

Does Bank Capital Matter for the Transmission of Monetary Policy?

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Introduction

Traditional monetary theory has largely ignored the role of bank equity. Bank-centred accounts of how monetary policy affects the real economy usually focus on the role of reserves and reserve requirements in determining the volume of demand deposits and, in the case of the bank lending channel, bank loans. As Benjamin Friedman (1991) observed, “Traditionally, most economists have regarded the fact that banks hold capital as at best a macroeconomic irrelevance and at worst a pedagogical inconvenience.” This stands in stark contrast with the importance attached to capital adequacy in the regulation of banks, especially since the adoption of the Basel Accord in 1988, which established risk-based capital requirements in the Group-of-Ten countries. The implementation of these regulations, along with other factors, has often been blamed for a perceived credit crunch in the United States immediately prior to and during the 1990–91 recession,

* This paper is a summary of “The Bank Capital Channel of Monetary Policy,” presented by the author at the conference. An earlier version of this paper appeared in the *Economic Policy Review*, Federal Reserve Bank of New York, Vol. 8, No. 1. The author would like to thank the discussant, Césaire Meh, as well as Andrew Abel, Kenneth Kuttner, Loretta Mester, Jeremy Stein, and conference participants for helpful comments and suggestions.

giving rise to the term “capital crunch.”¹ Research on this and other episodes has found that low bank capital is associated with sluggish lending.²

Despite this evidence, the role of bank capital and capital requirements in the monetary policy transmission mechanism has received much less attention.³ This paper addresses the issue by examining how bank capital and its regulation affect the role of bank lending in the transmission of monetary policy.⁴ I argue that taking into account bank capital has interesting implications for our understanding of the monetary policy transmission mechanism. In addition, I briefly discuss whether recently adopted and proposed amendments to the Basel Accord can be expected to change these implications.

1 Bank Capital and the Lending Channel

In theory, at least two distinct ways exist in which the level of bank capital can change the impact of monetary shocks on bank lending: through the traditional bank lending channel and through a more direct mechanism that can be described as a “bank capital channel.” Both channels derive from a failure of the Modigliani-Miller theorem for banks. In a Modigliani-Miller world of perfect capital markets, a bank’s lending decisions are independent of its financial structure, just as a non-financial firm’s investment decisions are independent of its financial structure under such conditions. Since the bank will always be able to find investors willing to finance profitable lending opportunities, the level of bank capital is irrelevant to lending, and thus to the monetary policy transmission mechanism.⁵ For each channel, this

1. Syron (1991). Also see Bernanke and Lown (1991).

2. See Sharpe (1995) for an overview of the literature dealing with this episode. In his judgment, the research has been less successful in determining whether this association is due to a causal effect of bank capital on loan supply, because of the difficulty in distinguishing between loan demand and loan supply. Hubbard, Kuttner, and Palia (2002) tackle this identification problem by using a matched sample of individual loans, borrowers, and banks. They find that higher bank capital lowers the rate charged on loans, even after controlling for borrower characteristics, other bank characteristics, and loan contract terms.

3. Exceptions are Bernanke and Lown (1991), Thakor (1996), Bolton and Freixas (2001), and the references mentioned in sections 1 and 2 in the discussions of the roles of capital in the bank lending channel and the bank capital channel.

4. There may also be interesting connections between capital requirements and the volume of demand deposits, which are part of the money supply. Diamond and Rajan’s (2000) work suggests that capital requirements may inhibit a bank’s ability to create liquidity. This avenue is not pursued here.

5. In fact, strictly speaking, there is no reason for banks to even exist in a Modigliani-Miller world, since firms could borrow directly from households.

logic fails for a specific reason, although the nature of the failure is somewhat different in each case. While the two are by no means mutually exclusive, it is easier to discuss them separately.

