

Skander J. Van den Heuvel

# DOES BANK CAPITAL MATTER FOR MONETARY TRANSMISSION?

## INTRODUCTION

Traditional monetary theory has largely ignored the role of bank equity. Bank-centered 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 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 to the importance attached to capital adequacy in the regulation of banks, especially since the adoption of the Basle 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, giving rise to the term “capital crunch.”<sup>1</sup> Research on this and other episodes has found that low bank capital is associated with sluggish lending.<sup>2</sup>

Despite this evidence, the role of bank capital and capital requirements in the monetary transmission mechanism has received much less attention.<sup>3</sup> This paper addresses this issue by examining how bank capital and its regulation affect the role of bank lending in the transmission of monetary policy.<sup>4</sup> I argue that taking into account bank capital has some

interesting implications for our understanding of the monetary transmission mechanism. In addition, I briefly discuss whether recently adopted and proposed amendments to the Basle Accord can be expected to change these implications.

## BANK CAPITAL AND THE LENDING CHANNEL

There are at least two theoretically distinct ways in which the level of bank capital can change the impact of monetary shocks on bank lending: through the traditional bank lending channel, also discussed in this volume by Lown and Morgan (2002), 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. As the bank will always be able to find investors willing to finance any profitable lending opportunities, the level of bank capital is irrelevant to lending, and thus to the monetary transmission mechanism.<sup>5</sup> For each channel, this logic fails for a specific reason, although the nature of the failure is somewhat different in each case. Although the two are by no means mutually exclusive, it is easier to discuss them separately.

Skander J. Van den Heuvel is an assistant professor of finance at the University of Pennsylvania’s Wharton School.

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According to the bank lending channel thesis, monetary policy has a direct effect on the supply of bank loans, and thus on the real economy, because banks finance loans in part with liabilities that carry reserve requirements.<sup>6</sup> 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 nonreservable bank liabilities is not frictionless.<sup>7</sup> 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), and there would be no reason for the bank to forgo profitable lending opportunities due to a binding reserve requirement.

Romer and Romer (1990), among others, claim that banks can in fact switch fairly easily to nonreservable 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 some 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 nonreservable bank liabilities are not insured, they are therefore at least somewhat risky, so the market for them is likely to be imperfect.

This discussion of the lending channel makes no reference to bank capital or capital regulation. The reason for this 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 can access a frictionless market for some managed liability, there is no lending channel. Nonetheless, there are some 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 nonreservable 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 provided in any given period, shocks to reserves will have no effect on lending with a binding capital requirement. 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 below makes 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, since there is no interbank market for equity, it is therefore 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 more detail below.

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 nonreservable 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.<sup>8</sup> 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, they are more exposed to any asymmetric information problems 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 requirements are 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 1) among adequately capitalized banks, (the market value of) equity is at high levels or 2) the fraction of poorly or undercapitalized banks is large. The fact that these conditions are somewhat contradictory illustrates the importance of taking 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 thus far has treated bank capital as given. But even in the presence of the type of financial frictions that are central to the lending channel and that prevent banks from readjusting their capital at any given instant, 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 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.

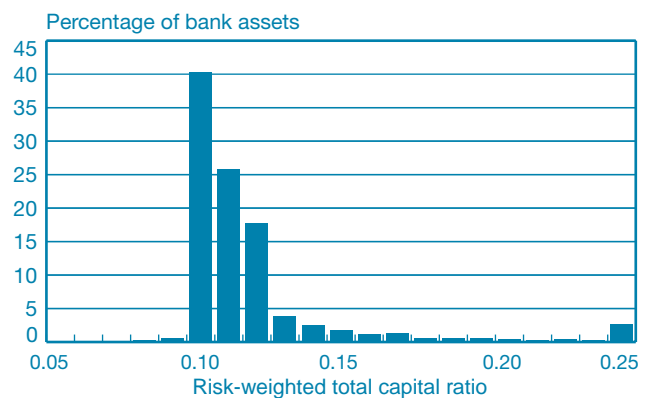
## THE BANK CAPITAL CHANNEL

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 2001), I present a dynamic bank asset and liability management model that formalizes this channel and analyzes its consequences for monetary policy. Although 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 Basle 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 in order 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.

