70 percent in 1985:4 and about 90 percent in 1989:2.

**Table 3. Commercial Bank Loan Sales, Loan Purchases, and Loans Outstanding,
Selected Quarters, 1983–91**

Billions of dollars

<i>Quarter</i>	<i>Loans sold</i>	<i>Loans purchased</i>	<i>Sold or participated loans outstanding</i>
1983:4	29.1
1984:4	50.2
1985:4	75.7	...	26.1
1986:4	111.8
1987:1	162.9	...	38.7
1987:4	198.0
1988:1	236.3	16.6	...
1988:2	248.4	16.2	53.1
1988:3	263.0	17.7	...
1988:4	286.8	19.3	...
1989:1	272.7	16.2	...
1989:2	276.5	18.2	72.2
1989:3	290.9	17.8	...
1989:4	258.7	19.9	...
1990:1	228.3	16.1	...
1990:2	190.2	15.9	80.0
1990:3	216.6	16.1	...
1990:4	165.0	17.1	...
1991:1	132.9	13.0	...
1991:2	59.5

Source: Sales and purchases data are from Gorton and Pennacchi (1991), with updates after 1990:3 by the authors, using the call reports. Loans sales and purchase data are quarterly flows. Sales reported are gross and exclude sales of mortgage loans, consumer loans, or loans subject to repurchase agreements or with recourse to seller. Data on outstandings are from the Federal Reserve's Senior Loan Officer Opinion Survey on Bank Lending Practices. The survey's estimated coverage of sold loans outstanding is 70 percent in 1985:4 and 90 percent in 1989:2.

We have not made the obvious adjustment to account for the increased coverage, but doing so would have no effect on the comments that follow.

Several points emerge from table 3. First, the data show that loans sold in each quarter may amount to three times the stock of outstandings or more. In part, this result reflects various double-counting problems that, despite the efforts of the Federal Reserve's staff, have probably not been entirely eliminated. But it is also true that many sold loans have short maturities.

Second, the call-report data in the first two columns show that loan

sales greatly exceeded loan purchases by banks, implying that most loans are sold outside the domestic commercial banking sector. Again, some skepticism about the data is warranted. For example, in contrast to the call-report numbers, the Senior Loan Officer Survey reports that between a third and a half of sold loans are purchased by domestic commercial banks. But a significant portion of loan sales do go outside the domestic banking system, primarily to foreign banks and institutional investors.

Third, like the other securitized assets, loan sales grew quickly in the 1980s. This growth is particularly evident in the activity measure of the first column.

Fourth, and most important for our purposes, both the flow and stock measures of loan sales activity show that loan sales peaked sometime between late 1989 and the beginning of the recession, then fell rather sharply. (Reduced interest in leveraged buyouts was one major reason for this decline.) Thus, treating loan sales as part of banks' C&I loan portfolios would probably make the measured decline in this type of lending larger rather than smaller.

Overall, it does not appear that the securitization of bank assets explains the slowdown in on-balance-sheet bank lending. It is true that securitized mortgages outstanding have grown quickly, but in any case there is not much reason to look for a credit crunch in the market for 1–4-family mortgages. Securitized consumer credit is growing but is still a relatively small component of total lending, while sold or participated C&I loans—which are the securitized assets bearing the closest connection to the “special” lending function of banks—have actually declined as much as, or more than, on-balance-sheet C&I lending over the recession.

Finally on the topic of securitization, one might ask why the trend toward securitization has occurred in the first place. There is no obvious fundamental reason why, in equilibrium, investors should prefer to hold securitized assets rather than the liabilities of the bank itself;²¹ indeed, considerations of moral hazard suggest that it is more efficient for the lender to own the loan, thereby internalizing the costs and benefits of the lender's screening and monitoring activities. The main impetus for

21. Diversification is a reason often cited, but similar effects should be attainable by banks' holding each other's liabilities.

securitization is probably the avoidance of regulatory costs: reserve requirements in an earlier period and regulatory capital requirements today. This observation further motivates our discussion below of banks' capital problems.

Overzealous Regulation

Some bankers have blamed the lending slowdown on overzealous regulation, particularly more aggressive examination practices that have allegedly forced banks to make excessive charges against current capital and to accept new credit risks more cautiously.

It seems likely that bank examiners have become tougher in response to the criticism that bank regulators have been excessively lax in the past, particularly in connection with the savings and loan debacle. What is less clear is whether in assessing capital charges against prospective loan losses examiners have begun to exceed the appropriate standard of actuarial fairness. Surprisingly, despite the interest in the subject, no studies appear to have compared examiners' charges against capital, in anticipation of loan losses, with the actual loan losses that were subsequently realized. Absent such studies, it is difficult to assess whether the examiners' procedures involve important biases.²² On the other hand, even if such studies were available, they would likely suffer from a "peso problem," given the systematic risks that affect the banking system. For example, if it were found (as it would be) that bank examiners consistently underestimated bank losses in the 1980s, would this prove that examination procedures are systematically lax? Probably not. Such a result would only confirm that examiners are no better than bankers at forecasting systematic problems like the LDC debt crisis or the sharp declines in real estate values in some regions of the United States.

These arguments suggest that it will be hard to determine whether regulators are "excessively" tough. However, suppose it is true that bank examiners have recently gone from being too lax to being actuarially fair, so that excessive toughness is not an issue. Such a change in standards would be desirable overall but would nevertheless have the effect of reducing the supply of bank loans. Could such a change in regulatory behavior be an important part of the story?

22. This point has been emphasized to us by Gary Gorton.

Table 4. Loan Losses for All FDIC-insured Commercial Banks, 1981–90

Billions of dollars, except ratios

Year	Provisions for losses	Net charge- offs	Provisions/ net charge- offs	Allowances for loan losses	Non- current loans	Allowances/ non- current loans
1981	5.1	3.8	1.35	11.4
1982	8.5	6.6	1.28	13.3	36.2	0.37
1983	10.8	8.5	1.27	15.5	40.9	0.38
1984	13.8	10.8	1.28	18.7	43.6	0.43
1985	17.7	13.2	1.34	23.2	43.9	0.53
1986	22.0	16.6	1.33	28.9	48.4	0.60
1987	37.5	16.4	2.29	49.7	63.3	0.79
1988	17.1	18.5	0.92	46.7	56.6	0.83
1989	31.0	22.9	1.36	53.7	62.1	0.87
1990	31.9	29.1	1.10	55.5	78.2	0.71

Source: Data are from Federal Deposit Insurance Corporation, *Statistics on Banking*, various issues. Recent data were obtained directly from the FDIC. Noncurrent loans refers to loans and leases 90 days or more past due plus loans and leases in nonaccrual status. Provisions and net charge-offs are annual flows; allowances and noncurrent loans are stocks measured as of December call dates.

A simple way to address this issue is to consider whether variables such as banks' allowances for loan losses and charges to capital have jumped discontinuously in the recent recession. Table 4 presents some relevant data for commercial banks insured by the Federal Deposit Insurance Corporation (FDIC) over the past decade. In the table, provisions for losses and net charge-offs are flow variables representing, respectively, the funds set aside by banks in anticipation of loan losses and the realization of those losses (determined in part by regulators). Allowances for loan losses, also known as loan-loss reserves, are the cumulated stock of provisions less net charge-offs.²³ The table also shows the end-of-year stock of noncurrent loans.

