

Discussion of “The Effects of Bank Capital on Lending: What Do We Know, and What Does It Mean?”*

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1. Introduction

The events of the last few years suggest that the financial sector—the banking sector in particular—is a crucial determinant of business cycle fluctuations. The worst financial crisis in Europe and in the United States since World War II was followed by a severe economic recession. The key channel through which banks affect the economy is the provision of credit to fund private investment and consumption. In a crisis, a credit reduction may be the result itself of the grim economic outlook, via weaker credit demand and net worth of firms and households. However, credit may also decline from a reduction of credit supply due to banks’ capital and liquidity problems.

The banking sector is not only at the center stage for controversy by being too stingy with credit on the downside of the business cycle, but banks are also accused of excessive credit creation and asset bubbles—excessive risk taking—on the upside of the cycle, both with important consequences for economic growth and financial stability.

The primary suspect in both scenarios is the credit supply channel; i.e., credit growth (or lack thereof) is being dictated by malfunctions in the credit supply process rather than economic fundamentals. In the downside of the cycle, in 2008, it was such a fear that forced central banks and governments around the world to intervene with hundreds of billions of euros in the banking industry. And it

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is also such a fear that has forced central banks to pay significantly more attention to macroprudential supervision and regulation when also we return to the upside of the cycle.

A common culprit of malfunctions in the credit supply process is the low level of capital by banks. On the upside, low levels of capital may cause excessive credit creation since banks' shareholders may have little capital at stake to lose in the event of bank losses and, moreover, they do not fully internalize all (potential) social losses.¹ On the downside, low level of capital may result in a credit crunch since the market may force banks to build up the capital ratio and also banks may hoard liquidity to use it in good investment opportunities arising from problems in other banks.²

What (and how important) are the effects of bank capital on bank lending? Despite the importance of the question, the empirical literature is thin. One reason is that in the macro literature there has not been much emphasis on the implications of bank capital and of credit supply in general.³ Conversely, there has been considerable emphasis on the regulation of bank capital both as a key mechanism to limit significant risk taking by banks on the upside of the cycle and as a buffer for banks to continue lending in the downside, starting in Basel I in the 1980s to the very recent Basel III. In this sense, it should be noted that there has been recently approved in Basel a substantial increase of global minimum bank capital standards.⁴

Banks were instead opposed to the change in capital regulation since they argue that bank profits would decrease, forcing them in turn to reduce lending, especially to small and medium firms. The Institute of International Finance (2010), representing the world's big banks, issued a report concluding that phasing in an increase in bank capital requirements of 2 percent will lead to a drop of GDP

¹For evidence of negative externalities in banking (contagion) and of higher social costs (than private) caused by bank failures, see Iyer and Peydró (2010). For systemic risk in banking, see Bandt, Hartmann, and Peydró (2009).

²See, among others, Holmstrom and Tirole (1997), Diamond and Rajan (2009), and Hanson, Kashyap and Stein (2010).

³See Adrian and Shin (2010) and Gertler and Kiyotaki (2010) for two recent exceptions. See also Freixas and Rochet (2008) and the references therein, where more emphasis is given to micro aspects.

⁴For the new bank rules, see www.bis.org/press/p100912.pdf?noframes=1.

of 3 percent in the United States, the euro area, and Japan. Conversely, banking regulators argue that the short-term costs of the new regulation are likely to be small and transitory, while the benefits of a stronger and healthier financial system will be around for years to come (the Basel Committee on Banking Supervision 2010 and Macroeconomic Assessment Group 2010). These studies assume different scenarios leading to very different real costs of an increase in bank capital. However, it is also very challenging to measure the relationship between bank capital and credit even when analyzing historical data.

The identification and measurement of the impact of bank capital on credit presents several key empirical challenges and, as I will argue later, both macro data and micro data at the bank (or firm) level (see, e.g., Berrospide and Edge 2010 or, more generally, papers that use bank-level regressions such as Kashyap and Stein 2000) are insufficiently precise to allow the identification of the causal impact of bank balance sheet shocks on economic activity through credit supply. The main reasons are that with these data sets one cannot distinguish between demand and supply of credit nor take into account the general equilibrium effects related to credit substitution. If this is true, one should be very cautious both in deriving policy implications (e.g., on bank bailouts) and in testing theories related to the credit channel from papers which only use aggregate- or bank-level data.

Berrospide and Edge (2010)—using bank-level data—find relatively small effects of bank capital on lending (they study the lending of large bank holding companies and use panel regression techniques following Bernanke and Lown 1991 and Hancock and Wilcox 1993, 1994). They also consider the effects of capital using a variant of Lown and Morgan's (2006) vector autoregression (VAR) model and, again, find a relatively modest impact of bank capital ratio changes on lending. Then, they use the estimated models to understand recent developments in bank lending and, in particular, to consider the role of TARP-related capital injections in affecting these developments.

