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8 Historical Perspectives on the Monetary Transmission Mechanism

Jeffrey A. Miron, Christina D. Romer, and David N. Weil

In recent years, macroeconomists have devoted renewed attention to understanding the monetary transmission mechanism. According to the standard "money" view, an open-market sale of bonds by the central bank forces up interest rates because bond holders must be compensated with higher interest income for holding a less liquid combination of assets. Although textbook presentations of this view often assume that banks are involved in the transmission of the open-market sale, the presence of banks, and particularly bank loans, is in no way necessary.

The alternative "lending" view of the monetary transmission mechanism assumes that bank loans are a special form of external finance. Banks do not regard loans and bonds as perfect substitutes on the asset side of their balance sheets, and firms do not regard bank loans as equivalent to other sources of funds on the liability side of their balance sheets. Since banks faced with a loss of reserves prefer to reduce the interest-bearing component of their portfolio partly via loans and partly via securities, and since firms do not view securities as perfect substitutes for bank loans, the interest rate on loans must increase relative to that on securities. This increase in the "spread" reflects an additional contractionary effect of restrictive monetary policy that is absent in the pure money view of the transmission mechanism.

This paper provides historical perspective on the monetary transmission

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mechanism. Several recent papers attempt to determine whether the special nature of bank lending impinges on the monetary transmission mechanism (Bernanke 1983; Calomiris and Hubbard 1989; Bordo, Rappaport, and Schwartz 1992; Kashyap, Stein, and Wilcox 1993; Romer and Romer 1990; Hall and Thomson 1993), and a number of these examine the transmission mechanism in particular historical episodes (Calomiris and Hubbard 1989; Bordo, Rappaport, and Schwartz 1992; Bernanke 1983). None of these papers, however, explores changes in the nature of the transmission mechanism over time. In this paper we directly examine the changes in financial market institutions over the last one hundred years, and we show how these changes can be used to assess the importance of the lending channel of monetary transmission.

Section 8.1 presents the basic analytical framework. We use the Bernanke and Blinder (1988) model of the monetary transmission mechanism to show under what conditions the response of the economy to a monetary contraction should be especially sensitive to the presence of a lending channel. Each of the conditions we identify can be examined in the data over long historical periods. We can therefore determine whether the lending channel appears to be important in periods when theory combined with evidence on the financial structure suggests it should be important.

Section 8.2 examines empirically those features of bank and firm balance sheets that our theoretical discussion suggests are most relevant to the quantitative importance of the lending channel. In particular we document how such factors as the structure of reserve requirements and the composition of external firm finance have changed over time. Our analysis shows that the lending channel should have played a much greater role in the pre-1929 era than during the early part of the post–World War II period.

In section 8.3 we present new evidence on the lending channel by determining whether measures of the importance of bank lending behave differently across periods characterized by differences in those factors that our theoretical discussion suggests determine the strength of the lending channel. The measures we consider are the spread between the interest rate on bank loans and the interest rate on commercial paper, the ratio of bank loans to other sources of credit (the "mix"), and the relation between bank loans and output after monetary contractions and in more ordinary times. We find little evidence that these measures of the importance of the lending channel change across time periods in the ways implied by changes in financial structure and institutions.

Section 8.4 concludes the paper. The evidence we present can be interpreted in at least two ways. On the one hand, it may indicate that traditional indicators of the importance of the lending channel are not useful. On the other hand, it may indicate that the lending channel has not been particularly important in any sample period. Our analysis does not rule decisively on which of these two explanations is correct. However, since the most obvious indicators of the lending channel fail to provide consistent evidence of its importance, we be-

lieve proponents of this view are likely to have a difficult time providing a compelling case for its empirical relevance.

8.1 Framework for Analysis

We begin by laying out a model of the monetary transmission mechanism that considers the relative importance of different financing channels. The model is a modified version of the one presented in Bernanke and Blinder (1988). We use the model to highlight the role of various institutional features in determining the importance of the lending channel.

8.1.1 The Model

We begin by considering the more familiar model in which loans play no role. The only assets are money, m, and bonds, b. Our notation is that small letters signify quantities, capital letters signify functions, subscripts signify derivatives, and superscripts signify subsets of quantities (for example, b is bonds while b^b is bonds held by banks). Since the price level and the inflation rate are held fixed throughout, we normalize them to 1 and 0, respectively. All variables are therefore in real terms.

The demand for money depends on output, y, and the bond interest rate, i,

$$m = D(i,y). \tag{1}$$

As in the standard *IS* curve, output depends negatively on the interest rate,

$$y = Y(i). \tag{2}$$

Differentiating (1) and (2) yields

$$\frac{dy}{dm} = \frac{Y_i}{D_i + D_y Y_i}. \tag{3}$$

Equation (3) shows the effect of money on output when only the money channel is operational.

Theories of the lending channel begin by recognizing the existence of another asset, loans, l. The banking sector's balance sheet is then

$$m = b^b + l + r, \tag{4}$$

where r is reserves and b^b is net holdings of bonds by banks. Note that we treat time deposits and certificates of deposit (CDs) as bank-issued bonds, which are subtracted from bank holdings of bonds in calculating b^b. All money is held in the form of deposits, which are liabilities of banks. Nonbank holdings of nominally denominated assets, w, are given by

$$w = b^p + m - l, \tag{5}$$

where b^p is net bond holdings of the nonbank public. Note that we include both firms and households in the nonbank sector. This formulation assumes that in

the short run the stock of nominally denominated assets held by the nonbank sector is fixed.

Introducing a third asset requires introducing a second interest rate. Rather than including the interest rate on loans directly, we introduce the difference between the loan interest rate and the bond interest rate, δ, which affects investment demand. Thus (2) becomes

$$y = Y(i,\delta), \tag{6}$$

where $Y_i < 0$ and $Y_\delta < 0$. The demand for loans by the nonbank public is

$$l = L(\delta,i,y), \tag{7}$$

where $L_\delta < 0$. We discuss the signs of L_i and L_y below.

Banks hold deposits as liabilities, and loans and reserves as assets. Combining the models of Romer and Romer (1990) and Bernanke and Blinder (1988), we allow banks to hold bonds as either assets or liabilities, with time deposits and CDs defined as bank-issued bonds. We define b^b as banks' net holdings of bonds. As discussed by Romer and Romer, bond issues by banks may or may not require significant reserve holdings. We assume that if reserve requirements are imposed on bond issue, then banks will not both hold and issue bonds, except for small quantities of bonds held for liquidity purposes. Thus the reserve requirement holds on the net issue of bonds.

We take the fraction of bank deposits held as reserves against demand deposits to be constant at some level τ_1 that can be thought of as required or desired reserves. Reserves against bond issues are taken to be constant at rate τ_2. Banks choose the fraction of nonreserve assets held in the form of loans as a function of the loan-bond interest differential,

$$\frac{l}{l + b^b} = \lambda = \Lambda(\delta), \tag{8}$$

where $\Lambda_\delta > 0$.[1] If λ is less than one, banks hold bonds on net. If λ is greater than one, banks issue bonds on net.

In the case where banks are net holders of bonds, the supply of loans is

$$l = \Lambda(\delta)(1 - \tau_1)m. \tag{9}$$

In the case where banks are net issuers of bonds, the supply of loans is

$$l = \left(\frac{\Lambda(\delta)(1 - \tau_1)}{1 + (\Lambda(\delta) - 1)\tau_2}\right)m. \tag{10}$$

Note that if the reserve requirement on bond issues is zero, then equations (9) and (10) are the same. Thus in the rest of this section, we assume that reserves

1. Bernanke and Blinder (1988) assume that the desired fraction of the bank's nonreserve portfolio held in the form of loans is a function of the rates of interest on loans and bonds separately. We believe nothing rests on our simplification.

are held on net bond issues and then discuss the cases where no such reserves are held by setting τ_2 to zero.

Equating the supply and demand for loans yields

$$L(\delta,i,y) = \left(\frac{\Lambda(\delta)(1-\tau_1)}{1+(\Lambda(\delta)-1)\tau_2}\right)m. \tag{11}$$

Equations (1), (6), and (11) determine the levels of y, i, and δ given the level of m. Totally differentiating the three equations, the effect of a change in the money supply on output is

$$\frac{dy}{dm} = \frac{\left(\frac{\Lambda_\delta}{\lambda}\left(\frac{1-\tau_2}{1+(\lambda-1)\tau_2}\right)-\frac{L_\delta}{l}\right)\left(\frac{Y_i}{Y_\delta}\right)+\left(\frac{L_i}{l}\right)-\left(\frac{D_i}{m}\right)}{\left(\frac{\Lambda_\delta}{\lambda}\left(\frac{1-\tau_2}{1+(\lambda-1)\tau_2}\right)-\frac{L_\delta}{l}\right)\left(\frac{D_i+D_yY_i}{Y_\delta}\right)+\left(\frac{L_iD_y-L_yD_i}{l}\right)}. \tag{12}$$

This equation shows the effects of an open-market sale that reduces m and raises either b^b or b^p, holding w constant, when both a lending channel and a money channel are operational.

8.1.2 Simplifying Assumptions

We now add further assumptions to simplify expression (12). We begin with the interest elasticities of the nonbank public's demands for different assets. Starting from the nonbank sector's holdings of nominally denominated assets, we have the usual adding up constraint

$$0 = B_i^p + D_i - L_i, \tag{13}$$

where $B^p(\cdot)$ is the nonbank public's demand for bonds. Dividing by the total amount of deposits and rearranging gives

$$\frac{D_i}{m} = \frac{L_i}{l}\frac{l}{m} - \frac{B_i^p}{b^p}\frac{b^p}{m}. \tag{14}$$

This equation relates the percentage change in deposits in response to an interest-rate increase to the percentage changes in loan and bond holdings in response to an interest-rate increase and to the relative sizes of the three nominal assets held by the nonbank sector. When interest rates rise, the nonbank public wants to hold less money. It can accomplish this by holding more bonds ($B_i^p > 0$) or fewer loans ($L_i < 0$) or both.

To go further, we assume that the percentage changes in the holdings of the two assets in response to interest-rate changes are equal. Thus,

$$\frac{L_i}{l} = -\frac{B_i^p}{b^p}. \tag{15}$$

The relationship between the interest elasticities of money and loan demand is therefore

$$\frac{L_i}{l} = \left(\frac{D_i}{m}\right)\left(\frac{m}{l + b^p}\right). \tag{16}$$

Substituting this expression into equation (12) eliminates one term in the numerator.

We now turn to the income elasticities of money, loan, and bond demand. The adding up constraint means that

$$0 = B^p_y + D_y - L_y. \tag{17}$$

The standard assumption is that D_y is positive, and we add the assumption that in response to an increase in income, bond and loan demand adjust by the same percentage, so

$$\frac{L_y}{l} = -\frac{B^p_y}{b^p}. \tag{18}$$

We thus derive an expression for the relationship between the income elasticities of money and loan demand analogous to (16) above,

$$\frac{D_y}{m} = \left(\frac{L_y}{l}\right)\left(\frac{l + b^p}{m}\right). \tag{19}$$

Combining (16) and (19) gives

$$D_i L_y = L_i D_y, \tag{20}$$

which eliminates one term in the denominator of the expression for *dy/dm* derived above.[2]

Incorporating these assumptions about elasticities, the derivative of output with respect to money becomes

$$\frac{dy}{dm} = \frac{\left(\frac{\Lambda_\delta}{\lambda}\left(\frac{1 - \tau_2}{1 + (\lambda - 1)\tau_2}\right) - \frac{L_\delta}{l}\right)\left(\frac{Y_i}{Y_\delta}\right) - \left(\frac{b^p + l - m}{b^p + l}\right)\left(\frac{D_i}{m}\right)}{\left(\frac{\Lambda_\delta}{\lambda}\left(\frac{1 - \tau_2}{1 + (\lambda - 1)\tau_2}\right) - \frac{L_\delta}{l}\right)\left(\frac{D_i + D_y Y_i}{Y_\delta}\right)}. \tag{21}$$

This expression shows the effects of money on output when a lending channel is operational, assuming our simplifying assumptions are approximately correct. Several comments about this expression are in order.

The conditions for a lending channel to be operational are that $\Lambda_\delta < \infty$,

2. The conditions under which the last term in the denominator drops out are more general than the assumptions made here. For example, rather than assuming that private bond holdings and loans both adjust by the same percentage (in response to changes in either i or y), we could assume that the ratio of their percentage adjustments is the same in either case.

$L_\delta > -\infty$, and $Y_\delta < 0$. If any of these conditions fails to hold, then (21) collapses to (3). The first of these conditions states that banks do not regard loans and bonds as perfect substitutes in their portfolios; the second states that firms do not regard loans and bonds as perfect substitutes in their portfolios; and the third states that firms' investment decisions depend on both the loan and bond interest rates.