The table indicates that in the 1980s banks generally made loan-loss provisions that were about one-third larger than their net charge-offs, leading to a steady increase in allowances for loan losses both in absolute terms and relative to noncurrent loans. The outlying observation is 1987, during which banks significantly increased their loan-loss provisions and their stock of allowances; this buildup of reserves, taken in response to the LDC debt crisis and other long-term problems, was

23. The change in allowances does not exactly equal provisions less charge-offs in the table, presumably because of factors such as bank closings or reorganizations.

Table 5. The Growth of Commercial Bank Assets and Equity Capital, by Census Region, 1986-90

Percent, except ratios		New England	Mid- Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Financial measure and year										
Asset growth										
1986-88	12.5	1.7	4.4	0.9	10.4	5.8	-7.2	2.3	1.5	
1988-89	1.5	3.0	5.4	2.0	11.8	5.9	2.1	4.6	9.0	
1989-90	-11.0	1.1	3.1	8.0	4.4	5.4	0.0	6.4	6.5	
Equity capital growth										
1986-88	16.8	2.6	3.9	4.1	11.8	9.0	-13.2	2.5	5.1	
1988-89	-9.6	-4.6	7.1	4.2	12.8	5.7	0.0	-2.0	18.1	
1989-90	-15.8	5.0	6.3	9.2	5.4	3.5	18.6	15.9	12.3	
Capital-asset ratio										
1986	0.055	0.056	0.067	0.070	0.067	0.073	0.064	0.071	0.053	
1988	0.060	0.057	0.067	0.074	0.069	0.077	0.056	0.071	0.057	
1989	0.053	0.053	0.068	0.076	0.070	0.077	0.055	0.067	0.062	
1990	0.050	0.055	0.070	0.077	0.070	0.075	0.065	0.073	0.065	
Ratio of noncurrent to total assets										
1990	0.051	0.036	0.013	0.010	0.018	0.011	0.015	0.019	0.019	
Personal income growth										
1986-88	9.5	8.2	6.9	5.4	9.1	8.1	5.9	7.1	8.1	
1988-89	5.5	6.7	6.3	7.6	7.4	6.1	6.4	8.2	7.8	
1989-90	3.8	5.0	5.1	6.4	5.9	5.9	7.5	7.3	7.2	

Source: Assets and equity capital data are for December 31 of each year and are taken from the call reports. Personal income data are from the Survey of Current Business, April issues. Personal income growth is measured fourth quarter to fourth quarter. All data are nominal.

partly offset by lower provisions in 1988. Other than the 1987–88 period, however, there are no evident discontinuities in the table. In particular, neither provisions nor charge-offs in 1989–90 seem grossly out of line with previous trends, particularly given the increasing losses experienced by banks during that period. This conclusion also holds if we look at specific regions, such as New England.²⁴

Overall, we do not find any clear evidence for the idea that overzealous regulation has significantly reduced lending. Further, to the extent that bank examiners have become tougher, their primary motivations are surely the loan losses and the depletion of bank capital that have occurred in recent years. Thus, as with securitization, the fundamental factor seems to be the fall in bank capital. The next section of this paper looks more closely at the bank capital problem as a potential source of the reduction in loan supply.

The Capital Crunch

In recent testimony before Congress, Richard Syron argued that the credit crunch in New England was due to a shortage of bank capital—hence his term, capital crunch. According to Syron, a collapse in the New England real estate bubble forced banks in the region to write down loans, which depleted their equity capital (in the book value sense). In order to meet regulatory capital standards, including the new international standards being phased in during this period under the Basle Accord,²⁵ banks had to sell assets and scale back their lending. Syron went on to argue that this capital crunch contributed to the severity of the recession in New England.

Regional data bearing on Syron's argument are reported in table 5. The table shows annual growth rates of nominal bank assets and equity capital as well as the aggregate capital-to-asset ratio for each census region over the 1986–90 period. Also shown are the most recent ratios of nonperforming assets to total assets and the nominal growth rates of regional personal income (which can be compared with the nominal growth rates of bank assets and capital).

24. For example, in New England in 1990 net charge-offs equaled only 31 percent of noncurrent loans, less than the national ratio.

25. For a summary of the new capital standards, see Board of Governors (1989).

The numbers in table 5 are generally consistent with Syron's story. New England is indeed the most striking case. After expanding through 1988, bank capital in that region plummeted by a quarter during 1989–90. The proximate cause of the capital decline was losses on real estate and other loans. By the end of 1990, more than 5 percent of New England's bank assets were nonperforming (compared with less than 1 percent at the end of 1986).²⁶ Total assets contracted too, but not as much—New England's aggregate capital-asset ratio fell from 0.060 at the end of 1988 to 0.050 at the end of 1990. These data may be compared with the sharp contraction in lending in New England shown in table 2.

Two other interesting regions are the Mid-Atlantic (New York, New Jersey, and Pennsylvania) and the West South Central (Arkansas, Louisiana, Oklahoma, and Texas). The Mid-Atlantic has also suffered real estate problems, which are reflected in its high ratio of noncurrent assets to assets (0.036, second only to New England and well above the next highest region) and its low capital-asset ratio. Table 2 showed that this region also experienced a fall in total outstanding bank loans. The West South Central region experienced a sharp decline in bank capital following the oil price declines of the mid-1980s. However, this region's banks improved their capital positions substantially during 1990, despite the national recession. At the close of 1990, capital-asset ratios in all of the census regions except New England and the Mid-Atlantic seemed healthy.

Relation of Bank Capital to Bank Lending

Some finer evidence on the links between bank capital and bank lending during the recent recession can be obtained from state-level data. The call reports provide state-by-state data on bank loans, capital, and assets. A simple cross-sectional regression of loan growth on bank capital yielded

$$(1) \quad (\Delta L/L)_{1990-91} = -0.182 + 2.733 (K/A)_{1989}, \\ (0.067) \quad (0.946) \quad R^2 = 0.128$$

where $(\Delta L/L)_{1990-91}$ is the annualized percentage loan growth over the

26. The 5 percent figure overstates loss rates in that some nonperforming assets eventually perform and understates loss rates in that it excludes assets that are completely written off or disposed of.

first three quarters of the current recession, and $(K/A)_{1989}$ is the ratio of equity capital to bank assets at the end of 1989. There are 51 observations (50 states and the District of Columbia) and standard errors are in parentheses. Equation 1 can be rationalized by a model in which banks adjust lending in order to set their capital-asset ratio to a target level (which in equation 1 is absorbed in the constant).