My main comment is therefore that one should be very cautious in drawing policy implications regarding TARP derived from research using a data set based on bank-level and macro data since one cannot, in principle, identify the causal impact of bank capital

on credit and the estimated coefficients may be biased upward or downward. Nonetheless, the paper is very interesting, rich in results, and useful for understanding the relationship between bank capital and lending. Moreover, it analyzes almost twenty years of data of the most important country in the world, the United States.

To tackle the different identification challenges, I will argue that one needs either exhaustive (firm-bank) loan-level data (see Jiménez, Mian, et al. 2010), even if possible with loan applications (Jiménez, Ongena, et al. 2010a, 2010b), or bank lending surveys from central banks, where decomposition between developments in credit demand and supply are given (see Ciccarelli, Maddaloni, and Peydró 2010). In the case of the United States, unfortunately, there is not an exhaustive credit register; however, there is a bank lending survey carried out by the Federal Reserve (see Lown and Morgan 2006).⁵ Using the U.S. Senior Loan Officer Opinion Survey, Ciccarelli, Maddaloni, and Peydró (2010) also find a weak impact of bank capital on aggregate output during the recent crisis.

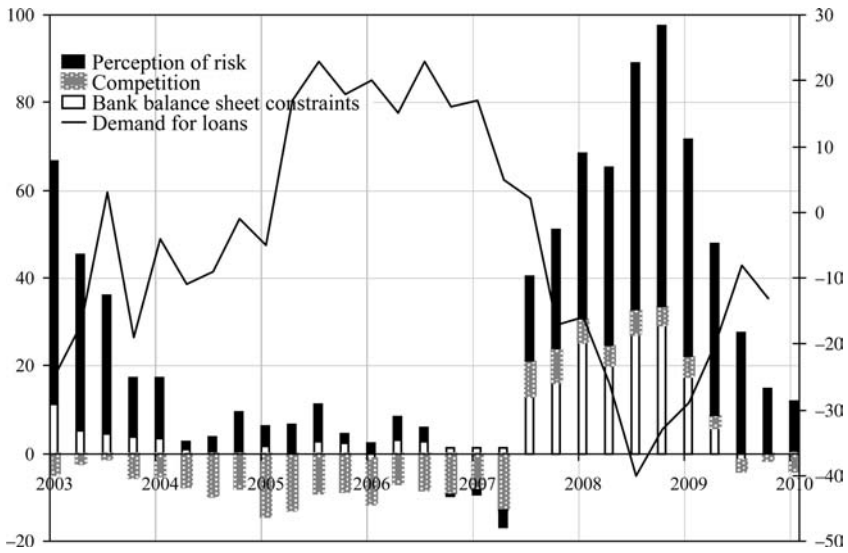
The rest of the discussion proceeds as follows. Section 2 addresses the main identification challenges of measuring the impact of bank capital on credit supply. Section 3 suggests an identification strategy that tackles the empirical challenges. Section 4 discusses other comments and suggestions. Section 5 concludes.

2. Identification Challenges

In the current crisis, banks started early on to tighten their lending standards both in the United States and in Europe. As figure 1 shows for the euro area, the tightening of lending standards started in 2007:Q3. It is important to note that at the same time that lending standards were tightened, credit demand was also reduced. Moreover, banks tightened their standards for loans due to bank balance sheet constraints (in capital and liquidity) but also because the borrowers were perceived riskier (with lower net worth, riskier collateral, and worse outlook). Hence, not only credit supply (due to

⁵In the United States there are loan-level data for large firms (syndicated loans). However, these data are not exhaustive even for the set of (large) firms, in turn making it difficult to separate credit demand from supply and to take into account the general equilibrium effects related to credit substitution.

Figure 1. Credit Demand and Supply Changes in the Euro Area



Note: This figure shows the lending standards (left axis) and credit demand (right axis) for corporate loans in the euro area from the Bank Lending Survey (BLS) based on a weighted average of the twelve (initial) euro-area countries as of 2004:Q4 (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). Lending standards for corporate loans are the net percentages of banks reporting a tightening of credit standards for loans to enterprises in the BLS. The darkest shaded part is the change in lending standards related to changes in economic conditions and borrower outlook and risk, the gray shaded part is the change in standards due to changes in bank competition, and the non-shaded (white) part is the change in standards due to changes in bank balance sheet strength (capital and liquidity). The black line is the change in loan demand from the BLS. See Maddaloni and Peydró (2010).

bank capital and liquidity problems) may have decreased but also credit demand and net worth of firms and households, which complicates any identification of bank capital implications on credit supply during the recent crisis.⁶

⁶Similar dynamics are observed in the United States (see www.federalreserve.gov/boarddocs/snloansurvey). The data for the euro area is from Maddaloni and Peydró (2010). For the sake of simplicity, I have plotted only the data related to corporate loans, but results are very similar for loans to households.