According to the thesis of the bank lending channel, monetary policy has a direct effect on the supply of bank loans, and thus the real economy, because banks finance loans in part with liabilities that carry reserve requirements.⁶ By lowering bank reserves, contractionary monetary policy reduces the extent to which banks can accept reservable deposits, if reserve requirements are binding. The decrease in reservable liabilities will, in turn, lead banks to reduce lending, if they cannot easily switch to alternative forms of finance or liquidate assets other than loans. Thus, a necessary condition for a bank lending channel to be operative is that the market for non-reservable bank liabilities is not frictionless.⁷ Otherwise, the bank could simply offset the decline in reservable deposits by costlessly switching to liabilities that carry no reserve requirements or lower reserve requirements, such as certificates of deposit (CDs). In this way, there would be no reason for the bank to forgo profitable lending opportunities resulting from a binding reserve requirement.

Romer and Romer (1990), among others, claim that banks can, in fact, switch fairly easily to non-reservable liabilities, and for this reason, they have expressed skepticism about the size of the lending channel. Kashyap and Stein (1995, 2000) and Stein (1998), however, counter (and provide evidence) that this type of Modigliani-Miller logic that Romer and Romer appeal to will fail if there is asymmetric information about the value of the bank's assets. In that case, as Stein's model shows, adverse selection leads to a "lemon's premium" in the market for risky bank liabilities. Since most non-reservable bank liabilities are not insured, they are therefore somewhat risky, so the market for them is likely to be imperfect.

6. For an overview of the theory and empirical evidence relating to the bank lending channel, see Kashyap and Stein (1994). Bernanke and Blinder (1988) provide a statement of the lending channel in terms of an IS/LM type model. Stein (1998) provides a "micro-founded" adverse-selection model of bank asset and liability management that generates a lending channel. See also Kashyap and Stein (2000).

7. For output effects, other necessary conditions are the presence of some nominal rigidity and that some borrowers cannot find perfect substitutes for bank loans (that is, the Modigliani-Miller theorem must fail for some non-financial firms, as well as for banks). See the references in the previous footnote for a discussion of these conditions. In addition, in its standard formulation, a final necessary condition for the existence of a lending channel is, of course, that reserve requirements are binding. In reality, many countries do not have legal reserve requirements, and, even in the United States, they are not binding for many banks. As long as reserves are crucial in the production of demand deposits, however, it can be argued that a "technological" reserve requirement effectively exists.

This discussion of the lending channel makes no reference to bank capital or capital regulation. The reason is that, in essence, the lending channel occurs because banks face a liquidity constraint: if all banks always have sufficient cash or liquid securities or are able to access a frictionless market for some managed liability, there is no lending channel. Nonetheless, there are important connections between the strength of the lending channel and the level of bank capital.

First, as noted by Bernanke and Lown (1991) and Kashyap and Stein (1994), among others, the lending channel may be less potent when bank equity is at or below the regulatory minimum for a sizable fraction of banks. This is because, with a binding risk-based capital requirement, a bank cannot expand lending without additional capital. If it is costly to issue risky non-reservable liabilities—a prerequisite for the existence of the lending channel—then it is certainly costly to issue equity, the most junior liability.

In the extreme case that equity is fixed in any given period, shocks to reserves will have no effect on lending if capital requirement is binding. An increase in bank reserves will still lead to an increase in reservable bank liabilities in these circumstances, but these additional funds must be put in assets that do not carry a capital requirement, such as government securities. They cannot be used to make (private) loans. Thus, the lending channel is shut down. In the intermediate case in which the marginal cost of issuing equity is increasing in the value issued (but not infinite), the lending channel will not be shut down completely, but it will be diminished in strength. Furthermore, as the discussion of the bank capital channel (see section 2) will make clear, this effect may manifest itself even when the capital requirement is not currently binding, but may be binding in the future.

This suggests that monetary policy effects on bank lending will be smaller when more banks have low capital levels relative to the regulatory minimum. Unlike reserves, there is no interbank market for equity, so it is not just the average of bank capital that matters, but also its distribution across banks.