The condition for money to have a greater effect on output when the lending channel is operational (that is, the condition for the expression in [21] to exceed the expression in [3]) is that

$$b^p + l - m > 0. \tag{22}$$

Since this term can be positive or negative, the lending channel can exacerbate or moderate the money channel's effect on output. From the bank's balance sheet,

$$l - m = -b^b - r. \tag{23}$$

So, the condition for the lending channel to exacerbate the effect of money on output is that

$$b^b + r < b^p. \tag{24}$$

We assume in what follows that this condition is satisfied.

8.1.3 The Determinants of *dy/dm*

Having laid out the basic model, we now consider how observable features of the institutional and financial structure of the economy are likely to affect the impact of money on output, assuming a lending channel is operational. Our discussion focuses on two broad areas: the structure of bank balance sheets and the structure of firm finance.

The first factor likely to determine the magnitude of money's effect on output is the structure of bank assets. Assuming that condition (24) is satisfied, *dy/dm* is largest when Λ_δ/λ is small, that is, when banks do not adjust the fraction of their assets made up of loans in response to a change in the loan-bond differential. Under the assumption that Λ_δ does not vary significantly with λ, this would imply that *dy/dm* is increasing in the fraction of their portfolios that banks hold in loans.

More generally, the effect of changes in λ on Λ_δ/λ depends on the underlying model of bank portfolio preferences. One case where one can determine the magnitude of Λ_δ/λ is when there is a significant reserve requirement on the issue of bonds by banks, and λ (the fraction of the bank's portfolio made up of loans) is near one. In this case banks are likely to be at a corner, where the marginal cost of one less loan (the interest rate on holding bonds, which is the opportunity cost of making loans) could be much less than the marginal cost of one more loan (that is, the bond interest rate adjusted for the cost of holding reserves against bond issue). In such a case, the elasticity of the portfolio share

with respect to the loan-bond differential is likely to be near zero, and thus, other factors held constant, *dy/dm* should be large.

The second factor affecting the size of *dy/dm* is the structure of firm finance. Expression (21) indicates that the fraction of firms' capital coming from loans relative to bonds likely affects the magnitude of the lending channel by changing the semielasticity of loan demand with respect to the loan-bond differential, L_δ/l. As loans increase as a fraction of firm finance, we expect L_δ/l to fall, thus increasing *dy/dm*.

A third factor in the size of *dy/dm* is the relative size of the sensitivities of investment to the bond interest rate and to the loan-bond differential. Holding Y_i constant, an increase in the ratio of Y_δ to Y_i raises the value of *dy/dm*. This ratio will be affected both by the different fractions of investment being financed at the loan and bond rates and by the potential for substitution between the two. If, for example, "small" firms invest using loans while "large" firms invest using bonds, if there is no substitution between the two sources of financing, and if the two size firms have the same interest elasticity of investment, then Y_δ/Y_i will just equal the fraction of firms that are small. Differences in the interest elasticities of investment between large and small firms will affect the ratio of Y_δ to Y_i. If small firms are more interest sensitive than large firms, *dy/dm* will be bigger. Finally, if firms are able to substitute between loans and bonds in their financing, this will reduce Y_δ and thus reduce *dy/dm*.

8.2 Changes in Financial Structure

According to the model presented in section 8.1, changes in the financial structure of the economy have important implications for the importance of the lending channel in the transmission of monetary shocks. Therefore, to see whether the importance of the lending channel is likely to have changed over time in the United States, we examine evidence on how various aspects of financial structure have changed between 1900 and 1988. In particular, we look at structural changes in the balance sheets of banks and firms.

The major finding of this analysis of institutions is that the lending channel of the monetary transmission mechanism should have been stronger before 1929 than in the first two decades after 1945. We find that important changes in financial structure occurred between the pre-Depression and post–World War II eras and that, at least up through 1970, essentially all of these changes imply a weakening of the lending channel. After 1970 the evidence is more complicated, with some changes further weakening the lending channel and others potentially strengthening it.

8.2.1 Banks

Assets

Annual data on bank balance sheets from 1896 to the present are available from the Federal Reserve. These data reflect a major effort by the Federal Re-

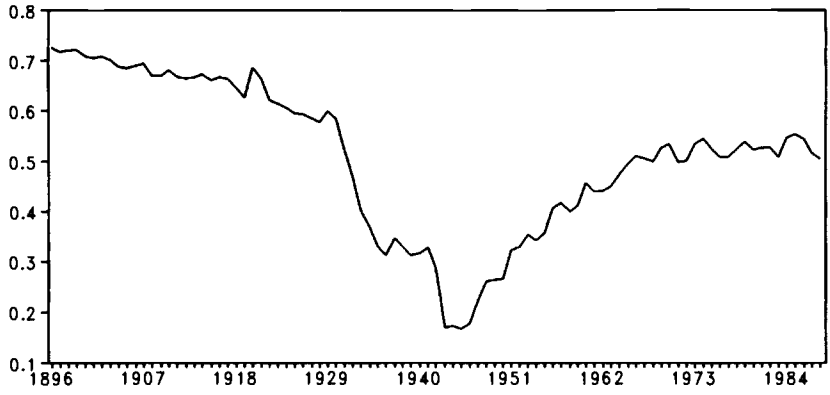


Fig. 8.1 Ratio of bank loans to total interest-bearing bank assets, 1896–1988
Note: Real estate loans are excluded from bank loans.

serve to adjust the historical statistics for the prewar era (from the Comptroller of the Currency) to be as consistent as possible with postwar statistics. This adjustment mainly involves inflating the data for nonnational banks to compensate for underreporting by state banks in the period before 1938. In this section we use the version of the Federal Reserve data corresponding to all commercial banks.[3]

Figure 8.1 shows the ratio of total bank loans less real estate loans to total interest-bearing bank assets for 1896 to 1988. This ratio declined slowly over the first three decades of the twentieth century, from 72 percent in 1896 to 60 percent in 1929. It then fell dramatically during the Great Depression and World War II, reaching 17 percent in 1945. Between 1945 and 1970 it rose steadily, reaching 27 percent in 1950, 46 percent in 1960, and 53 percent in 1970. Since 1970 non–real estate loans as a fraction of total bank assets have hovered around 52 percent.

Mirroring this fall over time in the loan ratio is a rise over time in the fraction of bank assets accounted for by government securities. Government securities accounted for between 5 and 7 percent of interest-bearing bank assets during most of the pre–World War I era. After the war this number was higher; in 1929, for example, government securities accounted for 10 percent of total assets. During World War II banks increased their holdings of U.S. government securities by a factor of four. This came on top of a threefold increase between 1929 and 1936. As a result, government securities accounted for 73 percent of total interest-bearing assets in 1945. Banks' holdings of government securities then fell steadily in the first two decades of the postwar era as loans rose. However, as the behavior of the loan ratio suggests, the fraction of bank assets

3. The data for 1896–1970 are from U.S. Bureau of the Census (1975, ser. X588–X609). Data after 1970 are from the *Annual Statistical Digest* of the Federal Reserve for various years. For all years we use total loans excluding interbank loans. Data prior to 1970 are for June 30 or the nearest available date; data thereafter are for the last Wednesday in June.

accounted for by government securities never returned to its pre–World War I level; in 1988 government securities were still 14 percent of total bank assets.

This pattern suggests that loans were, on average, a substantially larger fraction of total interest-bearing bank assets in the pre-Depression era than in the post–World War II period. Even at the postwar peak, the fraction of bank assets accounted for by non–real estate loans was more than ten percentage points smaller than the average fraction in the pre-1929 period. In terms of the model given in section 8.1, holding other factors constant, this change implies that the lending channel was substantially more important before 1929 than after 1945.[4]

The implications of the low loan holdings during the period 1929–1944 are harder to determine because the period is short and dominated by the Great Depression. The plummeting of the fraction of bank assets accounted for by loans between 1929 and 1936 almost surely reflects the tremendous fall in output, rather than some instantaneous change in the importance of the lending channel. Thus, a reasonable view is that the lending channel was as important during the declining phase of the Depression as it was in the three decades before 1929. On the other hand, after the recovery was firmly under way, it seems possible that the continued low loan ratios, including the additional declines associated with World War II, imply that the lending channel was considerably weaker in the late 1930s and early 1940s than previously. Once banks had switched so thoroughly out of loans and into other assets, a decline in reserves should have had less effect on bank lending.

Liabilities

The structure and level of reserve requirements has changed dramatically over time. Figure 8.2a shows the ratio of the reserve requirement on time deposits to the reserve requirement on demand deposits over the last century. Figure 8.2b shows the level of the reserve requirement on time deposits. Construction of these figures is somewhat complicated due to changes in the definition of time deposits and to the variation in state regulations before the founding of the Federal Reserve in 1914. For the period before 1917, we analyze reserve requirements for national banks, as set by the National Banking Act of 1864 and various amendments. These figures are also complicated by the fact that the definition of deposits was changed substantially by the Monetary Control Act of 1980.[5]

4. In the preceding discussion we examined total loans less real estate loans. This measure was motivated by the presumption that most real estate loans are to households and that the lending channel works mainly through loans to firms. However, if one includes real estate loans the results are qualitatively similar. The only difference is that the loan ratio including real estate loans nearly reaches pre-1929 levels in the 1980s.

5. The data on reserve requirements under the National Banking Act are from Bordo, Rappaport, and Schwartz (1992, 211). The data for 1917–80 are from U.S. Board of Governors of the Federal Reserve System (1983, 236–37). For the period 1917–62, we use the reserve requirements on

Under the National Banking Act no distinction was drawn between time deposits and demand deposits; there was a uniform reserve requirement on all deposits. Thus, the ratio of the reserve requirement on time deposits to that on demand deposits for national banks was one from 1874 until the founding of the Federal Reserve. Effective in 1917, the Federal Reserve Act distinguished between time and demand deposits, setting the ratio of the reserve requirements on the two at an initial level of roughly one to three. Though there was some variation in this ratio during the interwar and early postwar eras, it remained at roughly one to three until the mid-1960s. The relative size of the requirement on time deposits was lowered significantly in 1967, and the ratio hovered around ⅙ through the 1970s. After 1980 the ratio rose to ¼, but this change is somewhat hard to interpret because of the change in the definition of deposits.

The change in the ratio of reserve requirements on time and demand deposits in the postwar era is even more dramatic if one considers special time deposits rather than ordinary savings accounts. An important development of the 1960s was the advent of certificates of deposit.[6] While CDs had roughly the same reserve requirements as savings deposits in the late 1960s, in the 1970s their reserve requirement fell from 3 percent to 1 percent. In 1980, under the Monetary Control Act, the reserve requirement on CDs over a certain level was set to zero. As a result of this change, banks in the late 1970s and 1980s had a way of raising funds that was free of reserve limitations.

The level of the reserve requirement on time deposits follows almost the same pattern as the ratio of the reserve requirement on time deposits to that on demand deposits. Under the National Banking Act the reserve requirement on time deposits was not only the same as that on demand deposits, it was also very high (25 percent). With the advent of the Federal Reserve, the reserve requirement on time deposits fell dramatically (to 3 percent). This level rose somewhat during the Great Depression and the early postwar era (to between 5 and 7.5 percent), before returning to 3 percent in 1967. Once again, if special time deposits are considered rather than savings accounts, changes occur again in 1975 and 1980 when the reserve requirement on CDs was lowered and then eliminated.

As mentioned above, the discussion of reserve requirements for the pre–World War I era is complicated by the presence of state banks that were subject to individual state reserve requirements. In the period before World War I there

demand deposits for reserve city banks and time deposits for all classes of banks. For the period 1966–72 we use the requirements on demand deposits for reserve city banks with deposits over $5 million and on savings deposits. For 1972–80, we use the requirements on net demand deposits for banks with deposits over $400 million and on savings deposits. After 1980, we use the requirements on net transactions accounts over $28.9 million and on nonpersonal time deposits of maturity less than one and one-half years.

6. Kaufman (1992, 62) states that CDs "were developed in 1961 to provide commercial banks with a means of competing . . . for the temporary excess money balances of larger corporations."