The main empirical challenges to identifying the causal impact of a bank capital shock on loan supply are the following. First, bank capital is endogenous to economic conditions; in particular, capital may be low in a crisis because investment opportunities in lending are worse.

Second, credit demand changes are correlated with credit supply changes (as figure 1 shows for the time series). Bank capital shocks are often correlated with changes in the economic environment: if, for example, economic outlook worsens, bank capital decreases, but firms' demand for credit also drops since there is a reduced need for investment. Therefore, it is highly likely that an economy experiences at the same time credit decline and lower demand and supply of credit. These initial two points suggest that by looking only at the time series it may be almost impossible to obtain the causal impact of capital on credit supply.

Third, changes in the quality (net worth and risk) of the borrower pool may also be correlated with changes in credit supply (see also figure 1 for the time series). In the time series—e.g., in worse times—firms are in principle riskier and have lower net worth, so banks face a lower-quality pool of borrowers overall. Hence credit may decline because of bank capital problems but also because of (borrower) firm and household capital and risk problems.

Furthermore, there can also be a correlation on the *cross-section*. Banks with lower capital may lend more on average to firms with worse risk or capital, which further complicates the analysis at the bank level.⁷ For example, in crisis times, weaker firms may be more financially constrained and, hence, may need more bank finance (thus increasing credit demand). If these firms are therefore matched with banks with weaker capital, at the bank level one would find that banks with lower capital do not reduce lending, but this would be

⁷In theory, firm and bank balance sheet strengths could be correlated: the higher the agency problems between firms and banks due to the firms' moral hazard, the more fragile the banks will need to be (Diamond and Rajan 2000, 2001). Moreover, Peek and Rosengren (2005) and Caballero, Hoshi, and Kashyap (2008) document that, during the Japanese financial crisis, banks with capital ratios closer to the minimum binding levels lent more to zombie firms. Hence, the strength of the lending banks' balance sheets was positively correlated with those of the borrowing firms.

because these weaker banks are facing higher (countercyclical) credit demand, not because bank capital is not crucial.⁸

Fourth, there can be a substitution of the sources of credit, and banks with higher capital could seek finance firms who were borrowing from banks with lower capital (i.e., one needs to take into account the general equilibrium effects related to credit substitution). In this sense, a credit supply reduction in some banks would only translate into binding credit constraints if firms cannot compensate credit with other, less affected, banks. For economic activity, what matters most are the general equilibrium effects of lending, and these may be unaffected even if some banks are partially reducing lending. In consequence, an analysis at the bank level misses these general equilibrium effects since one cannot know whether the reduction in supply from one bank is compensated by another bank.

It should also be noted that it is increasingly recognized that documenting credit supply side failures at the bank level based on partial equilibrium analysis may not be relevant from a systemic risk perspective. What is strongly needed is a macroprudential approach that takes into account general equilibrium effects (Hanson, Kashyap, and Stein 2010). For example, a reduction in credit supply due to an adverse bank balance sheet shock may not have any negative impact if affected firms can go elsewhere to compensate for the loss in credit. Indeed, proponents of non-interventionist central banking argue that such general equilibrium effects are strong enough to let credit markets heal on their own. Unnecessary interventions, they argue, create more mischief by punctuating the virtuous cycle of creative destruction (see Jiménez, Mian, et al. 2010).

All in all, the above identification challenges suggest that obtaining the causal impact of bank capital on credit is tricky and that aggregate-level data and bank-level data are not enough to precisely estimate the elasticity of bank capital on credit. In this sense, Berrospide and Edge (2010) provide correlations rather than the causal coefficients and do not control for general equilibrium effects, at least in the first part of their analysis based on bank-level data. Moreover, the estimated coefficient could be in principle biased

⁸For similar reasons, an analysis at the firm level in the presence of firm-bank matching problems may yield biased estimates.

upward or downward depending on the covariance of the unobserved credit demand and supply shocks.