There is one important caveat to the conclusion that capital requirements, when binding, lower the effectiveness of monetary policy via the lending channel: the above effect is entirely static. If monetary policy actions affect bank profits, perhaps through changes in open market interest rates, then over time this will accumulate to changes in bank capital. Starting from a position of a binding capital requirement, any change in bank capital can, in turn, have a potentially large effect on lending. This dynamic effect is essentially the point of the bank capital channel, which I discuss in greater detail in section 2.

A second way in which bank equity can affect the strength of the lending channel is by mitigating the adverse-selection or moral-hazard problems in the market for non-reservable bank liabilities. To see this, consider two banks with the same quality assets, but different liability structures—bank one, say, has less equity and more debt than bank two. Suppose further that, following a contractionary monetary policy shock, both banks face an equal outflow of reservable deposits.⁸ Thus, both banks need to issue managed liabilities, say, large-denomination CDs, to keep lending at a normal level. Even though both banks have equally risky assets, bank one's CDs are more risky, because bank one has less equity to absorb future losses. Consequently, bank one's CDs are more exposed to problems of asymmetric information concerning the value of the bank's assets, and thus command a larger "lemon's premium." Hence, following the contractionary monetary shock, bank one will optimally choose to issue fewer CDs and cut back lending by more than the better-capitalized bank two. We have now reached a seemingly opposite conclusion: the lending channel is *stronger* for banks with *lower* levels of capital.

It is important to note that for this second effect, it is arguably the *market value* of bank equity that is the relevant quantity as the best measure of the bank's expected future free cash flows. For the first effect, which occurs when capital requirement is binding, the right quantity is clearly the book value of bank capital, as defined by the capital regulations.

The upshot is that the bank lending channel is likely to be weaker when, (i) among adequately or well-capitalized banks, (the market value of) equity is at high levels; or (ii) the fraction of poorly or undercapitalized banks is large. The fact that these conditions are somewhat contradictory illustrates that it is important to take into account the distribution of equity across banks, not just the mean. To the extent that the lending channel is economically large, a given change in the federal funds rate is likely to have a smaller effect on economic activity under these conditions.

The discussion so far has treated bank capital as given. But even in the presence of the sort of financial frictions that are central to the lending channel and that prevent banks from readjusting their capital at any given moment, this cannot be a complete analysis. Clearly, in response to economic conditions, banks do replenish their equity over time, mainly through retained earnings, or pay it out to shareholders as dividends. If bank equity responds in a systematic way to monetary shocks, then the above

8. Competition for deposits, combined with an interbank market for reserves, makes it unlikely that the deposit outflow will be equal, because the low-equity bank will turn out to have a bigger incentive to retain reservable deposits. However, Stein's (1998) analysis shows that even perfect interbank competition for deposits will not undo the conclusion.

conclusions may need to be modified. The fact that such a dynamic response is to be expected is one of the main points of what I call the bank capital channel.