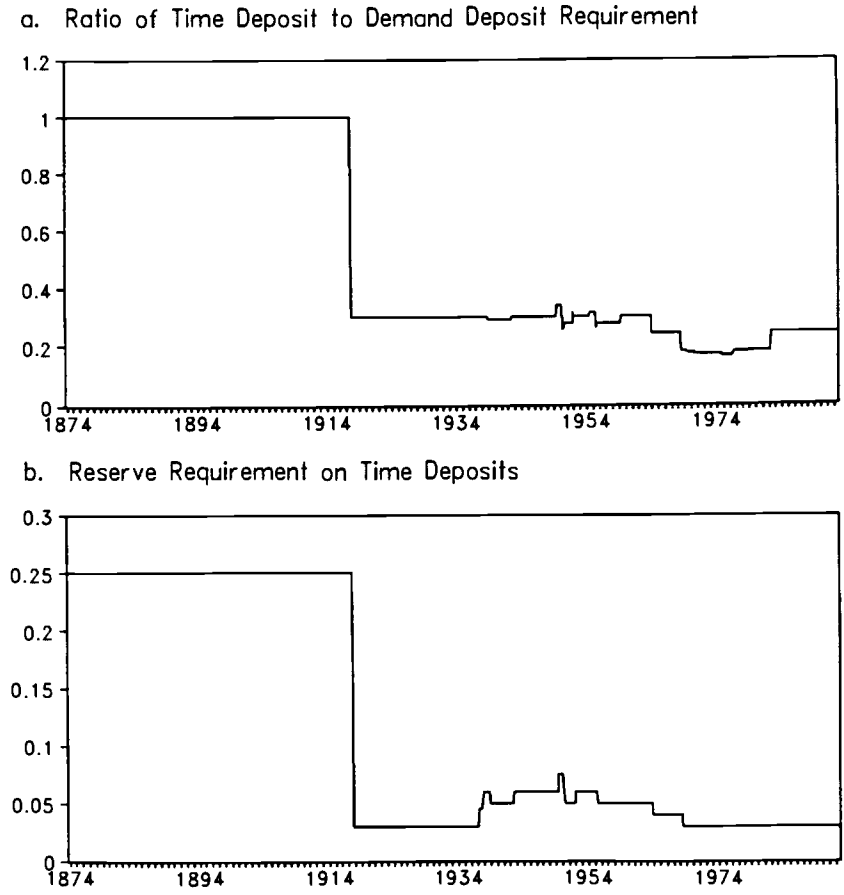


Fig. 8.2 Reserve requirements, 1874–1991

was substantial variation in state regulations. Before detailing the differences between state and national bank regulations, it is important to note that national banks account for a large fraction of total bank assets in the early period. National banks accounted for 42 percent of total bank assets in 1896 and 43 percent in 1910.[7] Thus, nearly half of bank deposits in the prewar era certainly had equal reserve requirements on demand and time deposits.

A systematic study of state reserve requirement legislation by Rodkey (1934) indicates that most state banks had similar reserve requirements on demand and time deposits during the period before the founding of the Federal Reserve. However, Rodkey lists eleven states that passed legislation distin-

7. The data on national and nonnational bank assets are from U.S. Bureau of the Census (1975, ser. X635, X657).

guishing between the different types of deposits in the setting of reserve requirements. These states were (in the order of the date of legislation) Maine, New Hampshire, Nebraska, Iowa, North Carolina, Oregon, Pennsylvania, Connecticut, Vermont, Utah, and Colorado. In most of these states, however, the ratio of the reserve requirement on time deposits to that on demand deposits was much closer to one than in the post–Federal Reserve period, and the level of reserve requirements on time deposits was substantial. For example, in the Pennsylvania statute passed in 1907, the reserve requirement on time deposits was 7.5 percent and that on demand deposits was 15 percent. In the Utah statute passed in 1911, the reserve requirement on time deposits was 10 percent and that on demand deposits was 15 percent.

Those states that had similar reserve requirements on time deposits and demand deposits typically set fairly high reserve requirements. A study by Welldon (1909) of state regulations in 1909 found that reserve requirements on time and demand deposits in state banks were usually between 15 and 25 percent. However, Welldon found that in 1909, fourteen states had zero reserve requirements on both time and demand deposits. Since reserve requirements were becoming more common over time, the number of states with no reserve requirements was surely much larger in the 1870s and 1880s.

Given that the majority of state banks set equal and high reserve requirements on time and demand deposits in the pre–Federal Reserve era, it is reasonable to conclude that the ratio of the reserve requirement on time deposits to that on demand deposits fell substantially between the pre-1914 era and the interwar and postwar periods. Furthermore, within the post–World War II period, the ratio fell even more. The level of reserve requirements on time deposits almost surely showed the same pattern.

To look directly at the importance of time deposits to bank balance sheets, figure 8.3a presents the ratio of time deposits to total interest-bearing assets of commercial banks.[8] The relative size of time deposits, though small, rose through the pre–Federal Reserve period and continued to rise through the onset of the Depression. The relative magnitude of time deposits fell during World War II, but then rose swiftly during the postwar period, with time deposits (including CDs) becoming the dominant liability of commercial banks in the 1970s and 1980s.

The change in the structure of reserve requirements over time and the corresponding rise in the importance of time deposits suggest that the lending channel should have been weakened between the pre-1914 and post–World War II periods. In the pre–Federal Reserve era, banks had little opportunity to raise funds to counteract a fall in reserves because all deposits were covered by the same reserve requirements. Thus, loans had to contract in response to a fall in reserves. In contrast, in the 1980s banks could issue CDs which have no reserve

8. Data on time deposits, which include CDs and savings accounts, for 1896–1970 are from U.S. Bureau of the Census, 1975, ser. 606; data for 1971–90 are from the Federal Reserve's *Annual Statistical Digest*. All data are for the end of June or the last Wednesday in June.

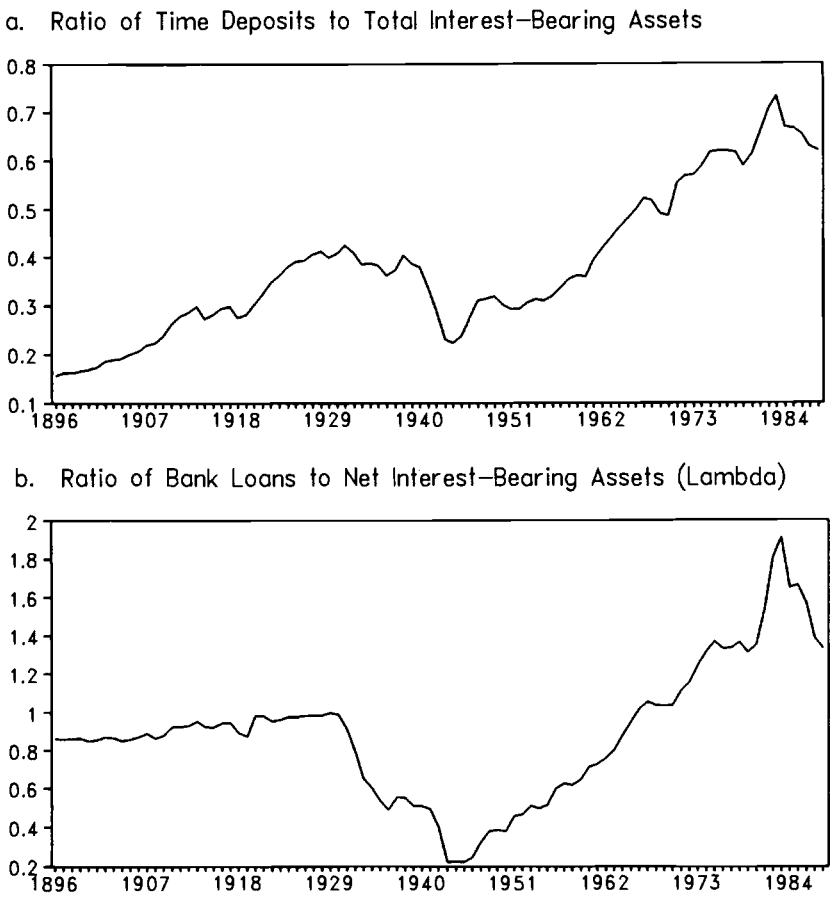


Fig. 8.3 Composition of bank portfolios, 1896–1988

requirement. As a result, loans no longer need to fall in response to a decline in reserves.

Figure 8.3b plots our summary measure of banks' portfolios, λ, which is the ratio of loans to net interest bearing assets (loans plus net bond holdings). During the period before the Great Depression, λ remained near one, reflecting the fact that banks' net holdings of bonds were near zero. During the first part of this period, when there were substantial reserve requirements on time deposits, we suspect that banks were at a corner with respect to the fraction of their net assets made up of loans. More generally, the fact that λ was so near to one *and* showed so little variation suggests that banks were reluctant to change the composition of their portfolios in response, for example, to a change in the loan-bond differential. In such a case, according to the model laid out above, the lending channel will be particularly potent. Over the post-

war period, λ rose steadily, reflecting both an increase in loans on the asset side and an increase in time deposits as liabilities. The effect of these changes in λ on the importance of the lending channel in the postwar era is ambiguous. On the one hand, the high values of λ in the latter half of the period might suggest that Λ_8/λ was small and the lending channel was important. On the other hand, the large range of values over which λ varied might suggest that banks were not reluctant to adjust their portfolios, and thus that the lending channel was not important.

8.2.2 Firms

According to the model given in section 8.1, changes in the composition of firm finance and the relative size of large and small firms over time would cause the importance of the lending channel of monetary transmission to change as well. If firms use fewer loans relative to other liabilities to finance investment, this should decrease the importance of the lending channel. This is true because a lower emphasis on loan finance means that firms are less sensitive to changes in the loan-bond interest differential. Since small firms are likely to be more constrained in their alternatives to bank credit, a fall in the proportion of firms that are small implies that the lending channel is likely to have become less important also.[9]

Aggregate Behavior

Perhaps the simplest measure of the importance of bank loans in the financing of firms is the ratio of total bank loans (less real estate loans) to the capital stock. This measure provides an indication of whether bank loans grew faster, slower, or at just the same rate as the capital which such loans are designed to finance. The data on total non–real estate bank loans are taken from the balance sheet for all commercial banks described above. The capital stock series used shows the net stock of fixed, nonresidential private capital.[10] Since the loan series is in current dollars, we use the current–cost valuation capital stock series as well. Because the capital stock series starts in 1925, we can look only at the ratio starting at the end of the pre-Depression era.

Figure 8.4 shows the ratio of total non–real estate bank loans to the capital stock. As can be seen, in the late 1920s this ratio was between 26 and 29 percent. During the Depression, the ratio plummeted as loans fell dramatically. The ratio remained below 20 percent until 1960. During the early 1970s, it reached levels close to the typical value in the late 1920s. In the late 1970s and early 1980s, the ratio of loans to the capital stock fell again, to values close to 20 percent. This picture certainly suggests that loans were a more important source of firm finance at the end of the pre-Depression era than in the postwar

9. Gertler and Gilchrist (1991) and Oliner and Rudebusch (1992) suggest that monetary contractions affect the economy by reducing the availability of bank loans to small firms.

10. These data are described in U.S. Bureau of Economic Analysis (1974). We use the most recent version of the data available from the National Trade Data Bank.

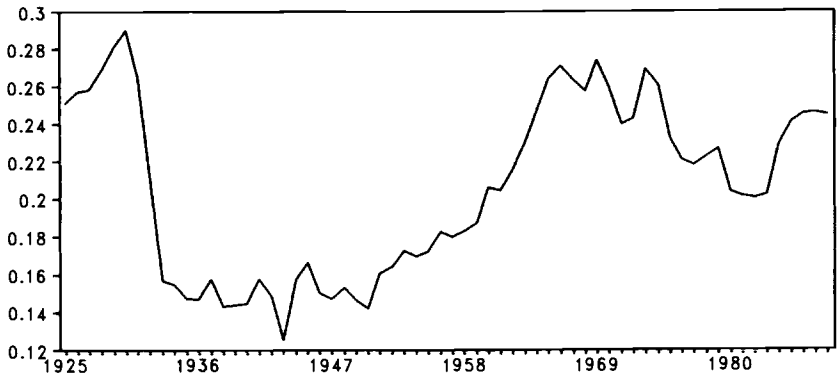


Fig. 8.4 Ratio of bank loans to the capital stock, 1925–88

era. However, what happened during the early years of the twentieth century cannot be discerned.

The fact that bank loans have not grown as rapidly as the capital stock at an aggregate level since 1925 is important because it provides a way of gauging the plausibility of the sectoral balance sheets discussed below. Given the aggregate behavior of loans, it would be impossible for several important sectors to show a marked increase in the importance of bank loans unless other sectors show a substantial decline. At a more fundamental level, the decline in the aggregate importance of bank loans over time suggests that the lending channel of monetary transmission is likely to have become less important over time. If more capital was financed using bank loans in the pre-1929 era than in the postwar era, it is likely that the lending channel was stronger in the past than today.