Equation 1 is consistent with there being a causal link between low capital-asset ratios and low lending growth in the subsequent recession, as implied by the capital crunch story. However, an alternative interpretation of equation 1 is possible. Suppose that economic conditions are serially correlated, so that a state or region doing poorly today will likely do poorly tomorrow. Then the relationship between the capital-asset ratio and lending found in equation 1 might be spurious, since it may be that previous economic misfortunes in a state both caused bank capital to fall and implied slower subsequent economic growth (and thus slower lending). Under this interpretation, there is not necessarily any causal link between bank capital and bank lending.²⁷

A distinction between the capital crunch story and the alternative is that the capital crunch hypothesis implies that the most recent *level* of the capital-asset ratio is relevant to future lending, since it is the current level that must meet regulatory standards. Under the alternative interpretation, it is the recent *change* in the capital-asset ratio that should be relevant for predicting future conditions, since if recent times have been difficult the capital-asset ratio will have been falling, whereas if times have been good the capital-asset ratio will have been rising. This observation suggests inclusion of the recent change in the capital-asset ratio, together with the level of the capital-asset ratio, in the regression explaining lending.

$$(2) \quad (\Delta L/L)_{1990-91} = -0.199 + 3.005 (K/A)_{1989} - 0.846 \Delta(K/A)_{1986-89}, \\ (0.07) \quad (1.06) \quad (1.43) \\ \bar{R}^2 = 0.119,$$

27. Yet another alternative hypothesis consistent with equation 1 is that banks raise capital in anticipation of future lending, so that capital predicts lending but there is no causal relation. There are two arguments against this story. First, at least at the regional level, changes in bank capital in recent years seem to have been driven by rates of loan losses, the result of past rather than future economic activity. Second, we have allowed a two-quarter lag between when we measure the capital-asset ratio and when we measure lending, which should reduce any anticipatory effects that are present.

where $\Delta(K/A)_{1986-89}$ is the change in the ratio of equity capital to bank assets between the end of 1986 and the end of 1989.

When the change in the capital-asset ratio is added to the regression, we find that it enters with the wrong sign and is statistically insignificant, while the level of the capital-asset ratio retains its high level of significance. This result lends support to the capital crunch interpretation.

A still more stringent test of the capital crunch hypothesis can be obtained by adding a measure of contemporaneous economic activity to the right side of the lending regression. If the capital-asset ratio in each state predicts future lending only because it contains information about future economic activity in the state (the alternative interpretation of equation 1), then adding a direct measure of activity should absorb the predictive power of the capital-asset ratio in the regression. We chose state employment growth as the most comprehensive and promptly available measure of economic activity at the state level. Adding contemporaneous employment growth to equation 1 yields

$$(3) \quad (\Delta L/L)_{1990-91} = -0.161 + 2.627 (K/A)_{1989} + 0.755 (\Delta E/E)_{1990-91}, \\ (0.063) \quad (0.881) \quad (0.258) \\ \bar{R}^2 = 0.245,$$

where $(\Delta E/E)_{1990-91}$ is the annualized percentage employment growth in the state between 1990:2 and 1991:1.

Equation 3 shows that employment growth is strongly related to current loan growth, as expected, but also that employment growth does not weaken the relationship between the ratio of bank capital to bank assets and subsequent lending. In other words, given current economic activity, states with lower capital-asset ratios continue to exhibit lower rates of bank lending than states with higher capital-asset ratios.²⁸ This result is further evidence against the alternative hypothesis that the capital-asset ratio predicts lending only because it is informative about future economic activity.

Evidence from New Jersey

In addition to using state-level data to study the link between capital and lending, we also examine data from individual banks. For this paper

28. Similar results have been obtained across Federal Reserve districts for C&I lending by Ronald Johnson (1991) of the Federal Reserve Bank of New York. Johnson showed that the quality of real estate loans was also a determinant of banks' C&I lending.

we conducted a small case study of banks in the state of New Jersey. The principal advantage of looking at banks in a single state is that, presumably, banks within a given state (particularly a small state like New Jersey) face more or less the same general economic conditions. Thus differences in loan growth among banks are more likely to be attributable to factors specific to the individual banks, such as their capital-asset ratios.²⁹

From the call reports we first extracted data on all banks extant in New Jersey between the December 1989 and March 1991 call-report dates. Not all of these banks existed continuously over the whole period, either because they were started up during the period, because they were closed temporarily (missing one or more call reports) and then reorganized, or because they were acquired by other banks (in all cases acquirers were other New Jersey banks). The eight banks in the first two categories were all quite small (as of March 1991, their loans accounted for less than 0.5 percent of outstanding bank loans in the state) and were omitted from the study. To deal with mergers, we treated acquiring and acquired banks as a single bank, adding together their pre-merger data as if the merger had taken place before the beginning of the sample period.³⁰ After these adjustments, a sample of 111 banks remained. Of these, we classified 21 as large banks (assets of at least \$1 billion in December 1989) and 90 as small banks (assets of less than \$1 billion).

As with the state data, our interest is in examining the relationship between banks' capital-asset ratios before the recession (December 1989) and the growth in bank lending during the recession (between the June 1990 and March 1991 call reports). As a first step, we aggregated large and small banks into four categories each, based on December 1989 capital-asset ratios (the ranges were 0–6 percent, 6–8 percent, 8–10 percent, and greater than 10 percent). The subsequent lending behavior of each of these categories of banks, broken down by type of loan, is summarized in table 6.

The behavior of small banks, which in aggregate were responsible for a little more than one-sixth of total lending in the state, is described in the

29. Besides smallness, other advantages of using New Jersey specifically (besides the fact that it is the home state of one of the authors) include its economic diversity, its manageable number of banks, and the fact that it has suffered a fairly severe recession.

30. We thank Stavros Peristiani of the Federal Reserve Bank of New York for data on bank mergers in New Jersey. The acquisition of a small out-of-state bank by a New Jersey bank was simply ignored.

**Table 6. The Growth of Lending in New Jersey from 1990:2 to 1991:1,
by Size and Capitalization of Bank**

Percent, unless otherwise noted

Item	Capital-asset ratio in 1989:4			
	Less than 0.06	0.06–0.08	0.08–0.10	More than 0.10
<i>Small banks</i>				
Total loans	−2.8	0.6	2.9	4.3
Commercial-industrial loans	−9.7	−10.4	−7.5	−6.2
Real estate loans	−0.2	4.0	4.6	7.8
1–4-family	−6.5	3.7	4.3	7.3
Other	11.8	6.0	7.0	11.8
Consumer and other loans	−8.5	−0.7	13.5	6.3
<i>Financial position in 1989:4</i>				
Capital-asset ratio	0.053	0.069	0.087	0.144
Loans (billions of dollars)	3.8	4.4	1.0	0.8
<i>Large banks</i>				
Total loans	−8.8	−7.4	−5.8	...
Commercial-industrial loans	−11.9	−14.8	−10.2	...
Real estate loans	−1.8	3.6	1.9	...
1–4-family	−0.6	0.4	3.3	...
Other	−2.9	−7.0	0.4	...
Consumer and other loans	−22.1	−4.1	−15.7	...
<i>Financial position in 1989:4</i>				
Capital-asset ratio	0.054	0.066	0.086	...
Loans (billions of dollars)	21.9	23.8	1.8	0.0

Source: Data are from the call reports and have not been seasonally adjusted. Large banks are defined to be banks with at least \$1 billion in assets in December 1989. The sample includes 21 large banks and 90 small banks. See the text for more detailed discussion.

top half of the table. These data strongly support a positive association between capital-asset ratios and subsequent lending growth. Well-capitalized small banks expanded their lending more than poorly capitalized banks (or cut back on their lending by less) in most individual lending categories as well as in overall totals. An interesting exception is real estate lending, in which poorly capitalized banks made a sharp shift from 1–4-family mortgages to the “other” category (which includes commercial real estate and construction loans), despite the relatively more favorable treatment of 1–4-family mortgages under the new risk-based capital standards. This shift suggests “gambling” behavior on the part of the poorly capitalized banks.