2 The Bank Capital Channel

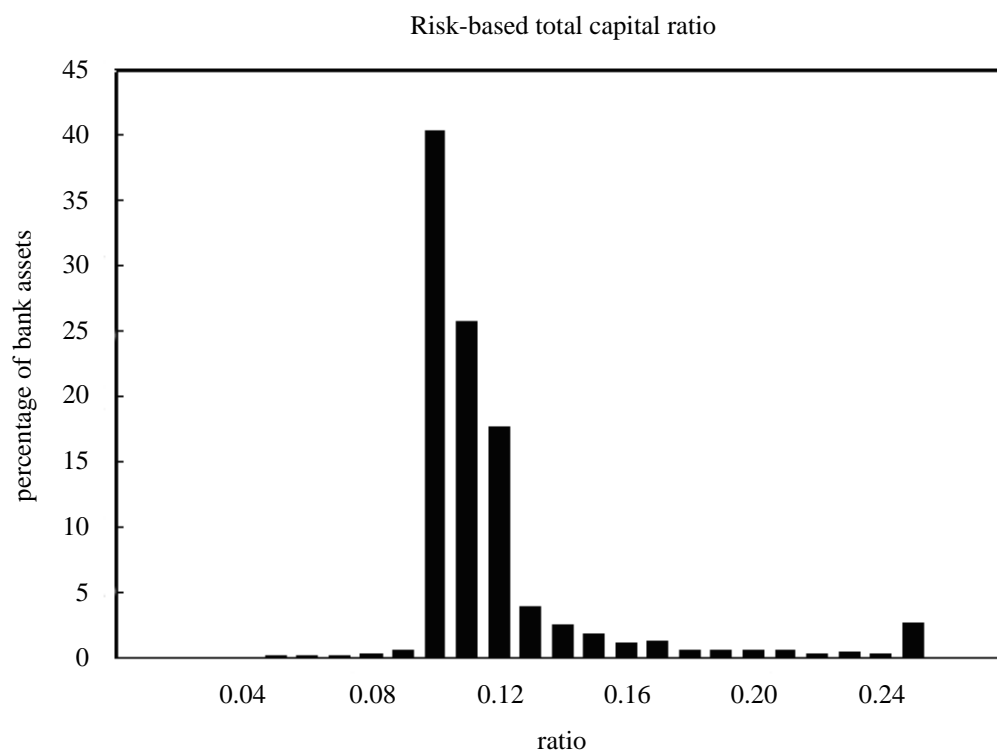
According to the bank capital channel thesis, monetary policy affects bank lending, in part, through its impact on bank equity capital. In a separate paper (Van den Heuvel 2003), I present a dynamic model of bank asset and liability management that formalizes this channel and analyzes its consequences for monetary policy.⁹ While I refer the reader to that paper for the formal analysis, as well as for the quantitative results based on a calibration exercise, it is useful to summarize the main argument. The model incorporates the risk-based capital requirements of the Basel Accord and an imperfect market for bank equity. These two conditions imply a failure of the Modigliani-Miller logic for the bank: the bank's lending will depend on its financial structure, as well as on lending opportunities and market interest rates. When equity is sufficiently low, because of loan losses or some other adverse shock, the bank will reduce lending because of the capital requirement and the cost of issuing new equity. Even when the capital requirement is not currently binding, the model shows that a low-capital bank may optimally forgo profitable lending opportunities now to lower the risk of future capital inadequacy. This is interesting, since in reality, and in the model, as calibrated with U.S. data, most banks are not at the capital constraint at any given time.

This fact is evident from Figure 1, which represents a histogram of the risk-based total capital ratio of U.S. commercial banks for the fourth quarter of 2000, weighted by total assets of the banks.¹⁰ For example, the figure reveals that about 40 per cent of the assets in U.S. commercial banks reside in banks with a risk-based total capital ratio between 10 and 11 per cent. As can be seen, there is a fairly wide spread of capital ratios across banks, with a mode just above 10 per cent and relatively few sizable banks below that ratio.

9. See Chami and Cosimano (2001) for related work, also based on regulatory capital requirements. Meh and Moran (2004) explore the implications of "market-imposed" capital requirements for the monetary policy transmission mechanism. They also find that endogenous fluctuations in bank capital can lead to propagation of monetary and other shocks.

10. Source: Report of Condition and Income for all banks regulated by the Federal Reserve System, Federal Deposit Insurance Corporation, and the Comptroller of the Currency, from the Federal Reserve Bank of Chicago's Commercial Bank and Bank Holding Company Database. These data are available on the Internet at: <<http://www.chicagofed.org/economicresearchanddata/data/bhcdatabase/index.cfm>>.