The latter phenomenon is evident from the chart, which presents a histogram of the risk-based total capital ratios of U.S. commercial banks for 2000:4, weighted by total assets of the banks. For example, the chart reveals that about 40 percent of the assets in U.S. commercial banks reside in banks with a risk-based total capital ratio of between 10 and 11 percent. As we see, there is a fairly wide spread of capital ratios across banks, with a mode just above 10 percent and relatively few sizable banks below that ratio. Interestingly, while the Basle Accord sets an 8 percent minimum risk-based ratio for total capital, the 10 percent 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).<sup>9</sup>

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

Distribution of Risk-Based Total Capital Ratios of U.S. Banks in 2000:4



Source: Federal Reserve Bank of Chicago, Commercial Bank and Bank Holding Company Database (<<http://www.chicagofed.org/economicresearchanddata/data/bhcdatabase/index.cfm>>).

Note: Data are from the *Report of Condition and Income* for all banks regulated by the Federal Reserve System, the Federal Deposit Insurance Corporation, and the Comptroller of the Currency.

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 behavior 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, although the lending response of banks with *inadequate* capital at the time of the shock will exhibit an initial delay due to 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, some 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 are low on capital, as many U.S. banks were in the aftermath of the Great Depression.<sup>10</sup> 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 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 Treasuries, which does not count when computing risk-weighted assets, is irrelevant when it is a risk-based capital requirement that constrains lending.<sup>11</sup>

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 nonreservable liabilities. For example, small-denomination CDs already carry no reserve requirements, but are insured and therefore cannot be subject to a lemon’s premium.<sup>12</sup> If banks’ ability to rely on such sources of financing 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 nonreservable liabilities.

## NEW DIRECTIONS OF THE BASLE ACCORD

The Basle Accord, the basis of the current risk-based capital requirements, is in the process of being amended for implementation in 2005. 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,<sup>13</sup> and this can lead to regulatory arbitrage, for example, through securitization or lending to costumers whose capital charge is too low relative to the risk involved. Some of the proposed changes involve making the risk weight dependent on the rating of borrowers. The rating could either be 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.<sup>14</sup>

In light of the above discussion, an interesting question is what consequences the recently proposed changes would have for the monetary transmission mechanism and macro-economic stability. It would be outside the scope of this paper to give anything close to a complete answer to this question. It would also be very hard 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, as Jeremy Stein points out in his commentary on this paper, 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.<sup>15</sup> Thus, banks may have to scramble for equity during a recession—arguably not the best time to build up capital. The danger is 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.

What would the consequences be for the monetary transmission mechanism? If a monetary 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

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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 Basle 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 greatly depend on the details of “Basle 2,” which are still under discussion. The potential for automatic destabilization can be

minimized by defining the ratings in such a way that they respond smoothly to economic conditions. This could be achieved by choosing a long horizon for the evaluation of credit risk, preferably one that includes the possibility of a recession. An alternative approach 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.

## ENDNOTES

1. Syron (1991). See also Bernanke and Lown (1991).
2. See Sharpe (1995) for an overview of the literature on 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 (forthcoming) 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 (2000), and the citations mentioned below in the context of the bank lending 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, as firms could borrow directly from households.
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) gives 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 that some borrowers cannot find perfect substitutes for bank loans (that is, the Modigliani-Miller theorem must fail for some nonfinancial firms as well as for banks) and the presence of some nominal rigidity. See the citations in endnote 6 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. However, as long as reserves are crucial to the production of demand deposits, there will effectively be a "technological" reserve requirement.
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 greater incentive to retain reservable deposits. However, Stein's (1998) analysis shows that even perfect interbank competition for deposits will not undo the conclusion.
9. The benefits of being well-capitalized, as opposed to merely being "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. Being well capitalized also affects a bank's "CAMELS" rating.
10. See Ramos (1996). His explanation for this observation is that the Great Depression left banks undercapitalized, so banks chose to increase their holdings of liquid assets to calm depositors' fears. Issuing new equity was deemed too expensive, according to Ramos.
11. 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 requirements by selling securities.
12. Hence, in the context of the lending channel, some other friction, such as a liquidity premium, needs to be invoked to explain why small-denomination CDs are not the dominant form of bank financing. See Stein (1998).
13. For example, all loans to the nonbank private sector except residential mortgages have the same risk weight, 100 percent.
14. The internal-models approach is already used as an alternative for capital charges stemming from the banks' trading books. See Hirtle et al. (2001) for some of the issues that arise when using credit risk models for wider regulatory purposes.
15. All the credit goes to Jeremy Stein for thinking of this issue in the context of the bank capital channel.

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