Large banks in New Jersey were generally less well capitalized than small banks, and they contracted lending sharply relative to small

banks. Within the category of large banks, however, the relationship between capital-asset ratios and lending is observable but appears significantly weaker. Although better capitalized large banks contracted lending by less overall, the differences were not large. Also, for the large banks, the relationship between capital-asset ratios and lending within subcategories of loans is not always clear.

A bank-by-bank regression of lending growth during the recession against December 1989 capital-asset ratios, analogous to equation 1 for the state-by-state data, yields

$$(4) \quad (\Delta L/L)_{1990-91} = -0.104 + 2.024 (K/A)_{1989}. \quad R^2 = 0.100$$

(0.076) (0.556)

For small banks only, the same regression gave

$$(5) \quad (\Delta L/L)_{1990-91} = -0.187 + 2.483 (K/A)_{1989}. \quad R^2 = 0.646$$

(0.028) (0.198)

These regressions give quantitatively similar results to the state-by-state regression.³¹ The coefficient on the capital-asset ratio is highly significant in both equations, particularly in equation 5, in which it has a *t*-statistic exceeding 12. This equation also has a high adjusted R^2 .

Since New Jersey is divided between two Federal Reserve districts (the New York district in the north and the Philadelphia district in the south), the regressions above can also be run for northern and southern banks separately, further reducing the size of the banking market under consideration. The north-south results are quite similar to the overall results in equations 4 and 5.

In contrast to the results for all banks and for small banks only, the same regression run for large banks only yields a coefficient on the capital-asset ratio, which, although positive, is small and statistically insignificant. This finding accords with the impression given by table 6, that capital-asset ratios and lending were more strongly linked for small banks than for large banks. The result for large banks in New Jersey may be interpreted as evidence against the capital crunch hypothesis: it

31. Our discussant and other Brookings Panel members wondered if equations 4 and 5 might better be specified nonlinearly, since banks near the regulatory minimum capital-asset ratio might respond differently to changes in capital than banks far from the minimum. However, a scatter plot of the data did not suggest obvious departures from linearity.

might be argued that only large banks face a statewide lending market, while small banks are confined to lending within a very small area; if so, it may be that the positive results for small banks reflect a spurious correlation induced by the effect of recent economic performance in the small bank's locality on both capital-asset ratios and the bank's lending. On the other hand, the negative results for large banks could simply derive from the relatively small number of large banks in the sample and the lack of sample variation in large banks' capital-asset ratios.³²

Taken together, the evidence from the states and from New Jersey seems to provide support for the capital crunch hypothesis: declines in bank capital have contributed to the slowdown in lending. The magnitude of the effect is not insignificant but, based on the regression coefficients, does not seem extremely large either. For example, these regression coefficients suggest that the 1988–90 fall in capital in New England explains only 2 to 3 percentage points of that region's precipitous decline in lending.³³

Implications for the Economy and for Policy

If a capital shortage has reduced bank lending below its economically desirable level, this raises two potential concerns for public policy. First, if bank lending is cut back, bank-dependent borrowers, such as some small businesses, may find it more difficult or costly to obtain credit. This additional burden on bank-dependent borrowers will be viewed by many people as inequitable; it may also be inefficient for the economy in the long run if, for example, it is true that small businesses play an important role in developing product and process innovations. The abundance of anecdotal evidence suggests that at least some small

32. The capital-asset ratios for large banks were strongly clustered around 0.06. Since we know that at least a few of the large banks are controlled by multibank holding companies, it seems possible that the capital-asset ratios reported for these banks represent strategic accounting decisions by the parent company and do not necessarily indicate the amount of capital available to the bank.

33. This conclusion uses a model estimated in a cross section to make a time series prediction. Giuseppe Bertola has pointed out to us, correctly, that it would be preferable to specify an explicit time series model of the joint behavior of capital, assets, and lending. Another objection to our conclusion is that measurement error may bias the regression coefficient downward.

borrowers have suffered from the reduction in bank lending during the recent downturn. More systematic evidence is provided by Mark Gertler and Simon Gilchrist, who have found using the Quarterly Financial Reports that small manufacturing firms grew considerably more slowly than large firms after 1991:1.³⁴ However, in a recent survey, small businesses reported experiencing no significant credit crunch (except in real estate and in New England).³⁵

Second, in principle, reduced bank lending arising from a capital shortage could dampen economic activity, affecting both aggregate demand and aggregate supply. The potential aggregate supply effects are straightforward: by limiting access to working capital, reduced lending could force firms to shed workers and delay investment plans, reducing output in both the short and long run.

Effects of Reduced Bank Lending on Aggregate Demand

The aggregate demand effects of a reduction in bank lending have been worked out in a simple *IS-LM* context by Bernanke and Alan Blinder,³⁶ under the additional assumption (not made in the standard *IS-LM* model) that bank loans are imperfect substitutes for other types of assets (bonds and money). For the purposes of this paper, their result may be summarized thus: in an *IS-LM* diagram with the safe real interest rate on the vertical axis, an exogenous decline in bank lending (resulting, for example, from a shortage of equity capital) is a negative *IS* shock to the economy.³⁷ The intuition behind this conclusion is straightforward. Given the safe real interest rate, the net return to investment for a bank-dependent borrower depends not only on the marginal product of the proposed investment but also on the cost of financial intermediation (the difference between the safe interest rate and the effective cost of funds to the bank-dependent borrower). An exogenous decline in banks' willingness to lend either cuts off bank-dependent borrowers entirely or

34. Gertler and Gilchrist (1991).

35. National Federation of Independent Business (1991, p. 10).

36. Bernanke and Blinder (1988). Variants of their model are presented in Romer and Romer (1990) and Kashyap, Stein, and Wilcox (1991).

37. What we refer to as the *IS* curve, Bernanke and Blinder refer to as the *CC* curve, for "commodities and credit." The *CC* curve combines the conventional goods market equilibrium with an equilibrium condition for the loan market. Financial factors can affect the slope of the *IS-CC* curve as well, a point that we do not discuss here.

forces them to employ more costly forms of credit. In either case, the net return to investing, and thus the investment demand of bank-dependent borrowers, falls at any given safe real interest rate, so that the *IS* curve shifts down. Absent any other change, the downward *IS* shift is contractionary for the macroeconomy.

Two points can be usefully added to this brief analysis. First, the Bernanke-Blinder conclusions require only that bank loans be imperfect substitutes for other assets; credit rationing, in the sense used by Joseph Stiglitz and Andrew Weiss, is consistent with their story but is not essential.³⁸ Thus the notion that a macroeconomically significant credit crunch necessarily involves elements of credit rationing or a complete cutoff of some groups from credit is incorrect.