Figure 1
Histogram of risk-based total capital ratios of U.S. banks in 2000Q4



Interestingly, while the Basel Accord sets an 8 per cent minimum risk-based ratio for total capital, the 10 per cent ratio is one of the main minimum requirements a U.S. bank must satisfy to be regarded as “well capitalized,” according to the Prompt Corrective Action provisions of the Federal Deposit Insurance Corporation Improvement Act (FDICIA).¹¹

Another crucial feature of the model, besides capital-adequacy regulations and an imperfect market for bank equity, is the maturity transformation performed by banks, exposing them to interest rate risk. A consequence of this is that a monetary tightening, by raising the short-term interest rate, lowers bank profits. Unless the bank can reduce dividends substantially, this will result over time in lower bank capital and, given the failure of the Modigliani-Miller logic, less lending. Thus, monetary policy affects the supply of bank loans through its effect on bank equity. This dynamic

11. Benefits of being “well capitalized,” as opposed to merely “adequately capitalized,” include the ability to use brokered deposits under the FDICIA and to become a Financial Services Holding Company and engage in expanded activities under the Gramm-Leach-Bliley Act. It also affects a bank’s CAMELS rating.

effect—the bank capital channel—amplifies the standard interest rate channel of monetary policy.

Results from simulating the calibrated model suggest that the economic size of the amplification is moderate to large. From the perspective of optimal monetary policy, the most interesting result is perhaps that the size and the dynamics of the effect are highly dependent on the initial level and distribution of capital among banks. Intuitively, the reason is that the capital requirement affects bank behaviour more when bank equity is low. Thus, the amplification is much stronger for banks that start out with already low capital than for well-capitalized banks. Empirical work by Kishan and Opiela (2000) finds support for this prediction: lending by banks with a low capital ratio indeed seems to react more strongly to monetary policy shocks.¹² In the model, there is still the caveat that the lending response of banks with *inadequate* capital at the time of the shock will exhibit an initial delay because of the binding capital requirement, just as in the case of the bank lending channel. Hence, if bank equity is low, the monetary policy effects on lending via the bank capital channel may be weak initially, but will be much larger after several quarters.

It is reassuring that these conclusions are not diametrically opposed to those arrived at from the perspective of the bank lending channel. There are, however, interesting differences. I will mention two. First, to the extent that the bank capital channel is important, we can expect monetary policy effects on bank lending not only to vary in strength, but also in the timing of their maximum impact. This possibility of “long and variable lags” is perhaps not the most comforting consideration for central banks.

Second, suppose banks are flush with cash and government-backed securities but low on capital, as many U.S. banks were in the aftermath of the Great Depression.¹³ Under those conditions, the lending channel is expected to be weak: following a monetary tightening, a decline in reservable deposits can easily be offset by selling some securities without issuing many new CDs, so that the low level of equity is not a problem. According to the bank capital channel thesis, however, the increase in

12. In Kishan and Opiela’s paper, “poorly capitalized” is defined in terms of the regular (not risk-based) capital-asset ratio. The inclusion of other contemporaneous balance-sheet variables as explanatory variables leaves Kishan and Opiela’s results open to other interpretations. In addition, since market capital and book capital are likely positively correlated, their results also could be interpreted as reflecting the role of bank capital in the lending channel, as discussed above.

13. See Ramos (1996). His explanation for this observation is that the Great Depression left banks undercapitalized, so that banks chose to increase their holding of liquid assets to calm depositors’ fears. Issuing new equity was deemed too expensive, according to Ramos.

interest rates will lower bank equity even further, causing some banks to cut lending to reduce the risk of capital inadequacy. Thus, the latter channel is expected to be strong. The fact that banks have a large stock of cash or Treasury bills, which do not count in the computation of risk-weighted assets, is irrelevant when it is a risk-based capital requirement that constrains lending.¹⁴

A related point concerns what happens if financial markets and bank regulation continue to develop in such a way that it becomes increasingly less difficult for banks to issue non-reservable liabilities. For example, small-denomination CDs already carry no reserve requirements, but are insured and therefore cannot be subject to a “lemon’s premium.”¹⁵ If the ability of banks to rely on such sources of finance increases, the lending channel can be expected to diminish in strength. Such a development would not affect the bank capital channel, however, as long as the frictions in the market for bank equity and some form of capital-adequacy regulation remain. In other words, the latter channel is immune to the aforementioned critique by Romer and Romer (1990), unless one believes that banks can at any time frictionlessly issue new equity, as opposed to non-reservable liabilities.