Corporations

More detailed information about the importance of bank lending in the financing of firms can be found in the sectoral balance sheet of the nonfinancial corporate sector and the nonfarm, unincorporated business sector of the U.S. economy. The annual balance sheet data are constructed by merging the data from Goldsmith, Lipsey, and Mendelson (1963) for selected years between 1900–45 with those from the Flow of Funds Accounts of the Federal Reserve for 1945–90. The data from Goldsmith, Lipsey, and Mendelson, while similar in concept to those of the Federal Reserve, differ in many practical ways from the modern data. Furthermore, the Flow of Funds data from the Federal Reserve on assets and liabilities have been revised over time, so that data from the early postwar era are not strictly comparable with more recent data. To deal with these problems of comparability, we make several adjustments to the various series. These adjustments are described in the appendix.

The bank loans n.e.c. (not elsewhere classified) entry in the sectoral balance

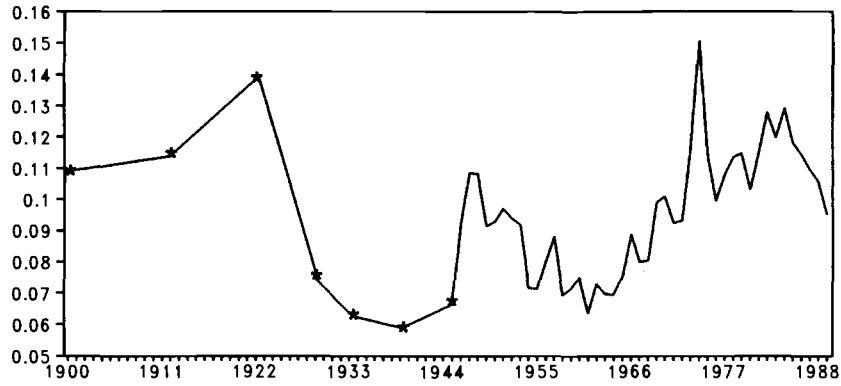


Fig. 8.5 Ratio of loans to total liabilities for corporations, 1900–89
Note: Before 1945 data are available only for starred observations; after 1945 the data are annual.

sheet is the best available measure of total bank loans to corporations. There are surely other bank loans made to corporations, but they are lumped in with the loans of other financial intermediaries in such categories as mortgages and loans on securities. To gauge the changes in the importance of bank loans, we compare bank loans with the sum of total liabilities of corporations, less trade debt and the market value of corporate equities. While gross trade debt is typically included in total liabilities, it is not a large net source of finance for the corporate sector because firms owe most of it to each other. Therefore, we exclude gross trade debt from total liabilities. Figure 8.5 shows the ratio of bank loans n.e.c. to total liabilities less trade debt plus equities for nonfinancial corporations.

This graph shows that the loan ratio of corporations rose over the course of the pre-Depression era, from 11 percent in 1900 to 14 percent in 1922. By 1929, however, it had fallen back to 8 percent because of the explosion in the market value of corporate equities. It then fell further during the Depression, reaching 6 percent in 1933. The corporate loan ratio started the postwar era fairly high, reaching 11 percent in 1947, but then dropped substantially in the 1950s. During the 1950s and 1960s, the ratio hovered around 7 percent. It then rose in the 1970s, but, with the exception of 1974, it did not reach its pre-Depression peak value. Based on this graph, it appears that the loan ratio for corporations was noticeably higher in the pre-Depression era than in the first two decades of the postwar era. After 1970, loans increased in importance, but they are still less important than in the first decades of the 1900s.

The decreased role of bank loans in the postwar era has various sources. One widely cited change in corporate finance between the pre–World War I era and the interwar and postwar periods is the expansion of the commercial paper market (see, for example, Cargill 1991, 140, and Greef 1938). However,

even though the commercial paper market expanded significantly, especially after 1960, it is still a very small fraction of total liabilities. Thus, it is not the main source of the decreased importance of loans. The more important change is the expansion of corporate equities. Corporate equities increased much faster between the pre-1929 and postwar eras than did loans or total liabilities (less trade debt). Indeed, the ratio of loans to total liabilities (less trade debt) was roughly the same in the early 1900s and the early postwar era.[11] Thus, the main source of the decline in the importance of bank finance for corporations is the expansion of equity finance.

Unincorporated Businesses

As described in the appendix, the balance sheet for nonfarm, unincorporated businesses cannot be made consistent over time. However, the data from Goldsmith, Lipsey, and Mendelson for 1900 to 1945 show some interesting trends. Figure 8.6 shows the ratio of bank loans to total liabilities (less trade debt) for unincorporated businesses before 1945. As with corporate finance, loans became a much smaller fraction of total liabilities of unincorporated businesses beginning in 1929 and this decline continued through the Great Depression. The decline in the loans to total liabilities ratio was also substantially larger for unincorporated businesses than for corporations. The level to which the loan ratio for unincorporated businesses returned in 1945 is much lower than its pre-Depression level. While one would not want to deduce a postwar trend from 1945 alone, there is certainly no evidence of a rapid postwar expansion of bank loan finance for unincorporated businesses.

As mentioned above, the ratio of total bank loans to the capital stock imposes some constraints on what could plausibly have happened to the importance of loans for the unincorporated business sector over the postwar era. We know that bank loans became less important at an aggregate level in financing the capital stock between the prewar era and the first two decades of the postwar era. After 1970, bank loans increased in importance, but loans were still a less important form of finance than in the pre-Depression era. The loan ratio of corporations shows exactly the same pattern as the aggregate ratio. Therefore, unless some other sector showed a great decrease in the importance of loans, the unincorporated business sector could not have greatly increased its loan ratio over the postwar era.

The fact that in the postwar era bank loans have become a smaller fraction of total liabilities, certainly for corporations and probably for unincorporated businesses, makes it likely that the lending channel of the transmission mechanism has weakened over time. In terms of our model, if there are more substitutes for bank loans in the postwar era than in the pre-1929 era, then the sensitivity of investment to the loan-bond spread should have diminished. This in

11. The ratio of loans to total liabilities, including gross trade debt, shows a noticeable fall between the pre-Depression and postwar eras. This is because trade debt has also expanded rapidly.

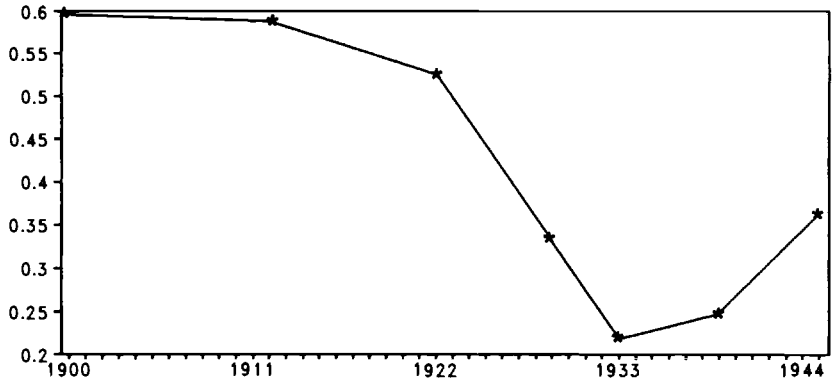


Fig. 8.6 Ratio of loans to total liabilities for unincorporated businesses, 1900–45

Note: Data are available only for starred observations.

turn implies that the relative importance of the lending channel should have declined as well.

The fact that loans have become a more important source of firm finance over the course of the postwar era suggests that the relative importance of the lending channel may not have been constant between 1945 and 1990. Indeed, judging just from the facts about firm finance, it appears quite likely that the lending channel became more important after 1970 than it was in the 1950s and 1960s, though not as important as in the pre-Depression era.

Relative Size of Corporations and Unincorporated Businesses

While the classification of particular liabilities for unincorporated businesses cannot be made consistent over time, the data for total liabilities and equities do appear to be comparable across time periods. Therefore, it is possible to use this information to gauge the relative size of the corporate and unincorporated sectors.[12] Since corporations are typically much larger than unincorporated businesses, this comparison can give some indication of changes in the distribution of large and small firms over time. Figure 8.7 graphs the ratio of total liabilities (less gross trade debt) of unincorporated businesses to the sum of total liabilities (again, less gross trade debt) of corporations and corporate equities.

Judging from this measure, the corporate sector grew more rapidly than the unincorporated sector between 1900 and 1945; the ratio of total liabilities of unincorporated businesses to total liabilities plus equities of corporations fell

12. Total assets would be a more obvious way to compare the sizes of the two sectors. Unfortunately, the balance sheets give only total financial assets, which are not a good indicator of relative size.

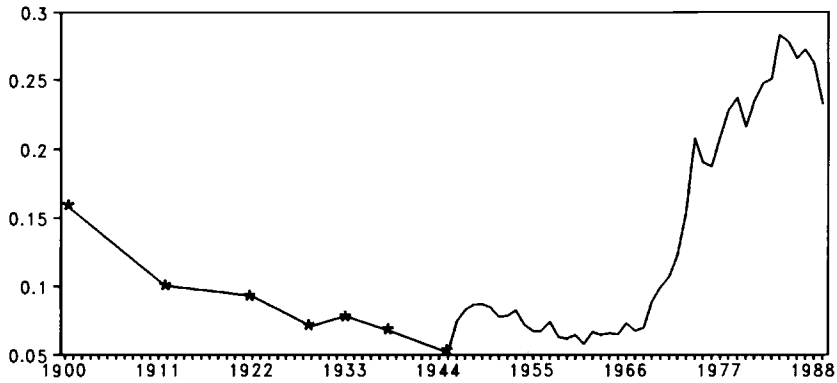


Fig. 8.7 Ratio of total liabilities of unincorporated businesses to total liabilities of corporations, 1900–89
Note: Before 1945 data are available only for starred observations; after 1945 the data are annual.

steadily over this period. In the early postwar era, the ratio hovered at roughly the same level as in 1929. After 1970, this ratio rose substantially, reflecting the greater growth of total liabilities for unincorporated businesses.

If this ratio truly reflects the relative size of the two sectors, and if the lending channel is more important the larger the bank-dependent unincorporated sector, then the fall in the ratio between 1900 and 1945 suggests that the lending channel of monetary transmission was weakening over this period. It then remained at its 1929 level during the early postwar era. The subsequent rise in the relative size of the two sectors suggests that the lending channel has become more important again in the last two decades.

8.2.3 Summary

Taken together, the various changes in the structure of financial institutions suggest that the lending channel should have decreased in importance between the pre-1929 and the post-1945 eras. Both the structure of bank balance sheets and the structure of firm balance sheets suggest that loans were more important before the Great Depression than after. Within the pre-Depression era, the differentiation of reserve requirements on time deposits and demand deposits and the large decline in the level of reserve requirements on time deposits at the time of the founding of the Federal Reserve suggest that the lending channel should have been stronger before 1914 than after.

Within the postwar era, the fact that bank loans have become a larger fraction of total bank assets and total firm liabilities after 1970 than in the first two decades of the postwar era suggests that the lending channel may have been increasing in importance. The relative importance of unincorporated (and presumably bank-dependent) businesses also rose in the second half of the post–World War II era, again suggesting an increased importance of the lending

channel. However, the ratio of the reserve requirement on time deposits to that on demand deposits and the level of reserve requirements on time deposits fell in the late postwar era, and time deposits and CDs rose to become the dominant liability of commercial banks over the postwar period. These factors would tend to lessen the importance of the lending channel. Thus, while it is clear that the lending channel should have weakened between the pre-Depression era and early postwar eras, the relative strength of the lending channel in the early and late postwar eras is ambiguous.

8.3 Historical Evidence on the Lending Channel

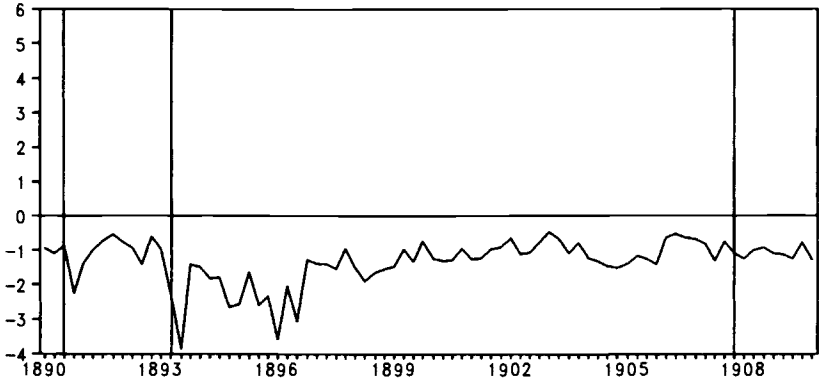
In this section we examine the behavior since the late nineteenth century of various indicators of the strength of the lending channel. In particular, we look at the spread between the loan and bond rates, the mix of credit market instruments between loans and commercial paper, and the correlation between output and lending. The analysis of section 8.1 and previous analytical work suggest that these measures should behave differently after monetary contractions than in more ordinary times if the lending channel is important. Since the institutional analysis of section 8.2 suggests that the strength of the lending channel should have declined over time, our hypothesis is that the response of these variables to monetary shocks should have declined as well. If they have not, this could either be evidence that these measures of the strength of the lending channel are not very good, or evidence that the lending channel has not been important in any era.