Second, the *IS*-curve effect suggested by the Bernanke-Blinder model occurs whenever the wedge between the safe real interest rate and the effective cost of credit to borrowers increases; it does not matter whether the increased cost of intermediation is due to problems in the banking sector or (alternatively) to weaknesses in borrowers' balance sheets that make it more difficult for them to obtain credit. Hence, although it is possible that the recent decline in lending has more to do with the financial problems of borrowers than those of banks, there is nothing benign about such a situation, and the macroeconomic implications are the same as those of a fall in lending caused by weaknesses in the banking system.

We have identified two areas of potential concern about the effects of a reduction in bank lending resulting from a shortage of capital: namely, the direct effects on bank-dependent borrowers and the indirect effects on the macroeconomy. Qualitatively, these effects will occur as long as bank loans are imperfect substitutes for other types of credit provision, which we certainly believe to be true for at least some types of lending. Quantitatively, however, the effect of a reduction in bank lending depends on several factors, including (1) the size of the reduction in the supply of bank loans; (2) the extent to which a given reduction in lending raises the cost of credit to borrowers, which in turn depends on the degree to which other forms of credit can be substituted for bank loans; (3) the share of output, employment, and investment accounted for by bank-dependent borrowers; and (4) the strength of the economy's response to a given change in aggregate demand.

38. Stiglitz and Weiss (1981).

It is well beyond what we can accomplish here to obtain accurate estimates of each of these factors. Instead we attempt to contribute two small pieces to the puzzle. First, we look briefly at the degree to which alternative forms of credit have been substituted for bank loans during the recession. We then make a direct attempt to measure the employment effect of the credit crunch using state data.

Substitutes for Bank Lending

If alternative forms of credit are easily substitutable with bank loans, so that reduced bank lending has relatively little effect on the cost of credit faced by borrowers, then a fall in the supply of bank loans will have only a small economic effect. If alternative forms of credit are not easily substitutable with bank loans, by contrast, the economic effect of a fall in bank lending—both directly on small borrowers and indirectly on the macroeconomy as a whole—may be significant.

To what degree have other forms of credit substituted for bank loans in the most recent recession, and how does the experience of the 1990 recession compare with that of previous ones? Data bearing on these questions are given in tables 7 and 8. Table 7 examines the behavior of commercial-industrial loans by domestically chartered commercial banks and five alternative sources of short- to medium-term business credit over the same six recessions shown in table 1. For each recession and each form of credit, the table shows both the value of outstandings (in billions of dollars) in the quarter before the cyclical peak and the annualized growth rate of that form of credit over the next three quarters. Table 8 presents similar data for mortgage lending for commercial properties, another intermediation-intensive form of credit. All data are from the Flow of Funds accounts.

One of the most interesting results in tables 7 and 8 relates to the recent behavior of nonfinancial commercial paper. In previous recessions, slowdowns in bank lending have been accompanied by spurts in commercial-paper issuance, a point that Anil Kashyap, Jeremy Stein, and David Wilcox have noted, and which they interpret as evidence for the view that most previous recessions have resulted from monetary policy-induced slowdowns in bank lending.³⁹ However, in the 1990 recession commercial paper outstanding actually declined. This decline is surpris-

39. Kashyap, Stein, and Wilcox (1991).

Table 7. Short- to Medium-Term Business Credit during Six Recessions, by Year of Cyclical Peak
 Levels in billions of dollars; growth in percent

Credit source	1960		1969		1973		1980		1981		1990	
	Initial level	Growth										
<i>Commercial and industrial loans</i>												
Domestic banks	39.8	3.6	106.7	10.1	160.9	19.2	276.4	4.8	357.1	16.8	677.3	-1.1
Foreign banks	6.3	42.4	21.5	12.1	26.2	13.3	117.3	11.6
Saving and loans	0.2	248.4	29.1	-31.0
Nonfinancial commercial paper	0.4	128.3	5.3	46.6	6.2	88.3	26.3	24.7	36.5	52.9	125.3	-6.0
Finance company business credit	7.1	22.4	20.2	15.1	31.3	12.5	84.3	2.9	95.0	5.9	274.3	8.2
Trade credit	19.2	9.9	32.6	10.0	45.9	21.3	135.2	2.1	146.0	-4.2	246.8	-7.4
Total	66.5	8.1	164.8	11.9	250.7	20.9	543.7	5.1	661.0	3.3	1470.0	-0.5

Source: Data are from the Flow of Funds and have been seasonally adjusted using X11. Initial levels refer to stocks outstanding in the quarter preceding the cyclical peak. The growth of dollar amounts outstanding is measured from the quarter preceding the cyclical peak to three quarters later.

Table 8. Mortgage Lending for Commercial Properties during Six Recessions, by Year of Cyclical Peak
 Levels in billions of dollars; growth in percent

<i>Mortgage holder</i>	1960		1969		1973		1980		1981		1990	
	<i>Initial level</i>	<i>Growth level</i>	<i>Initial level</i>	<i>Growth level</i>	<i>Initial level</i>	<i>Growth level</i>	<i>Initial level</i>	<i>Growth</i>	<i>Initial level</i>	<i>Growth</i>	<i>Initial level</i>	<i>Growth</i>
Domestic commercial banks	6.4	8.5	21.9	3.4	37.0	18.4	75.9	6.0	85.5	12.1	331.0	3.2
Savings institutions	4.6	15.2	17.5	6.4	33.0	12.3	59.8	1.5	62.4	3.0	120.3	-21.1
Life insurance companies	9.3	9.9	23.6	9.4	34.8	15.2	70.6	14.6	84.6	7.9	213.7	-1.1
Other	10.7	9.2	13.6	10.6	22.2	8.2	29.6	8.7	34.0	7.9	89.7	20.2
Total	30.9	10.1	76.5	7.2	127.1	14.2	235.8	7.7	266.6	8.1	754.8	-0.1

Source: Data are from the Flow of Funds and have been seasonally adjusted using X11. Initial levels refer to stocks outstanding in the quarter preceding the cyclical peak. The growth of dollar amounts outstanding is measured from the quarter preceding the cyclical peak to three quarters later. "Other" mortgage sources include households, nonfarm noncorporate business, governments (including the Resolution Trust Corporation), private pension funds, other insurance companies, finance companies, and REITs.

ing if one believes that a credit crunch was an important force in the recession, since the expectation is that, in a credit crunch, firms that are able to substitute commercial paper issuance for bank loans would do so.

More generally, the impression from tables 7 and 8 is that a large upsurge in alternatives to bank credit did not occur during the 1990 recession; if anything, there has been less switching to alternative forms of credit in the current recession. Indeed, in the recent recession, the percentage growth of total short- to medium-term business credit has been about the same as bank C&I lending (table 7), and the growth of total commercial mortgages outstanding has been lower than the growth in commercial mortgages held by banks (table 8).⁴⁰ More broadly, the Flow of Funds' measure of private domestic nonfinancial credit grew at an annualized rate of 3.3 percent between 1990:2 and 1991:1, compared with 1.7 percent for total bank loans (see table 1).

What do we make of the result that during the 1990 recession alternatives to bank lending did not grow any more quickly than bank lending itself? The most likely explanation is that the recession brought with it an overall decline in credit demand (perhaps exacerbated by borrowers' weak balance sheets) that affected alternatives to bank lending as well as bank loans and that overwhelmed changes in the supply of bank loans.