3 New Directions of the Basel Accord

The Basel Accord, the basis of the current risk-based capital requirements, is in the process of being substantially altered. According to the current timetable, the new Accord, Basel II, will be ready for implementation in 2006. The overall goal of the changes is to make the risk weights, which determine how much capital banks have to hold against various kinds of assets and off-balance-sheet items, more risk-sensitive. The current “buckets” are somewhat crude,¹⁶ and this can lead to regulatory arbitrage, for example, through securitization or by lending to customers whose capital charge is too low relative to the risk involved.¹⁷ Some of the proposed changes involve making the risk weight dependent on the rating of the loan.

14. This is not true for a leverage ratio requirement, which applies to total assets, not risk-weighted assets. Banks can lower their leverage-based capital requirement by selling securities.

15. Hence, in the context of the lending channel, some other friction needs to be invoked to explain why small-denomination CDs are not the dominant form of bank financing, e.g., a liquidity premium. See Stein (1998).

16. For example, all loans to the non-bank private sector, except residential mortgages, have the same risk weight, 100 per cent.

17. The current Accord also offers no reward for diversification of credit risk by lending to a diversified portfolio of borrowers.

The rating could be either external, when the borrower has been evaluated by a rating agency or, for sophisticated banks, internal, that is, based on the bank's own credit-risk model.¹⁸

In light of the above discussion, an interesting question is what consequences the recently proposed changes would have for the monetary policy transmission mechanism and macroeconomic stability. It would be outside the scope of this paper to provide anything close to a complete answer to this question. It would also be difficult to do at this early stage. Instead, I merely venture to offer some speculative thoughts.

The more sophisticated risk weights have a clear advantage in ensuring that riskier banks have more equity, and this may reduce the risk of banking crises. However, a potential disadvantage may be that the capital charge for a given portfolio of assets is likely to be countercyclical, as borrowers are downgraded during recessions, leading to higher capital requirements. Thus, banks may have to scramble for equity during a recession—arguably not the best time to build up capital. The logic of the bank capital channel suggests that there is a danger that the more risk-sensitive capital requirements will act as “automatic destabilizers”: higher capital requirements may lead banks to cut back on lending even more than usual during recessions.¹⁹

What would the consequences be for the monetary policy transmission mechanism? If a monetary policy tightening causes a slowdown, borrowers are likely to be downgraded, leading to higher capital requirements. Hence, the bank capital channel is likely to be amplified: not only will bank equity be lower in the aftermath of the tightening, but more will be needed to maintain capital adequacy, as risk-weighted assets increase. Of course, increased effectiveness of monetary policy is not necessarily undesirable. The years close to the implementation of the New Basel Capital Accord, however, might be characterized by increased uncertainty about the effects of monetary policy, as banks and monetary authorities adjust to the new regulatory environment.

How strongly these concerns will manifest themselves will depend greatly on the details of the implementation of Basel II. For example, how many banks will choose the internal ratings approach is not clear at this time. The potential for automatic destabilization could be minimized by defining the ratings in such a way that they respond smoothly to economic conditions.

18. The internal-model approach is already used as an alternative for capital charges stemming from the banks' trading book. See Hirtle et al. (2001) for issues that arise in using credit-risk models for wider regulatory purposes.

19. Jeremy Stein (2002) discusses this issue in the context of the bank capital channel. See also Borio (2003) and Kashyap and Stein (2004).

This could be achieved by choosing a long horizon for the evaluation of credit risk, preferably one that includes the possibility of a recession.²⁰ An alternative approach, which would require amending Basel II, would be to index the capital charge for a loan with a given rating to aggregate economic conditions, decreasing it when conditions worsen. In this way, risk-weighted assets could remain approximately the same during recessions for a typical bank, despite the inevitable decline in ratings.

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20. Claudio Borio (2003) also suggests this option.

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