3. An Alternative, Potentially Better Way of Identification

Bernanke and Lown (1991) define a credit crunch as “a significant leftward shift in the supply curve for loans, holding constant both the safe real interest rate and the quality of potential borrowers.” Given that borrowers may differ in quality both in observable and unobservable characteristics, a way to fully control for borrower quality and demand of credit is to analyze credit supply at the firm-bank level using firm fixed effects to fully capture the borrower demand and risk (Khwaja and Mian 2008). In this case, identification comes from comparing lending to the same firm from a bank with a positive shock vis-à-vis a bank with a negative shock.⁹

Jiménez, Ongena, et al. (2010a), to identify the credit supply effects of monetary policy, use firm*time fixed effects to control for unobserved time-varying heterogeneity in firm loan demand and risk. They use exhaustive loan-level data from Spain over twenty years. They find that bank-level regressions underestimate the bank lending channel (e.g., Kashyap and Stein 2000); hence there is a non-random matching problem between borrowers and lenders and, hence, regressions at the bank level are not well specified. Moreover, they analyze whether firms borrowing more from affected banks can substitute credit from other, less affected, banks, and find binding effects of bank capital. Moreover, they find that banks with higher capital lend more to existing clients than banks with lower capital; however, banks with lower capital tend to lend more on average to new clients (probably riskier customers for the bank). That is, the effect of capital on credit supply is totally different in the intensive vis-à-vis the extensive margin of lending.

There are still two problems using firm*time fixed effects with outstanding credit: First, one cannot perfectly analyze the extensive margin of lending to new clients (one cannot analyze changes in credit from different banks which were lending to the same firm

⁹In Khwaja and Mian (2008) the shock comes from a nuclear threat, which impacts bank liquidity differently across different banks.

since the firm is a new client); hence, with the above strategy of fixed effects and change in outstanding credit, it is only possible to fully identify the intensive margin of lending and extensive margin of terminated loans. Second, one cannot horse-race the non-financial borrower (e.g., firm) balance sheet channel vis-à-vis the bank balance sheet (lending) channel since the firm fixed effect fully captures the firm channel, but not adding the firm fixed effect implies not controlling for credit demand. Jiménez, Ongena, et al. (2010a), however, use loan applications for analyzing both the extensive margin and the firm vis-à-vis the bank balance sheet channels. In this case identification is possible, since the different loan applications from new clients are observed and firm fixed effects are less needed to control for credit demand (volume).

Credit composition is also crucial. Supply changes of composition of credit (bank risk taking) are analyzed by Jiménez, Ongena, et al. (2010b). Using the credit register from Spain, they analyze bank risk-taking effects of monetary policy. They use firm*time and bank*time fixed effects to account for both observed and unobserved time-varying firm and bank heterogeneity that proxy the firm demand, balance sheet, and bank lending channels. They find that a lower overnight interest rate induces lower capitalized banks to expand and prolong credit to riskier firms, and to lend to riskier new applicants, granting them loans that are larger and longer term. A lower long-term rate, however, has smaller or no such effects.

General equilibrium effects related to credit substitution are taken into account and formalized in Jiménez, Mian, et al. (2010). They formalize a new methodology for estimating the aggregate firm-level impact of the bank lending channel, and apply it to estimate the effect of securitization (capital and liquidity shock) on credit supply in Spain. At the bank level, they find that an increase in banks' ability to securitize real-estate assets leads to an increase in the quantity of credit extended to non-real-estate firms. However, their methodology shows that this effect is close to zero for most firms in general equilibrium due to a crowding out of existing bank credit. Nonetheless, securitization does lead to an expansion in credit for first-time clients that are significantly more likely to end up in default. Securitization also leads to a broader relaxation in credit terms, probably due to stiffer competition. Finally, while the collapse of the private securitization market in 2008 contracted credit from

more securitization-dependent banks, aggregate firm-level impact of securitization-driven credit crunch is close to zero.

Firms can also substitute credit with other sources of finance—for example, with other debt claims such as trade credit and market debt. Iyer et al. (2010) analyze the impact of the interbank liquidity crunch on the credit crunch using credit register data from Portugal. They find that the bank liquidity shock of August 2007 implied a credit supply reduction from banks, and that firms could not substitute this bank credit reduction with other sources of credit.

The previous studies allow an identification of credit supply and can take into account general equilibrium effects related to credit substitution. However, difference-in-difference exercises cannot take fully all the general equilibrium effects. The micro identification cannot analyze the total effect of a bank capital shock on real activity, but only a difference-in-difference effect by comparing banks with different degrees of capital. Moreover, bank capital may affect economic activity through credit supply, and these changes in real activity may in turn affect bank capital. These cannot be fully captured by the difference-in-difference coefficients.