Additional evidence for the view that demand factors were dominant during the recession comes from comparing the recent recession with the previous year (1989:2–1990:2). The behavior of alternatives to bank lending in the earlier period gives a much stronger impression of a credit crunch in the banking sector. In the category of short- to medium-term business credit, domestic bank C&I loans grew only 2.8 percent in the prerecession period, while foreign bank C&I loans grew 9.7 percent, finance company business credit grew 9.7 percent, and commercial paper outstanding grew 16.7 percent.⁴¹ Similarly, while bank holdings of mortgages for commercial properties grew only 2.8 percent in the year before the recession, life insurance companies increased their holdings by 12.9 percent.⁴² These data are consistent with the idea that a credit crunch in

40. Perhaps the most striking feature of the 1990 column in table 8 is the large transfer of commercial mortgages from savings institutions to the "other" category. This shift largely reflects the ongoing resolution of thrift failures.

41. Compare with table 7. Trade credit grew 3.9 percent in the earlier period and C&I loans by savings institutions fell 15.0 percent.

42. Compare with table 8. Mortgages held by savings institutions fell 14.2 percent and the "other" category rose by 23.0 percent.

banking was in progress in the prerecession period and even during the recession period, but they are inconsistent with the view that a reduced supply of bank loans was a dominant factor in the recession.⁴³

Capital-Asset Ratios and Employment Growth

Earlier in this paper we showed a statistically significant link across states between bank capital-asset ratios and subsequent lending growth. A potentially interesting exercise is to extend this analysis to see if changes in state lending growth induced by variation in capital-asset ratios have significant predictive power for economic activity in the state. For this exercise, we used as the dependent variable each state's actual employment growth between 1990:2 and 1991:1, $\Delta E/E_{1990-91}$, less the employment change that would have been predicted during the recession on the basis of the state's industrial composition, $\Delta \hat{E}/\hat{E}_{1990-91}$.⁴⁴ The idea was to see how much of the unexplained or idiosyncratic variation in each state's employment can be explained by banking factors. The results described below apply equally to actual employment change, however.

We first verified that the growth in actual less predicted employment in each state is related to contemporaneous growth in bank lending in the state. A cross-sectional ordinary least squares regression of residual employment growth on growth in lending gives⁴⁵

$$(6) \quad [(\Delta E/E)_{1990-91} - (\Delta \hat{E}/\hat{E})_{1990-91}] = -0.0016 + 0.207 (\Delta L/L)_{1990-91}, \\ (0.0049) \quad (0.061) \\ \bar{R}^2 = 0.174,$$

where $[(\Delta E/E)_{1990-91} - (\Delta \hat{E}/\hat{E})_{1990-91}]$ is actual less predicted employment growth in the state between 1990:2 and 1991:1, annualized.

43. An alternative view is that the credit crunch spread from the banking sector in 1989 to all other suppliers of credit in 1990. Some alternative lenders, such as life insurance companies, have indeed run into problems recently, but it seems excessively coincidental that all sources of credit would dry up at about the same time.

44. To construct the predicted employment change, we calculated what the state's employment growth would have been if its employment in each one-digit SIC industry had grown by the same percentage as national employment in that industry between June 1990 and March 1991.

45. Because a constant term is included in the cross-sectional regression, identical results would be obtained if lending growth were measured in real terms or relative to the national mean.

Not surprisingly, there is a statistically significant relationship across states between changes in employment and bank lending. This relationship reflects the link between economic growth and credit demand as well as the link between growth and credit supply. Earlier, we found evidence consistent with the view that shocks to bank capital-asset ratios were a source of shocks to loan supply in the recent recession. To isolate the effects of changes in loan supply on economic activity, we rerun equation 6 using the bank capital-asset ratio in each state at the end of 1989 as an instrument for bank loan growth. The instrumental variables result is⁴⁶

$$(7) \quad [(\Delta E/E)_{1990-91} - (\Delta \hat{E}/\hat{E})_{1990-91}] = -0.0002 + 0.062 (\Delta L/L)_{1990-91}, \\ (0.0036) \quad (0.169) \\ \bar{R}^2 = 0.078.$$

The econometric exogeneity of the capital-asset ratio in equation 7 can be debated, though there is little need to—the IV regression shows no significant relationship between lending and the unpredicted part of employment growth. It might be that this regression is too crude to measure the economic effects of the credit crunch (in principle, many other factors could be controlled for), but taken at face value this simple exercise suggests that the credit crunch has not been a major cause of the recession.⁴⁷

What is our overall assessment of the macroeconomic effect of the credit crunch in the banking sector? We cannot be certain, but the pieces of evidence that we have turned up are not consistent with a large role for the credit crunch. First, as the results just reported show, although ratios of bank capital to bank assets did have an effect on lending, bank capital and the severity of recession across states are only weakly correlated. Second, although the relationship between bank capital and lending is highly significant, it is modest in size. Third, the behavior of over-

46. An outlier check found a large influence from Alaska, which had a sharp decline in employment despite a high ratio of bank capital to assets. Exclusion of Alaska yields a coefficient on loan growth of 0.179, with a *t*-statistic of 1.27.

47. In theory, a reason that we might find no link by state between lending and employment is that borrowers are free to borrow from banks outside the state. However, Elliehausen and Wolken (1990) found that of small and medium-sized businesses with a credit relationship 91.5 percent had a local relationship (within 30 miles) and 75.8 percent had exclusively a local relationship.

all credit aggregates suggests that credit demand factors have contributed in an important way to the slowdown in bank lending. Finally, we note that there are important sectors of the economy, such as the housing and auto sectors, in which weakness probably cannot be blamed on the credit crunch.

Whether the credit crunch was important in the recession is to some extent academic, however. As the next section discusses, whether the recession resulted from a credit crunch or other causes does not bear strongly on the ability of monetary and other stabilization policies to offset the downturn.

Implications for Monetary Policy

Federal Reserve officials have shown a great deal of concern over the past year about the possibility of a credit crunch, perhaps because of their dual role as monetary authorities and banking regulators. Our evidence, admittedly sparse, is that the credit crunch—although not a myth—has not been a major cause of the recession. Nevertheless, a few points about the implications for monetary policy of credit crunches—present or future—should be made.

First, some have worried that an unwillingness by banks to lend can render monetary policy impotent. This concern is misplaced unless a traditional liquidity trap (a perfectly elastic demand for money at the prevailing interest rate) also exists. Even if banks will not lend, an increase in reserves will raise the supply of deposits, lower open market interest rates (through the usual liquidity effect), and stimulate interest-sensitive spending. However, it is true that if banks refuse to lend (that is, if banks accommodate deposit expansion only by holding more securities), the “credit channel” of monetary influence will be shut down, and the real effects of a given monetary expansion will be smaller. In terms of the Bernanke-Blinder model, under normal conditions a monetary expansion raises aggregate demand both by shifting the *LM* curve and by shifting the *IS* curve (by stimulating bank lending); if banks refuse to lend, only the traditional *LM*-curve mechanism is operative.