Since the response of these variables to monetary contractions is the measure of the strength of the lending channel, identifying monetary contractions is an important step in the analysis. The monetary contractions that we consider consist of three pre–Federal Reserve financial panics (1890:8, 1893:5, and 1907:10); four interwar contractions consisting of Friedman and Schwartz's (1963) three crucial experiments plus the bank holiday (1920:1, 1931:10, 1933:2, and 1937:1); and seven post–World War II episodes identified by Romer and Romer (1989, 1994) as anti-inflation interventions by the Federal Reserve (1947:10, 1955:9, 1968:12, 1974:4, 1978:8, 1979:10, and 1988:12). The extent to which each of these episodes constitutes an exogenous monetary contraction has been debated at length elsewhere (Friedman 1989; Schwartz 1989; Hoover and Perez 1994; Dotsey and Reid 1992); we do not repeat that discussion here.

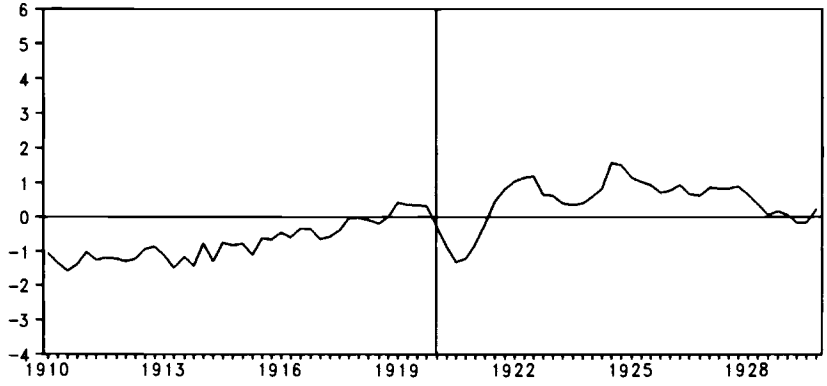
8.3.1 The Spread

According to the model presented above, one key indicator of the strength of the lending channel is δ, the spread between loan rates and bond rates. In response to a monetary contraction, the spread should increase as banks contract loans, and thus force firms to use bonds as an imperfect, alternate source of finance. Using the framework in section 8.1, and incorporating the simpli-

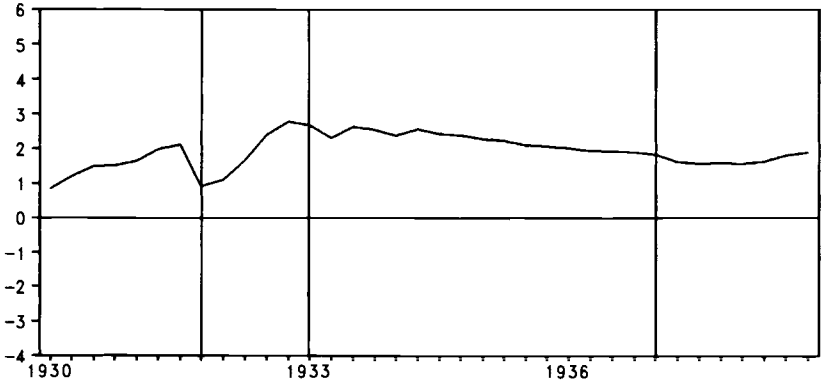
a. 1890–1909



b. 1910–1929



c. 1930–1938



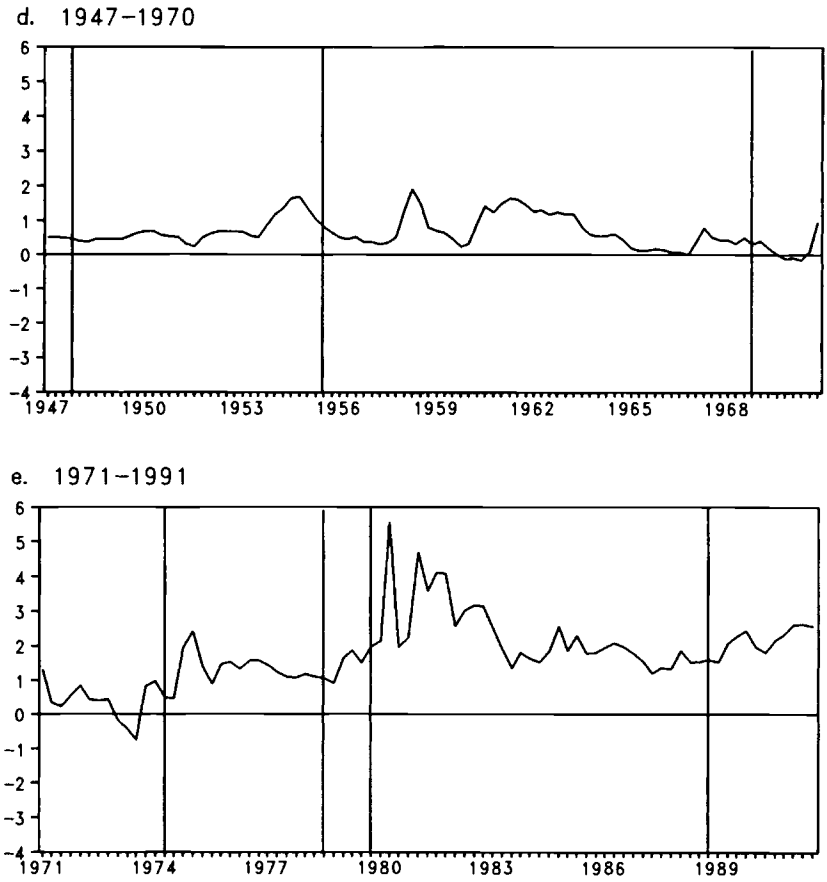


Fig. 8.8 Loan-bond interest-rate spread and monetary contractions, 1890–1991
Note: Vertical lines denote the dates of negative monetary shocks.

fying assumptions used there, the response of the spread to a change in the money stock is

$$\frac{d\delta}{dm} = \frac{-\left(\frac{b^p + l - m}{b^p + l}\right)\left(\frac{1}{m}\right)}{\left(\frac{\Lambda_\delta}{\lambda}\left(\frac{1 - \tau_2}{1 + (\lambda - 1)\tau_2}\right) - \frac{L_\delta}{l}\right)}. \tag{25}$$

The factors that imply a large response of the spread to money are a subset of those that lead to a large value of dy/dm in equation (21) above. The less willing banks and firms are to substitute between loans and bonds in response to changes in the spread, the larger the effect of money will be on the spread.

Similarly, in the case where banks are net issuers of bonds, the larger the reserve requirement on CDs and time deposits, the larger the effect of money on the spread. On the other hand, the sensitivities of investment to the bond interest rate and to the spread, which affect the size of dy/dm, do not affect the sensitivity of the spread to money shocks.

Data

Figure 8.8 presents a measure of the spread for the period 1890–1991. The loan rate series is the time-loan rate on six-month time loans for the period 1890–1918, the rate charged on customer loans by banks in principal cities for the period 1919–27, the rate charged on commercial loans by banks in principal cities for the period 1928–39, and the prime interest rate for the period 1947–91.[13] The bond rate series is for six-month prime commercial paper. All data are quarterly averages of monthly data. The figure indicates that the spread rose on average over the forty years prior to the Great Depression and that it was generally higher in the second half of the postwar period than in the first half.

Results

Rather than focus on long-term trends in the spread, we instead look at the behavior of the spread in monetary contractions. Figure 8.8 also shows the dates of negative monetary shocks so that we can evaluate the path of the spread following each of the fourteen monetary contractions we consider. Given the model presented in section 8.1, one should expect the spread to increase following monetary contractions. Given the evidence presented in section 8.2, and assuming that the magnitude of monetary contractions has been roughly similar over time, one should expect relatively large increases in the spread following pre-1929 monetary contractions and relatively modest increases in the spread following early postwar contractions.[14]

The data presented in the figure do not bear out these expectations. Note first that, looking across the entire sample, the spread does not consistently increase following monetary contractions. In nine of fourteen cases, the spread remains approximately unchanged or decreases slightly during the two years following the onset of a contraction. In three of the five cases where the spread does increase, the magnitude of this increase is only about one hundred basis points. The two episodes that display significant increases in the magnitude of the spread are dominated by the second quarter of 1980, when the Fed imposed credit controls that limited the rate of growth of bank lending (Schreft 1990;

13. The time loan rate data are from Mankiw, Miron, and Weil (1987, 1990). The customer and commercial loan rate data are from U.S. Board of Governors (1976a, 463–64, tables 124–25). The prime rate data are from Data Resources, Inc. (DRI).

14. The fact that consistent measures of aggregate output and unemployment show that recessions were of roughly the same size before 1929 and after 1945 is one indicator that monetary contractions were probably not radically different in the two eras.

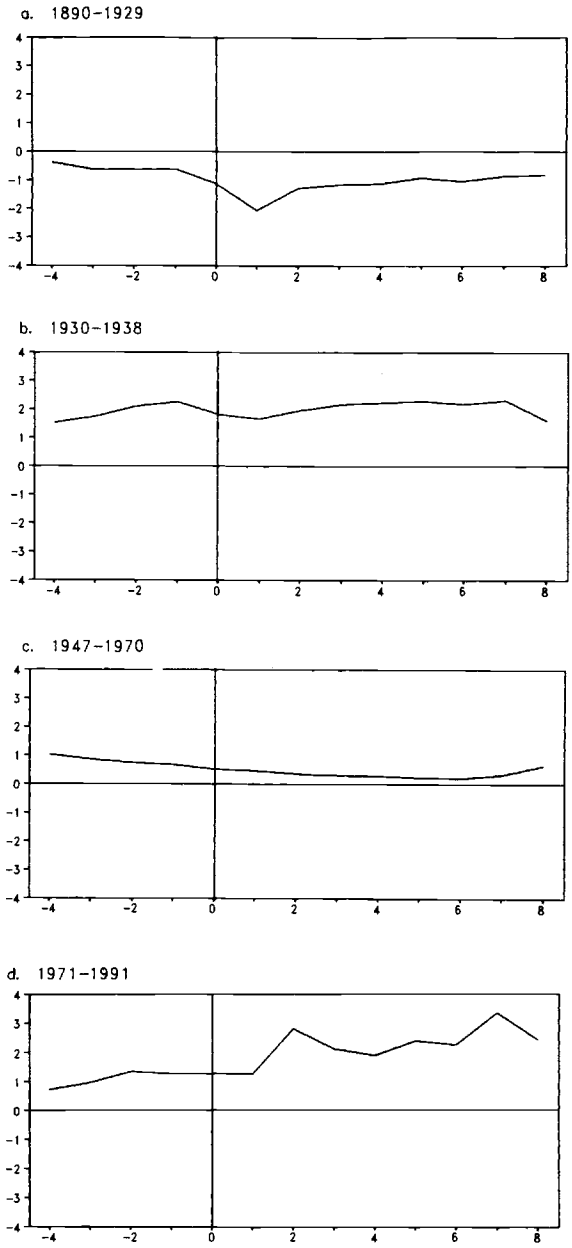


Fig. 8.9 Average response of the spread to monetary contractions
Note: The vertical line denotes the date of a negative monetary shock. The average behavior of the spread is calculated for four quarters before to eight quarters after the monetary shock.

Owens and Schreft 1992). Averaging over the entire sample, the spread increases by only twenty-one basis points at the one-year horizon and by thirty-nine basis points at the two-year horizon.[15]

Figure 8.9 shows the average behavior of the spread in each of four subsamples corresponding to different "lending regimes." The first regime is 1890–1929, the second is 1930–38, the third is 1947–70, and the fourth is 1971–91. According to the evidence presented in section 8.2, one ought to expect the most dramatic response of the spread during the pre-1929 period and the least dramatic during the 1947–70 period, assuming the magnitude of monetary contractions is roughly similar across the regimes.

The differences in the response of the spread across regimes only partially bear out this expectation. At the one-year horizon, the spread increases on average by one basis point during the 1890–1929 regime, falls by twenty-five basis points during the 1947–70 regime, and rises by sixty-two basis points during the 1971–91 regime. Thus, while post–World War II changes in the response of the spread to monetary contractions are consistent with the evidence presented in section 8.2, the difference in the behavior of the spread in the pre-Depression and post–World War II periods is not.