A way to control for these general equilibrium effects is provided by Ciccarelli, Maddaloni, and Peydró (2010). A key issue is how to obtain at the macro level time-varying information for both credit supply and demand since these are mostly unobserved. Bank lending surveys by central banks do, however, contain reliable quarterly information on credit supply and demand's quantity and quality, which serve to identify the credit demand and the firm, household, and bank balance sheet channels.

Ciccarelli, Maddaloni, and Peydró (2010) use the detailed answers of the confidential and unique Bank Lending Survey (BLS) for the euro area and of the Senior Loan Officer Opinion Survey (SLOOS) for the United States. Euro-area national central banks and regional Federal Reserve banks request from banks quarterly information on the lending standards that banks apply and on the loan demand that banks receive from firms and households. The detailed information reported in the surveys is very reliable, not least because the surveys are carried out by central banks, which are in most cases the bank supervisors and can cross-check the information received with exhaustive hard bank information.

They find that the credit channel amplifies a monetary policy shock on GDP and inflation, through the balance sheets of households, firms, and banks. For corporate loans, amplification is highest through credit supply; for households, demand is the strongest channel. Finally, in the euro area, a credit crunch for firms due to bank capital and liquidity problems reduced GDP significantly during the financial crisis. In the case of the United States, the authors do not find a strong effect of bank capital in the current crisis, consistent with the results of Berrospide and Edge (2010).

4. Other Comments and Suggestions

I would introduce, in Berrospide and Edge (2010), interactions between the business cycle (economic and monetary conditions) and bank capital to study whether the effect of bank capital on lending is stronger in bad vis-à-vis good times. For example, Jiménez, Ongena, et al. (2010a) find that conditioning on several loan applications of a firm in a month to new banks, banks with lower capital on average grant more loans in the extensive margin of lending to new clients, but in bad times the opposite occurs! Bernanke and Lown (1991) could also find stronger effects than Berrospide and Edge (2010) because, probably, Bernanke and Lown (1991) analyze the impact of bank capital on credit supply in bad times. Moreover, the effects in Adrian and Shin (2010) are different depending on the business cycle.

One may still find a small effect in loan volume in bad times due to loan evergreening (see, for example, evidence in Italy and Japan).¹⁰ For example, because of fear of loan defaults, banks may renew their loans with their weakest borrowers. Hence, it is crucial to analyze the extensive vis-à-vis the intensive margin of lending, and also credit composition and not only credit volume.

I would also introduce time fixed effects at least once to truly analyze the cross-sectional implications of bank capital on lending (note that it is difficult to control for all the aggregate “demand factors” with observable variables such as current GDP, prices, etc.).

¹⁰See Albertazzi and Marchetti (2010) for evidence in Italy, and Peek and Rosengren (2005) and Caballero, Hoshi, and Kashyap (2008) for evidence in Japan.

For example, expectations on the business cycle also matter. I would also introduce bank fixed effects once to analyze the “within” results, i.e., how changes in capital in a bank affect its lending (important given the bank omitted variables).

Other suggestions are to control for bank total assets and to analyze the effect of capital if one does not put net charge-offs in the regressions, since the latter should be correlated with capital. In addition, it would be nice to control for the drawing down of committed loans and credit lines. Finally, a key issue is whether bank capital is well measured or not, especially given all the off-balance-sheet items and the bank capital regulatory arbitrage in the United States before the recent crisis (Acharya and Richardson 2010).

5. Summary

Berrospide and Edge (2010) is a very interesting paper, very rich in results and very useful for understanding the relationship between bank capital and lending. Moreover, they analyze almost twenty years of data of the most important country in the world—the United States. They find a weak relationship between total lending and bank capital.

My main discussion point is to argue that causality and identification of credit supply may not be perfectly achieved because of the data available. As I argued in the discussion, due to the data, Berrospide and Edge (2010) may underestimate or overestimate the effects of bank capital on credit;¹¹ therefore, one should be careful both in drawing policy implications and in rejecting theories based on the importance of credit supply and bank capital.

I argued instead that exhaustive credit registers are better to identify credit supply changes, to analyze general equilibrium effects related to credit substitution, and, hence, to test the theories of the credit channel, providing in turn policy implications (see e.g. Jiménez, Mian, et al. 2010). Finally, to take into account all the different general equilibrium effects, bank lending surveys carried out by central banks (in most cases bank supervisors) may be very

¹¹The covariance between the credit demand and supply shocks may be very different even for the same country depending on the financial frictions one is analyzing (see Jiménez, Mian, et al. 2010 versus Jiménez, Ongena, et al. 2010a).

useful for analyzing the aggregate real effects of credit supply since surveys provide quarterly information on credit demand and supply developments (Ciccarelli, Maddaloni, and Peydró 2010).

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