Second, although a credit crunch will not render monetary policy impotent, it may make it more difficult to use conventional indicators to judge how tight or easy current policy is. In general, during a credit crunch both monetary aggregates and open market interest rates will be

lower than normal for a given state of the economy, thereby sending conflicting signals. Monetary aggregates may be lower than normal (as in the recent slowdown of M2) because financial intermediaries will be making less use of managed liabilities, which are components of the monetary aggregates, to raise funds. Interest rates may be lower than normal because, as discussed earlier, a credit crunch is a negative *IS* shock. Because problems in the financial-intermediation sector reduce the effective demand for saving, interest rates fall. It is arguable that both of these problems with monetary indicators have been observed during the recent recession.

Implications for Banking Reform

As we write, extensive banking reforms are being debated in Congress. What does the recent crunch mean for these reforms?

One of the striking features of recent banking problems is their strong regional dimension. The clear implication for the banking reform process is that it is important to remove the remaining barriers to interstate and interregional banking and to encourage banks to diversify their assets nationally (or internationally).

Reformers may also want to consider whether the bank examination process can be improved. For example, examiners' implicit predictions of bank losses should be subject to evaluation after the fact, with incentives provided for accuracy. Market data—on the prices received in loan sales, for example—might also help examiners evaluate bank capital positions.

The most difficult question raised by recent experience in banking is whether extraordinary measures (such as allowing nonfinancial firms to acquire banks) are needed in order to recapitalize the weakest portions of the banking system. There are really two issues here. First, is the market for bank equity sufficiently imperfect that intervention is desirable? The evidence we have presented for a capital crunch is also evidence for important imperfections in the market for bank equity, since the idea of a capital crunch makes sense only if for some reason banks with good lending opportunities are unable to attract capital in a reasonable time and on reasonable terms. Thus it is too facile to assert that "the market" will necessarily take care of banks' capital problems. On the other hand, clearly new capital does flow into banking: according to the Board of

Governors of the Federal Reserve, new equity issues by banks totaled \$3.2 billion in 1989, \$2.0 billion in 1990, and \$4.1 billion through the first nine months of 1991;⁴⁸ and there are many (mostly small) bank startups. Whether bank capital markets are "sufficiently" imperfect to warrant intervention is an extremely tough call; we do not pretend to know the answer.

The second issue bearing on the recapitalization debate is the optimal size of the banking system. It is certainly conceivable that the "capital shortage" in banking is a signal from the market that the U.S. commercial banking system has excess capacity.⁴⁹ If so, then the question of how to achieve recapitalization is moot. However, today's banking system operates with so many restrictions and subsidies that judging its optimal size is impossible. Reforms that further rationalize the banking industry will be invaluable in clarifying whether the U.S. banking system needs to grow or shrink in the future.

48. Two billion dollars of bank equity issues in 1990 is not a huge number nor is it insignificant, being equal to about one-sixth the value of nonfinancial corporate equity issues in 1990 (\$12.3 billion, according to the Federal Reserve) and to about 1 percent of the total book value of bank capital outstanding.

49. Boyd and Graham (1991) argue that despite the recent trend to consolidation the banking system does not necessarily have excess capacity.

Comments and Discussion

Benjamin M. Friedman: Traditionally, most economists have regarded the fact that banks hold capital as at best a macroeconomic irrelevance and at worst a pedagogical inconvenience. The presence of a capital account, rendering bank assets not equal to bank liabilities, adds unwelcome complexity to the otherwise analytically neat story of deposit and credit creation in a fractional reserve system. In more simple-minded representations, bank capital is one reason why the so-called “money multiplier” is not really a fixed multiplier. The consequent incentives to ignore the whole messy business have prevailed far more often than not.

By contrast, when a banking system involves minimum capital *requirements*, along with the more familiar minimum reserve requirements, it is at least possible that the effective limitation on the expansion of deposits and credit may be capital, not reserves. In this case, it is necessary to write the familiar balance-sheet relationships subject to *two* inequality constraints. Only by accident would both always be binding, or not, exactly in concert. And only by presumption would the reserve constraint always be binding and the capital constraint not. Further, if what binds is the capital constraint, then issues of distribution become important in ways that have no ready analog under the more familiar reserves story. There is no equivalent of a federal funds market to enable banks with excess capital to make transfers to banks with insufficient capital, so that the systemwide total is all that matters.

Much of the discussion of the recent business downturn in the United States has focused on the likelihood that during this period the binding constraint on banks’ ability to lend and thereby to create money has in fact been the capital constraint, and this idea is the focus of Ben Ber-

nanke and Cara Lown's useful and interesting paper. Bernanke and Lown do a fine job of explaining the basic principles involved and relating fluctuations in banks' capital to the experience of losses on their portfolios of what bankers and their regulators euphemistically call "nonperforming" loans.

All this is interesting enough at a conceptual level, but the pressing question is whether insufficient capital has in fact limited U.S. banks' lending to an extent that has mattered in a macroeconomic context. The chief contribution of the Bernanke-Lown paper is to show evidence, admittedly mixed but nonetheless suggestive, that capital constraints have indeed led to unwillingness to lend, and that the resulting sluggish credit expansion has either corresponded to or anticipated the weakness of real economic activity. The authors' state-by-state regressions relating loan expansion during the recession to either levels or changes in bank capital in the immediately prior period are especially instructive in this regard. I also found quite interesting their analysis based on individual bank data.

Indeed, given this empirical showing, what is perhaps most surprising about Bernanke and Lown's paper is how little they claim for their results. For example, after finding that a simple one-variable regression of loan growth on lagged capital ratios can explain almost half of the 15 percentage point difference in loan expansion between the fastest growing region (East South Central) and the slowest (New England), they describe this effect as "of small to medium size." Given the obvious measurement problems in this context, and the consequent presumed downward bias of estimated regression coefficients, just how much of this phenomenon would they have demanded that their simple regression explain before considering the estimated effect to be of major proportion? Much of the rest of the paper, including Bernanke and Lown's summary evaluation of their results at the beginning and the end of the paper, has a similar flavor. By contrast, against the background of the long history of researchers who have tried to find evidence of such effects on either bank behavior or economic activity, and have failed to do so, what impressed me about the empirical work presented in this paper is not how little evidence of such effects Bernanke and Lown find but how much.

Beyond this difference in interpretation of the quantitative importance of the empirical results, several conceptual aspects of Bernanke

and Lown's paper also bear comment. To begin at the beginning, what is a "credit crunch"? Bernanke and Lown define a credit crunch as "a significant leftward shift in the supply curve for bank loans, holding constant both the safe real interest rate and the quality of potential borrowers." But is that really all there is to it? Does a "credit crunch" involve no element at all of "credit rationing"? Bernanke and Lown clearly state in their paper that while their story is in no way inconsistent with credit rationing (in the standard sense of Stiglitz and Weiss), such phenomena are not a necessary ingredient of what they mean by a credit crunch.

I doubt, however, that a simple leftward shift of loan supply in a perfectly clearing market environment—so that all would-be borrowers could still obtain credit, albeit at a higher market-clearing interest rate—would qualify as a credit crunch in the mind of the typical market participant or monetary policymaker. Surely it is no coincidence that the notion of a credit crunch has typically surfaced at times when some factor outside the usual story of tight monetary policy in a fractional reserve banking system—binding Regulation Q ceilings and consequent disintermediation in 1966, 1970, and 1974, or capital constraints in 1990—has posed an impediment to the ordinary functioning of the nation's credit mechanism. It is also no coincidence that the widespread anecdotal evidence to which Bernanke and Lown refer includes many examples of borrowers who have been asked to wind up their loans despite having kept their accounts fully current, or new projects that U.S. lenders have simply declined to finance at any interest rate. In terms of the Bernanke-Blinder model to which Bernanke and Lown refer, not only is the *IS* channel of influence not active, as under what *they* call a credit crunch, but if credit rationing is also involved, then part of the *LM*-curve effect is not operative either.