Changes in the Commercial Paper Market

Given that the spread does not consistently rise after monetary contractions in the pre–World War I and interwar eras, it is reasonable to ask whether there have been changes in the commercial paper market that could make this variable a less reliable indicator of the strength of the credit channel before World War II than after. Our judgment is that there have not.

This is not to say that the commercial paper market has not changed over time. Most obviously, it has grown tremendously. Much of this growth has been in commercial paper issued by finance companies and directly placed, which is not considered in this paper.[16] Nevertheless, the nominal value of dealer-placed commercial paper increased by a factor of roughly 230 between December 1919 and December 1991. For comparison, the nominal value of bank loans increased by a factor of roughly 95 over the same period. This rapid growth, however, does not imply that the early commercial paper market was backward. According to Greef (1938), by 1890 the commercial paper market was national in scope and dominated by large commercial paper houses that were efficient and modern.

15. Kashyap, Stein, and Wilcox (1993) report that in both bivariate VARs and trivariate VARs that include GNP, Romer dates or Romer dates plus a 1966 credit-crunch dummy are statistically significant predictors of the interest-rate spread considered here. Their sample period is 1963–89. The results given above suggest that the Kashyap-Stein-Wilcox results are dominated by a few observations corresponding to the 1980 credit controls.

16. To give a sense of magnitudes, in December 1988, total commercial paper outstanding was approximately $455 billion and dealer-placed finance company paper and nonfinancial company paper were $261 billion.

There have also been some changes in the type of firms which issue commercial paper. In the nineteenth century, it was often the less established or less well regarded firms that issued commercial paper; firms with stronger reputations borrowed from banks.[17] This pattern changed gradually, and by the end of World War I it was typically large firms with solid credit ratings that issued commercial paper. This is still the case today. This change in the quality of borrowers in the commercial paper market is the obvious explanation for the change from negative to positive values of the spread over the last century, shown in figure 8.8.

It is hard to see how either of these changes (the growth of the commercial paper market or the switch to higher quality borrowers) could have caused the spread to fall after some monetary contractions in the early period if the lending channel were important. The market for commercial paper was certainly large enough and established enough by 1890 that it could absorb a significant increase in the supply of commercial paper without extreme movements in interest rates. Similarly, even if less high quality firms typically issued commercial paper in the earlier years than in the interwar or post–World War II periods, a decline in bank lending which made it harder for all firms to get loans would be expected to raise the loan rate relative to the commercial paper rate. Thus, neither of the major changes in the commercial paper market is likely to have made the spread fall after monetary contractions if the lending channel was important.

One institutional factor that could account for the peculiar behavior of the spread after financial panics is the fact that banks held a substantial fraction of the stock of commercial paper in the pre-1929 era. Greef (1938, 62) argues that a banking panic which strapped banks for reserves caused their demand for commercial paper to decline. If this effect were large enough, it could cause the commercial paper rate to rise and thus could cause the spread between the loan rate and the commercial paper rate to rise less than it otherwise might, or conceivably, even to fall. However, it is important to note that this explanation does not account for the very large fall in the spread following the monetary contraction of 1920 because in this episode there was little or no distress in the financial system.

There are alternative hypotheses that could also explain the fall in the spread after early monetary contractions. Most obviously, if the spread merely indicates default risk, then one might expect the spread to fall in the late 1800s and early 1900s because commercial paper was the more risky asset. This same reasoning could explain why the spread rises after monetary contractions in the postwar era, since today commercial paper is the less risky asset. This alternative, while consistent with the data, is not consistent with the view that the spread provides an indication of the strength of the lending channel in any period since it implies that movements in the spread are driven significantly by

17. See, for example, Macaulay (1938, A335).

movements in default risk rather than by movements in the supply of loans relative to bonds.

8.3.2 The Mix

One factor that potentially complicates the interpretation of our results on the behavior of the spread is the fact that since there are other dimensions to a loan besides the interest rate—collateral, for example—the observed interest rate may not be an accurate measure of its price. Or course, as long as the reported interest rate is one component of the price of a loan, the spread should still vary in the direction implied by the lending channel if this component of the transmission mechanism is empirically important. Nevertheless, this consideration implies the presence of possibly substantial noise in the relation between monetary contractions and the behavior of the spread.

In response to this problem of using observed spreads, Kashyap, Stein, and Wilcox (1993) suggest examining quantity variables as indicators of the strength of the lending channel. In particular, they note that if both banks and firms regard loans and securities as imperfect substitutes, a monetary contraction should lower the quantity of bank loans relative to total credit extended. This implication is immune to the criticism that a decline in output for any reason will endogenously tend to induce a decline in bank loans, since even in the face of declining output the lending hypothesis implies that monetary contractions induce a substitution by firms away from bank borrowing toward commercial paper issuance.[18] Kashyap, Stein, and Wilcox test this implication by examining the ratio of bank loans to bank loans plus commercial paper outstanding immediately following four of the Romer and Romer (1989) episodes. They show that this variable, referred to as the mix, tends to fall after Romer dates, consistent with the implications of the lending hypothesis. We extend this approach to early post–World War II and interwar data.

Data and Specification

The mix variable is calculated by taking the ratio of bank loans outstanding to the sum of commercial paper and bank loans outstanding. In calculating the mix we examine quarterly averages of monthly data. Monthly data on the nominal value of commercial paper outstanding are available from the Federal Reserve starting in 1919.[19] Over time, however, there have been changes in the definition and breakdown of the commercial paper data. To the extent possible, we use only data on dealer-placed, non-bank-related commercial paper. Dealer-placed financial company commercial paper is included in the total,

18. Gertler and Gilchrist (1991) discuss possible problems of interpretation with the Kashyap-Stein-Wilcox approach.

19. The data for 1919–40 are from U.S. Board of Governors (1976a, 465–67, tables 126–27). The data for 1941–69 are from U.S. Board of Governors (1976b, 714–18, tables 12.10–12.11). The data for 1970–78 are from the Federal Reserve's *Annual Statistical Digest* (1980, 73–74, table 22). The data after 1978 are from yearly issues of the *Annual Statistical Digest.*

but most financial company paper is directly placed and therefore excluded. Whenever there are changes in definition or data collection procedures and a period of overlap is given, we use ratio splices to prevent discrete jumps in the series.[20]

For the period 1919 to 1991 we use loans data from the asset statement of Weekly Reporting Member Banks in Leading Cities collected by the Federal Reserve.[21] This series reports total loans of reporting banks every Wednesday of the year. We use the data for the last Wednesday of the quarter as the quarterly observation.[22] Because there are some changes in definition and sample over time, we again use ratio splices when there is an obvious break in the series and an observation of overlap is available.[23]

Results

Figure 8.10 displays the mix for the period since 1919. Although we use slightly different data series in order to enhance comparability over time, our results for the second half of the postwar period are quite similar to those presented by Kashyap, Stein, and Wilcox. After the monetary shocks in 1968, 1974, 1978, 1979, and 1988 the mix declines consistently. One should note that during the period from about 1965 on the mix displays a general downward trend, but the declines following the five most recent Romer and Romer dates appear somewhat faster than implied by the negative trend.

In the early postwar and interwar periods, however, the mix does not generally behave as predicted by the lending hypothesis. During the 1947 and 1955 contractions the mix remains approximately constant, and subsequent to the 1931 and 1920 contractions the mix rises. It does fall slightly although briefly in 1937 and declines more consistently after the bank holiday in 1933.

In light of the information presented in section 8.2, the behavior of the mix is most anomalous in the 1920 episode. According to all the measures considered there, the lending channel should have been stronger in the 1920s than during any later period. Yet, during the one monetary contraction in the 1920s the mix behaves exactly contrary to the implications of the lending hypothesis. The behavior of the mix in 1931 is also difficult to reconcile with the lending view. Although bank loans had declined as a fraction of bank assets by 1931, most of this decline presumably reflected an endogenous response of lending

20. Splices are done in January 1970, August 1959, and December 1952.

21. The data for 1919–41 are from U.S. Board of Governors (1976a, 132–62, table 48). The data for 1942–70 are from U.S. Board of Governors (1976b, 256–82, table 4.1). The data after 1970 are from various issues of the *Annual Statistical Digest* of the Federal Reserve.

22. We have examined both seasonally adjusted and unadjusted data. Since the differences between the results were extremely small, we present only the unadjusted results for comparability with Kashyap, Stein, and Wilcox.

23. The two cases where we are able to do splices are in June 1969, when there was a change in the reporting form, and in January 1972, when all of the data back to 1972 were revised to conform to a new coverage basis started in 1979.

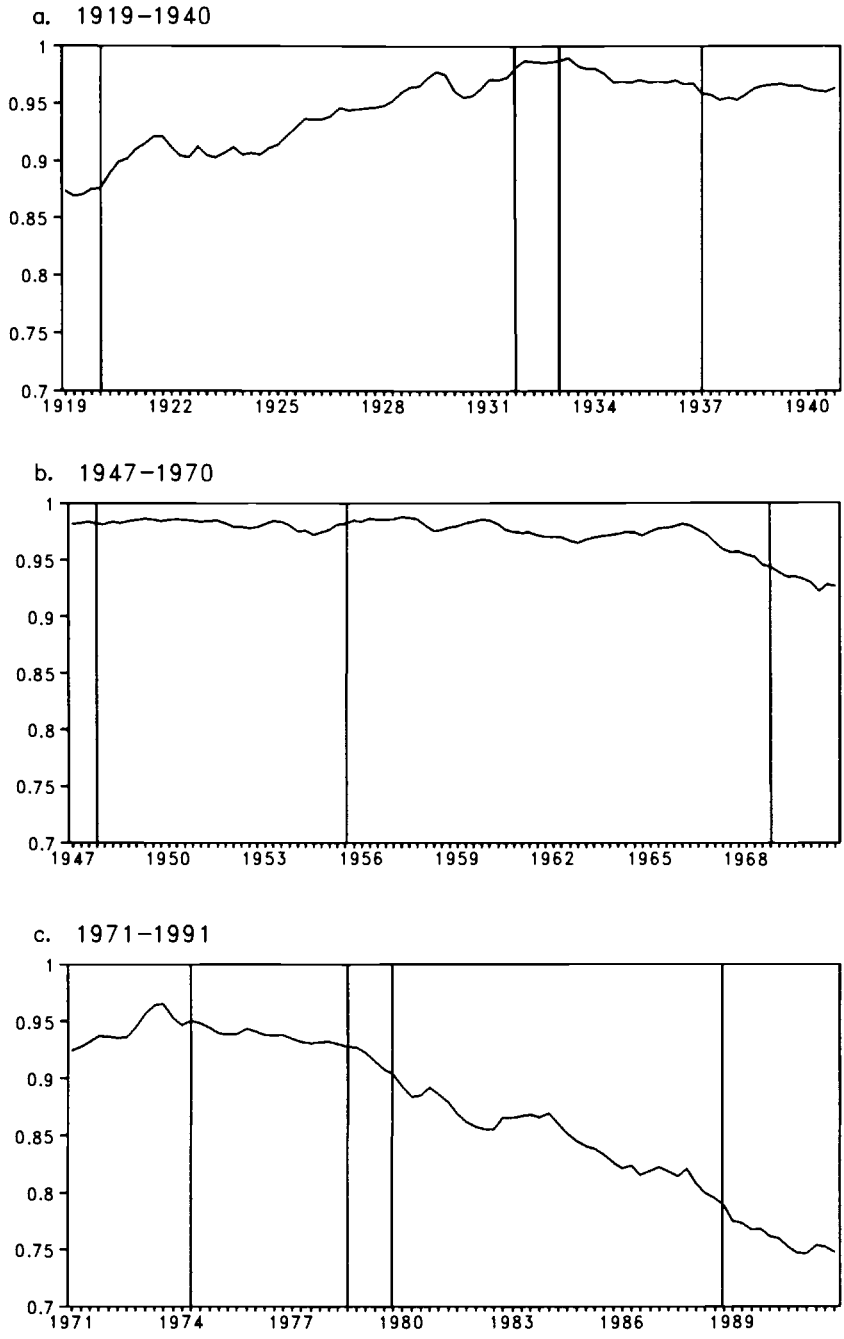


Fig. 8.10 The mix and monetary contractions, 1919–91

Note: The mix is calculated as the ratio of bank loans outstanding to the sum of bank loans and commercial paper outstanding. Vertical lines denote the dates of negative monetary shocks.

to the fall in output, rather than a structural change in the importance of the lending channel. Therefore, the mix should have fallen rather than risen in this episode.