A second and more important point on which I differ with Bernanke and Lown concerns the implications of a credit crunch for monetary policy. They claim that whether the recession resulted from a credit crunch or other causes does not strongly influence the ability of monetary and other stabilization policies to offset the downturn. Unless they mean by "monetary policy" something other than the standard combination of open market operations and manipulation of reserve requirements and the discount rate, how can that be so? If banks really cannot create money and credit because the *capital* restraint is binding, what effects follow from an increase in the quantity of bank *reserves*? I suppose a lit-

eral interpretation of Bernanke and Lown's definition of a credit crunch as merely a leftward shift of the loan supply curve implies that saying there has been a credit crunch leaves open the question of whether that shift has resulted from a binding capital constraint or a binding reserve constraint, but under this interpretation it would then be difficult to understand the focus of their paper's empirical work on changes in bank capital ratios rather than on Federal Reserve open market operations.

A third issue that bears attention is the role played in the latest economic downturn by nonbank lenders. Bernanke and Lown correctly point out that imperfect substitutability of bank and nonbank credit is central to most interpretations of what a credit crunch is all about (indeed, for that matter, to most credit-oriented theories of how monetary policy affects the nonfinancial economy). As they rightly argue, one would then expect that, all other things equal, a limitation on the ability or willingness of *banks* to lend should be accompanied by an *increase* in credit extensions by other lenders. They therefore interpret the absence of a growth spurt in nonbank credit as evidence that much of the decline in bank loans in this episode has reflected a decline in credit *demand*, rather than a change in credit supply from banks.

The problem with this argument stems, once again, from the distinction between a credit crunch as most observers conventionally understand it and a mere leftward shift of bank loan supply resulting from, for example, tight monetary policy. When the Federal Reserve restricts the supply of bank reserves, that action causes *banks'* loan supply to shift leftward but does not affect credit supply from other lenders, and so if credit demand is unchanged then, just as Bernanke and Lown suggest, bank lending will contract (or grow less slowly) while lending by other institutions and from the open market will expand. By contrast, the credit crunch of 1990 resulted from the impact on bank balance sheets of the credit excesses of the 1980s, and just as banks were not alone in participating in those excesses, they are not alone in suffering the consequences. The same problems that have impaired some banks' capital have also shrunk the "surpluses" of insurance companies, have caused profitability problems for finance companies, and have led to the collapse of the junk-bond market. In short, all other things have not been equal, and Bernanke and Lown's inference that credit *demand* has been weak does not follow from the pervasiveness of the slowdown in credit extensions among bank and nonbank lenders.

Finally, especially in light of what I took to be the quite impressive evidence that Bernanke and Lown found in favor of a credit crunch, in the sense of limitations on bank lending resulting from insufficiency of bank capital, I was sorry that they did not investigate in greater depth the possibility of what they call "overzealous regulation." Anecdotal information about individual banks' examinations during this period is replete with stories of reclassification of outstanding loans on the basis of no change in the current status of the specific transactions in question. Similarly, bankers have widely reported a new attitude on the examiners' part toward the classification of potential new credits. None of this is to say, of course, that the responsible regulators have done any more than bring the bookkeeping of the 1990s into line with the reality left by the poor credit decisions of the 1980s. But in either case it would be nice to know.

General Discussion

Members of the panel presented a variety of views on the effectiveness of monetary policy during the current recession. William Nordhaus agreed with the authors that the Federal Reserve could offset the effect of capital constraints if it recognized the importance of that shock. Joseph Stiglitz observed that to the extent that monetary policy had not brought down loan rates, even though it had lowered Treasury bill rates, it had not been expansionary. This disparity could reflect a lack of awareness by the Federal Reserve that a given Treasury bill rate corresponds to a tighter policy when capital requirements are binding, or it could reflect an inability to lower loan rates by increasing unborrowed reserves. Nordhaus and William Brainard preferred to regard the binding capital requirements on banks as a shift in the *LM* curve rather than the *IS* curve since, in the first instance, such a shift corresponds to a change in the demands for and supplies of financial assets. Because a shift in the capital constraint affects the relationship between open market interest rates and the terms on which firms can finance investment, the interest rate in the traditional *LM* curve should be interpreted as the cost of capital or Tobin's *q*. Brainard noted that in this model, tightened capital requirements not only shift the *LM* curve up and to the left (a higher required rate on capital for a given level of output) but also make

the curve steeper. Expansionary policy is needed just to offset the contractionary effect of tightened capital requirements; still more expansionary policy is needed to stimulate the desired economic recovery.

Richard Cooper remarked that one important channel of monetary policy does not require an expansion of bank lending: a decrease in the Treasury bill rate stimulates economic activity by causing a depreciation of the dollar. Martin Baily questioned the importance of tightened capital requirements and a credit crunch during a recession. In his view, the credit crunch could have been important in the period preceding the current recession, having helped the economy to turn down; the recession itself, however, is better characterized by a decline in the demand for loans that keeps the capital constraint from binding. The credit crunch should manifest itself again during the recovery. Ben Bernanke noted that all other forms of credit were dropping about the same amount as bank loans during the recession, consistent with Baily's view. A year before the cyclical peak, alternatives to bank credit were growing quickly while bank credit was stagnating.

Several panelists raised questions about the empirical analysis in the paper. Cooper wondered how important the substantial tightening of bank supervision has been. Some of the apparent decline in bank capital ratios is simply a recognition of nonperforming assets. The current consequences of this component of the decline are presumably less severe than the earlier deterioration of economic value that is now belatedly being recognized. Joseph Stiglitz observed that much of the paper tries to distinguish between a supply and a demand shift, without trying to fit separate demand and supply functions. Christopher Sims noted that the paper is mostly written as if a capital shortage originated outside the banking system and generated effects in it. But he doubted that banks have no control over the capital-asset ratio. Adding the growth of the capital-asset ratio to the regression does not necessarily get rid of the endogeneity problem; both low capital-asset ratios and slow loan growth might be caused by poor economic performance. In the same spirit Brainard suggested that the instrumental variables method was not a completely satisfactory way of dealing with endogeneity in the cross section. Much of the variation among states or banks is likely to be relatively permanent, so that using lagged variables will not eliminate the endogeneity problem. Sims also suggested that the authors should look at what determines the flow of deposits into these financial institutions.

If depositors care about the capital-asset ratios of banks, then banks with low capital-asset ratios might have lower deposit inflows, which in turn means less lending.

Brainard observed that one might expect the effects of capital requirements to be highly nonlinear, with changes in capital relatively unimportant for sound banks but very important for banks near insolvency. Allen Frankel thought this might explain why the coefficient on the capital-asset ratio in the linear equation does not do a good job of explaining the New England experience. The typical bank in New England is much closer than the average bank to a regulatory problem.

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