Changes in the Commercial Paper Market

As with the spread, it is important to consider whether there is anything peculiar about the commercial paper market that could explain the dramatic rise of the mix in 1920. First, at a general level, the argument that the expansion and improvement in the quality of commercial paper should not have affected the behavior of the spread also applies to the mix. The commercial paper market was large enough and comprised of high enough quality borrowers by the end of World War I that a monetary contraction which reduced the ability of firms to borrow from banks should have led to a rise in commercial paper issued relative to bank loans.

The effect on the commercial paper market of the establishment of the Federal Reserve is a complicated topic that may be related to the behavior of the mix in 1920. The Federal Reserve Act of 1913 made commercial paper eligible for rediscount by the Federal Reserve banks for their member banks. According to Greef, this "created a broader and more continuous market for notes handled by dealers and thus gave them a greater degree of liquidity than they had possessed at any previous time" (1938, 143). This presumably encouraged the growth of the commercial paper market. At the same time, however, the Federal Reserve sought to encourage the development of the bankers' acceptances market by also allowing member banks to accept bills of exchange for rediscount.[24] Both Greef and Macaulay (1938) argue that this development may have had little effect on the commercial paper market because acceptances were typically used for financing transactions very different from those for which commercial paper was used. Greef thinks that changes in firm operating practices, the boom in the stock market, and the generally unsettled condition of business in the 1920s were the more important sources of a decline in the volume of commercial paper issued in the 1920s.

Even if the policies of the Federal Reserve were a factor in the long-term rise in the mix in the interwar era, it is hard to see how this could explain the dramatic rise in the mix in 1920. As can be seen in figure 8.9, the rise in the mix in 1920 and 1921 exceeds any reasonable estimate of the usual trend behavior of this series.

8.3.3 The Correlation between Output and Lending

A final test of the strength of the lending channel in different eras involves examining the correlation between output and lending both after monetary contractions and in other periods. In any time period there is likely to be a positive correlation between lending and output because lending has a substantial endogenous component: investment and loans tend to go up when the econ-

24. Bankers' acceptances are two-name paper; they are a direct liability of the firm issuing them and a contingent liability of the bank guaranteeing funds at maturity.

omy is doing well and fall when the economy is declining. However, if lending also has an independent component which declines in monetary contractions and actually causes a fall in output, the correlation between lending and output should be even higher than usual soon after monetary contractions, because both the usual endogenous response and the independent lending channel will be operating. This reasoning suggests that the differential in the correlation between output and lending after monetary contractions and in other times provides information about the importance of the lending channel. If there is a large difference between the two correlations, this is evidence that there is a lending channel to the monetary transmission mechanism. Comparing this differential across eras can indicate whether the lending channel used to be stronger in the past than it is today.

Data and Specification

For these calculations we use quarterly data on lending and industrial production. The lending data that we use for this calculation come from two sources. For the period 1884 to 1929 we use data collected by the Comptroller of the Currency. These data show the quantity of loans held by national banks on particular call dates during the year.[25] While this series does not show data for the same dates each year or for every month, there is almost always one call date in each quarter of the year. When there is more than one call date in a quarter, we use the later of the two as the observation for the quarter.[26] Furthermore, as discussed above, since national banks account for nearly half of all bank assets in the pre-1929 era, this loan series has reasonably broad coverage. For the period 1919 to 1991 we use the loans data from Weekly Reporting Member Banks discussed in section 8.3.2.

The industrial production series for 1919–91 is from the Federal Reserve Board. Before 1919 we use a smoothed version of the index of industrial production compiled by Miron and Romer (1990). This series is smoothed based on a regression of the Federal Reserve Board index for 1920–29 on the Miron-Romer series.[27]

Since the relationship between lending and output is presumably more complicated than a simple contemporaneous correlation we use the following regression to estimate the correlation. We first detrend and seasonally adjust both lending and industrial production by regressing the percentage changes on quarterly dummy variables and a linear trend and then taking the residuals. We then regress the residuals for industrial production on the contemporaneous

25. The data for 1884–1918 are given in U.S. Comptroller of the Currency, 1919, *Annual Report* (pp. 276–303). The data for 1919 are from the 1924 *Annual Report.* The data for 1920–24 are from the 1927 *Annual Report.* The data for 1925–32 are from the 1932 *Annual Report.* Since the early data lump total loans and discounts together with overdrafts, we include overdrafts in the total when they begin to be reported separately in 1898.

26. After 1924 it is often the case that there is no call date in the third quarter of the year but instead two observations for the fourth quarter. For these cases we take the first call date for the fourth quarter (which is typically in early October) as the observation for the third quarter.

27. See Romer (1994) for a full discussion of this adjustment.

Table 8.1 **R^2's from Regressions of Industrial Production on Lending**

Sample Period	0–12 Quarters after a Monetary Contraction	All Other Times
	Comptroller of the Currency Lending Data	
1885:1–1929:4	0.32	0.08
1885:1–1914:4	0.35	0.13
1920:1–1929:4	0.56	0.10
	Weekly Reporting Banks Lending Data	
1920:1–1929:4	0.59	0.06
1920:1–1940:4	0.65	0.35
1948:1–1991:2	0.29	0.12
1948:1–1970:4	0.36	0.13
1971:1–1991:2	0.29	0.21

value and three lags of the residuals for lending. The R^2's of the regressions are a measure of the explanatory power of lagged and contemporaneous lending for movements in real output. We run this regression both for the sample period that includes only the twelve quarters after monetary contractions and for the sample period that consists of all other times. We estimate this pair of regressions for different eras, including our main periods of comparison, 1885–1929 and 1948–91.

Results

The R^2's of these regressions for different eras are given in table 8.1. First, because the lending data change between the pre-1914 and post-1948 period, it is important to compare the results for the period 1919 to 1929, when both lending series exist. As can be seen from the table, the two lending series give very similar results for the 1920s; the R^2's for both regressions are nearly identical using the two different lending series.

Because data differences do not seem to matter, it is reasonable to compare the data before 1929 with those after 1948. For the period 1885–1929, the spread between the R^2 for the regression for the period twelve quarters after monetary contractions and that for all other times is 0.24. For the period 1948–91, the spread in R^2's is 0.17. These results suggest that there has been little change in the spread in R^2's over time. To the degree that there is any difference, the spread in the R^2's is slightly larger before 1929 than after 1948. The results also show that the absolute spread is fairly small in both eras, on the order of 0.2. To put this spread in perspective, the same type of regression for money (using data on M1) yields spreads of between 0.3 and 0.4 for various sample periods in the postwar era.[28]

28. The data on M1 for 1919–58 are from Friedman and Schwartz (1963, 709–21, table A-1, col. 7). The data for 1959–91 are from the Citibase data bank, July 1992 update. A ratio splice is

There is some variation in the relationship between the R^2's when one looks at certain shorter sample periods. First, the spread between the R^2 for the regression estimated for the sample period after monetary contractions and that for all other times is substantially bigger for the 1920s than for the period before 1914: the spread is roughly 0.5 for the 1920s and 0.2 for the three decades before 1914. This finding should be interpreted with caution, however, because there is only one monetary contraction during the 1920s (1920:1). Second, within the postwar era, the results are somewhat different for the two decades before 1970 than for the two decades after. The spread between the R^2's for the two regressions before 1970 is 0.23, almost identical to that in the pre-1929 era. For the period 1971–91, however, the spread is only 0.08. This suggests that, if anything, the lending channel has gotten weaker over the postwar era.

8.4 Conclusions

Our goal in this paper has been to use historical data to shed light on the importance of the lending channel of monetary transmission. We began by laying out a model in which shocks to the money supply affect aggregate demand through both the money and lending channels. We used this model to analyze the effect of structural changes on the importance of the lending channel. We showed that increasing the fraction of bank assets made up of loans and raising the reserve requirement on bank issue of liabilities, such as time loans or CDs, increases the importance of the lending channel. Similarly, raising the fraction of firm finance made up of bank loans or the fraction of investment done by bank-dependent small firms makes the lending channel more important.

Armed with the results of this modeling exercise, we then analyzed the historical changes in the structure of finance. We found that several changes in financial structure over the past one hundred years should have had major effects on the importance of the lending channel. The fraction of bank portfolios held in the form of loans declined dramatically during the Depression and World War II eras and rose during the latter half of the post–World War II era to nearly its pre-Depression level. Both absolute and relative reserve requirements on time deposits and CDs fell dramatically with the founding of the Federal Reserve and fell further in the post–World War II period. Similarly, the ratio of bank loans to the capital stock fell dramatically with the onset of

used to connect the two series in January 1959. The usual money-output relationship breaks down after the 1988 monetary contraction: the movements in money are much larger and further behind the movements in output than after other monetary contractions. For this reason, the spread in the R^2's for money is small for sample periods that include the post-1987 period, but large for the pre-1986 era.

the Great Depression and did not return to its pre-1929 level until the second half of the post–World War II era. The relative importance of unincorporated firms, which are presumably more dependent on banks than are corporations, fell over the first seventy years of the twentieth century, although it rose in the 1970s and 1980s to levels higher than those experienced before the Depression. The overall effect of these changes should have been to weaken the lending channel in the early post–World War II period compared to the pre-Depression era. The lending channel may have been stronger in the second half of the post–World War II era than in the first half, but whether it should have been as strong as the pre-Depression era is not clear.

We then turned to the data to see whether we could find evidence of the changes in the importance of the lending channel predicted by our model given the observed changes in financial structure. The results of this exercise were striking. The systematic increase in the interest-rate spread between loans and bonds that the lending channel predicts should follow a monetary contraction does not appear in the data. The mix, which declined following monetary contractions in the later post–World War II period, fails to do so in the one pre-Depression contraction for which we have evidence. Finally, the difference between the R^2's of regressions of output on lending inside and outside of contractionary episodes is no larger in the pre-Depression period than in the post–World War II period.

Our failure to find evidence of the systematic changes in the response of these indicators to monetary contractions predicted by our model of the lending channel is subject to two interpretations. First, the indicators we examine may simply be poor measures of the importance of the lending channel. In this case, much of the evidence in favor of the existence of a strong postwar lending channel would have to be questioned. Alternatively, it may be that changes in the importance of the lending channel have not been reflected in these measures because the lending channel itself is very weak. As a result, most of the movement in these indicators would be due to noise or random events, not to changes in the specialness of bank loans over time. Our analysis does not rule decisively on which of these two explanations is correct. However, both of these interpretations suggest that the empirical relevance of the lending channel has yet to be demonstrated.

Appendix
Balance Sheet Data for Firms and Households

The data come from three basic sources: Goldsmith, Lipsey, and Mendelson (1963), the U.S. Board of Governors of the Federal Reserve System (1973), and the U.S. Board of Governors of the Federal Reserve System (1990). These

sources are referred to as GLM, FRB 1973, and FRB 1990, respectively, in the following descriptions. We line up the data from GLM on nonfinancial corporations with the FRB series on corporate, nonfinancial business, and the data from GLM on nonfarm unincorporated businesses with the FRB series on nonfarm, noncorporate business.

The general strategy is to line up particular components of the balance sheet that are of interest, such as total liabilities, bank loans not elsewhere classified, and bonds and notes, from the different sources and then ratio splice them together. The ratio splices are necessary because the series do not line up exactly due to slight changes in concepts and measurement techniques over time. The data for 1966–89 are from FRB 1990 and are taken as they are. The data for 1946–66 are from FRB 1973 and are ratio spliced to the modern data in 1966. The data for 1900–45 are from GLM and are spliced on in 1945.

Nonfinancial Corporations

The balance sheet data for 1900–45 are given in GLM (1963, 146, table III-4b). The data for 1945–66 are from FRB (1973, 85–87). The data for 1966–89 are from FRB (1990, 9–10). The GLM data include commercial paper liabilities in the bonds and notes category, while the FRB reports bonds and open-market paper separately (GLM, p. 10). We combine the two to be the extension of the GLM series. Trade debt is gross for both sources. The data for corporate equities for 1900–45 is from GLM (1963, 318–19, table IV-b-17b). The equities data for 1945–66 are from FRB (1973, 117–19) and for 1966–89 are from FRB (1990, 9–10).

Nonfarm, Unincorporated Businesses

We had hoped to form a continuous balance sheet for nonfarm, unincorporated businesses as well as for corporations. However, in 1945, the one year of overlap between the two series, bank loans n.e.c. are roughly nine times larger in the GLM data than in the FRB data. Much of this difference appears to be due to how total liabilities are allocated among categories. For this reason, we do not examine the individual elements of the unincorporated business sector. We do, however, use the data on total liabilities. The data for 1900–45 are from GLM (1963, 128, table III-2a). Data for 1945–66 are from FRB (1973, 85–87) and for 1966–89 from FRB (1990, 7–8). Adjustment of the FRB series is needed because for 1945–66 the total liabilities series includes net trade debt, while GLM and the later FRB series includes gross trade debt (GLM, p. 9). For these years we subtract net trade debt from total liabilities, and add in gross trade debt.

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Comment

Ben S. Bernanke

It will probably not come as a surprise that I find the evidence found by these authors against the "lending" view of monetary policy transmission to be less compelling than they do, and I will devote most of this Comment to explaining why. But Miron, Romer, and Weil (MRW) are nevertheless to be commended for bringing the historical approach to bear on the question of how monetary policy changes are transmitted to the economy. Given the inherent difficulties of discriminating among hypothesized channels of monetary transmission, it is certainly worthwhile to see whether the important changes that have occurred in financial institutions, markets, and regulations over the last century can provide any identifying power. In a similar spirit, international differences

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in financial markets and institutions existing at a given time might also prove useful for identifying the channels of monetary transmission.

The meat of this article is to be found in sections 8.2 and 8.3, in which MRW attempt to build an empirical case against the existence of a lending channel. In brief, the logic of their case is as follows: First, in section 8.2, MRW use historical information about changes in financial institutions, financial regulation, and portfolio behavior to argue that the lending channel, if it ever existed, is likely to have become weaker over time. Second, in section 8.3, they examine some empirical indicators of the lending channel, looking for changes in the behavior of these indicators across different subperiods. Since they do not find that these indicators differ across subperiods in the way suggested by their analysis of section 8.2, they conclude that the lending channel was probably not important in any period.

I think both steps of this argument are subject to question. Let me take them in order, beginning with the proposition that the lending channel has become less important.

Most of section 8.2's conclusion that the lending channel has weakened over time depends on treating endogenous variables (such as the ratios of loans to securities in the banking sector, or the share of capital financed by bank loans) as if they were exogenous. For the type of argument MRW want to make, however, it is not enough to know that the values taken on by certain endogenous variables have changed over time; it is crucial also to know *why* the endogenous variable changed, and what else was changing in the system at the same time.

For example, the finding that over some period loans fell relative to the capital stock—the result, MRW argue, of the increased development of the equity market—does not necessarily imply that the lending channel became less important, as the authors conclude.[1] It could just as well be argued, for example, that the withdrawal of large firms from the use of bank credit resulted in the typical bank borrower having fewer alternative credit sources and less internal finance available than before. This change would imply a sharper effect of a given contraction of bank lending on spending, since borrowers denied bank credit would have nowhere else to go.

Similarly, the increased share of loans in banks' portfolios in the latter postwar period does not necessarily imply that the lending channel was strengthening after 1970, as the MRW methodology would suggest: rather, it is likely that this increase in loan share was driven by developments such as securitization that increased the liquidity of bank loans, as well as improvements in money markets that reduced banks' precautionary demand for securities. These changes might well have weakened the lending channel on net by increasing

1. Inventory stocks would be a more reasonable denominator than the capital stock in this application, since bank loans are typically used to finance working capital rather than long-term fixed capital.

banks' willingness to reduce securities holdings to low levels in times of tight money.

The bottom line is that, to make the case for regime changes, it is important to focus on fundamental institutional or regulatory changes rather than on endogenous choice variables of banks or firms, as MRW have done in a number of cases.

A second general objection to the analysis of section 8.2 is its asymmetry: it looks at only the institutional changes affecting the potency of the lending view but not those affecting the potency of the money view. In fact, a number of changes—most notably, the development of a variety of close money substitutes—would lead one to guess that the "money channel" has weakened over this period as well. Thus it is possible that the *relative* contribution of the lending channel to the overall impact effect of monetary policy changes has risen or stayed the same instead of falling. It seems to me that the failure to control for changes in the money channel vitiates the tests of section 8.3, which implicitly assume that the potency of the money channel has not changed.

A final comment to be made about the historical analysis has to do with truth in advertising: although there are qualifications in the paper, when interpreting or summarizing their results MRW tend to overstate the degree to which the weakening of the lending channel can be found in the data. For example, in their introduction they write, "Our analysis shows that the lending channel should have played a *much greater* role in the pre-1929 era than during the post–World War II period, *especially* the early part of this period" (italics mine). I think any reasonable parsing of that sentence gives the meaning that the strength of the lending channel was definitely lower after 1970 than before 1929, even though the difference might have been less than the difference between the early postwar period and the pre-1929 period. Yet, even if we accept MRW's methodology (which I have suggested we should not), this claim is not well supported by what they find. For example, figures 8.4, 8.5, and 8.7 of their paper suggest that the lending channel was approximately as strong after 1970 as it was pre-1929. The implication is that MRW's tests of section 8.3 must rely heavily, not on obvious differences between the pre-1929 and post-1945 eras, but rather on the outlying observations generated by the experience of the 1950s and early 1960s.

In section 8.3, as I have noted, MRW examine the behavior of some indicators of the lending channel across the "regimes" identified in section 8.2. Not finding the differences in behavior across regimes that they expect, they conclude that the lending view must have never been relevant. I find this logic strange. As an analogy, consider a scientist with two beakers (metaphors for the prewar and postwar periods). Suppose that the scientist has pretty good a priori reasons (based on historical analysis) to believe that a certain compound (the lending view) is in beaker A (the prewar period), but is unsure about whether the compound is in beaker B (the postwar period) as well. Using instruments of uncertain quality (the lending-view indicators), the scientist tests

beaker B for the compound. Not receiving a definitive answer, she then uses the same instruments to test beaker A, again not finding anything definitive. What should the scientist conclude? MRW seem to think that the right conclusion is that the compound is in neither beaker, despite the a priori reasons to believe that the compound was in beaker A. It seems to me that the right conclusion is instead that the instruments aren't any good.

In fact, the "instruments" used by MRW to detect a lending channel are quite tenuous. I discuss each of MRW's three indicator variables briefly:

The Loan Rate—Commercial Paper Rate Spread

The authors use this interest-rate spread to proxy for the loan-bond spread in the theoretical model, a spread which the model predicts should rise when monetary tightening reduces the relative supply of bank loans. Unfortunately, this proxy is a poor one: First, the empirical bank-loan rate does not measure the marginal cost of bank funds to a constant-quality borrower, as it would have to do to match the theoretical construct. Rather, factors such as changing borrower mix, changes in collateral and other nonprice terms, and possibly rationing may make the empirical loan rate behave very differently from its theoretical counterpart. In particular, counter to a claim of the paper, it is plausible that the theoretical and empirical spreads do not even have to move in the same direction. For example, there is good evidence that banks drop smaller and riskier borrowers in favor of larger, safer ones during a recession. This "flight to quality" effect alone could explain the sometimes perverse movements of the empirical loan rate.

As the empirical loan rate is a poor proxy for the loan rate in the theory, so is the commercial paper rate a poor proxy for the safe rate in the model. Commercial paper (CP) is not a safe (or even completely liquid) asset; early in the MRW sample there were periods in which the CP rate actually exceeded the loan rate. In the postwar period, the commercial paper rate (and the CP rate–Treasury-bill rate) has been a sensitive indicator of monetary contractions and credit crunches, probably because of imperfect liquidity of the CP market. Thus using the CP rate as a proxy for the safe rate is likely to be highly misleading.

The reader of this comment may suspect that my criticism of the loan rate–CP rate spread as an indicator arises in part because I don't like the results of the test. On the contrary, the empirical problems with using this spread as an indicator have been understood in the literature for a long time. In my 1983 paper, for example, I wrote

> It would be useful to have a direct measure of the CCI [the bank's loan rate less the cost of funds]; unfortunately, no really satisfactory representation of this concept is available. Reported commercial loan rates reflect loans that are actually made, not the shadow cost of bank funds to the representative potential borrower; since banks in a period of retrenchment make only the

> safest and highest-quality loans, measured loan rates may well move inversely to the CCI. (Bernanke 1983, 264)

I have made similar observations in a number of subsequent papers, as have other people working on this topic.

The Correlation between Output and Lending

As the basis for another test of the lending view, MRW argue that, if the lending view is true, loans and output should be more strongly correlated during periods of monetary restriction than otherwise. However, they do not present any formal explanation of why we should take the simple correlation of two endogenous variables as evidence for a structural hypothesis. Indeed, there are forces working in the opposite direction of their claim: for example, most studies of the response of loans to a monetary contraction find that loans actually rise in the short run, a pattern that appears to be the result of larger firms taking down their lines of bank credit in order to finance unintended inventory accumulations. This pattern is not inconsistent with a role for the lending channel in the medium run (indeed, small firms without lines of credit feel the brunt in the short run); yet the "perverse" movement of loans immediately following a monetary contraction could rationalize even a decline in the correlation of loans and output during periods of monetary stringency. More broadly, as I have argued in much greater detail in a Comment on Ramey (1993), it is generally not the case that reduced-form correlations or timing relationships among output, money, and loans can identify the channels of monetary transmission.

As it happens, however, MRW do find a stronger relationship between industrial production and bank lending during the three years following a monetary contraction than at other times (their table 8.1). Rather than emphasize this finding, however, MRW look at the *differences of differences of* R^2*'s* (of the regression of output on lending) across the various regimes, arguing that the differential link of output and lending (between tight money periods and other periods) should be stronger where the lending channel is stronger. At this point, noise in the data must be the dominant factor. Incredibly, and swallowing all the logical steps leading up to this test, the MRW results don't look that bad for the lending view: the differential R^2's do seem to fall over time, as predicted by the premise that the lending channel has weakened over time. Nevertheless, without statistical or other rationales, MRW conclude that these results are somehow not favorable to the lending view. I don't understand why not, given the logic of the test.

The Mix between Bank Loans and Commercial Paper

In an innovative paper, Kashyap, Stein, and Wilcox (1993) showed that the ratio of loans to commercial paper fell sharply in periods of monetary stringency, a result they interpreted as confirming the lending view's implication that tight money forces borrowers away from banks toward other credit

sources. MRW reproduce these results for the postwar period but find them to be less evident in other periods. In particular, during the 1920 tight money episode loans actually rose relative to commercial paper.

Of the three indicators that MRW use, I think the "mix" variable is the most legitimate, and the only one of the three that can be called (in MRW's phrase) a "traditional" indicator of the lending view. Thus I find MRW's evidence, particularly the anomalous 1920 episode, to be intriguing and worth exploring further. My guess is, though, that the explanation for 1920 will turn out to lie in differences in institutions between then and now. In particular, in 1920 commercial paper was not backed by bank lines of credit (as it almost always is today), and commercial paper borrowers often posed as much credit risk as bank borrowers. Thus it is possible that the "flight to quality" phenomenon worked in the opposite direction in 1920 than it does today.

In challenging MRW's specific tests, I do not mean to imply by any means that the existence of the lending channel is not a testable proposition. On the contrary, there is now quite a large body of evidence—including observations on the nature of institutional arrangements, historical experiences, and more formal econometric studies—that confirms various aspects of the lending view hypothesis. This evidence is discussed very completely by Kashyap and Stein in chapter 7 of this volume, so I will not restate those points here. But MRW's implication that there exists no positive evidence for a lending channel—even a lending channel that plays a relatively small role in the overall monetary policy transmission process—is clearly not correct.

This brings me to a final general point, which again concerns the asymmetry of the testing procedure followed by MRW. MRW implicitly treat the conventional money view as the null hypothesis; when their tests do not turn up convincing evidence for the lending view, they seem happy to ascribe all of the (unexplained) impact of monetary policy to the money channel. But MRW never offer any positive evidence for the money view!

What if we were to turn the exercise around and make the lending view the null hypothesis, thereby putting the burden of proof on the money view? I think the money view would do badly. First of all, as I discussed in the previous paragraph, there is a respectable set of arguments and evidence making the positive case for the existence of the lending view. (The case for the lending view becomes even stronger when its definition is broadened to include other imperfect capital markets phenomena, such as balance sheet and cash flow effects.) In contrast, the proposition that the money channel is powerful runs into some challenging empirical problems. These difficulties include (*a*) the increasing prevalence of money substitutes, which reduces the leverage of the money channel on interest rates; (*b*) the "term structure problem," that is, the relative inability of the Fed to control long-term as opposed to short-term interest rates (presumably, long-term rates are the ones relevant to most firm investment decisions); and (*c*) the "cost of capital problem," that is, the consistent finding that small to moderate changes in interest rates don't seem to affect

investment decisions very much. A serious defense of the conventional money view should address these issues as well as attack the lending view.

I have tried to refute what I believe to be invalid or fragile conclusions drawn by this paper, particularly the rather implausible claim that the lending channel should be given literally no weight at all in the monetary transmission process. Evidence and common sense tell us that both the money and lending channels must be operative to some degree. The real question (both for economists and Federal Reserve policymakers) is quantitative: how big are the two channels and by how much has their relative importance changed over time? We should try to develop and estimate general models of bank, depositor, and borrower behavior that will allow us to get at these questions.

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