CHAPTER 13

Does Bank Regulation Spill Over to Firm Financing? SME Financing, Bank Monitoring, and the Efficiency of the Bank Lending Channel

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1 Introduction

Small and medium-sized enterprises (SMEs) make up more than 99 per cent of all firms in the EU and account, on average, for about two thirds of total employment. Clearly, these firms are fundamental to the economy, and the ways in which SMEs are financed are a widely debated issue (see Navaretti et al. 2015 for a recent summary of public and academic arguments with regard to SME financing). This chapter deals with one of the key channels of SME funding, namely, the bank lending channel (see Berger and Udell 1998; Bolton and Freixas 2000; López-Gracia and Sogorb-Mira 2008; Vera and Onji 2010; Moro et al. 2012), and particularly with how stricter capital regulations affect bank lending to SMEs.

While there are certainly strong arguments in favour of stricter capital regulations for banks (BCBS 2010; Admati et al. 2013), concerns have been raised that these requirements may have adverse effects on the economy (Allen et al. 2012; Francis and Osborne 2009; Mésonnier and Monks 2015), especially SMEs (Saurina and Trucharte 2004; Humblot 2014). One of the key concerns is whether the comparative informational disadvantage normally attributed to SMEs (Berger and Udell 1998; López-Gracia and Sogorb-Mira 2008) will result in banks being less willing to lend to them in the face of stricter capital requirements. This is an area of great political importance and several policy measures have been taken in the European Union (EU) to mitigate such adverse effects, including (1) a capital requirement rebate for banks on SME lending ('the supporting factor'), (2) specific government-funded facilities directly investing in SMEs, and (3) liquidity windows that increase the viability of packaging and securitizing SME loans (Navaretti et al. 2015).

Despite such measures, SMEs continue to express an experienced funding gap between their needs and the actual availability of funds. Furthermore, the 2017 Safe survey[1] shows that SMEs in Europe are in fact experiencing deteriorating access to bank lending. The extent to which market failure can explain this 'experienced funding gap' resides in a multitude of complementary (and sometimes ambiguous) theoretical arguments (see Calomiris and Kahn 1991; Hughes 1999; Diamond and Rajan 2001; Calem and Follain 2007; Acharya et al. 2016). For

[1] SAFE (2017) is a survey of financing conditions faced by SMEs, run jointly by EC DG Internal Market, Industry, Entrepreneurship and SMEs, and the European Central Bank. The survey has been conducted seven times since 2007.

instance, regulation may have negative effects on bank efficiency, banking competition, the monitoring capacity of banks, the pricing of loans, and firm access to loans. Both Allen et al. (2012) and Humblot (2014) argue that the most bank-dependent agents, such as SMEs, will be adversely affected by the recently introduced Basel III requirements. This is in line with claims that banks will reduce relatively risky lending such as lending to SMEs. Other explanations with similar implications for SMEs include (1) crowding out, that is, banks de-lever rather than raise new equity when faced with stricter capital requirements (Stein 1998; Aiyar and Jain-Chandra 2012; Wehinger 2012), (2) less reliance on soft in favour of hard information in bank monitoring (Grunert and Norden 2012), and (3) bank use of regulatory arbitrage, which means that regulation can lead to a comparative advantage or disadvantage depending on the relationship between actual risk and the risk estimated for capital purposes (Willesson 2017).

With theories in conflict and scant empirical evidence on the spillover from regulation—via banks—to clients, further research is motivated. One of the key empirical challenges is identification, because of the difficulty of distinguishing loan supply and demand shocks from each other (Ashcraft 2006). Controlling for demand, we empirically investigate the supply effects of capital regulation on the bank lending channel on data associated with higher risk and/or higher asymmetric information than average, that is, loans to SMEs. More specifically, drawing on a sample of Swedish SMEs as our laboratory, we test a number of hypotheses based on the conflicting theories of how capital requirements affect bank lending to SMEs. The remainder of the chapter is organized as follows. First, we introduce the channel and the various theoretical explanations for why and how changes in capital regulation could affect bank lending to SMEs. We then introduce our methods and empirical strategy, after which we present our results. Finally, we offer some concluding remarks.

2 Theoretical Framework

We draw on the intermediate approach in banking (Sealey Jr and Lindley 1977) to analyse the possible spillover from regulation to firms via the banking system. In its simplest form, this approach holds that a bank accepts deposits from the public and invests it in risky assets. The bank adds value by offering efficient monitoring services that reduce the impact of information asymmetries. This means that banks should maintain

control over both credit risk and liquidity on behalf of depositors, who would not accept depositing money unless proper risk management procedures were in place (Black 1975; Diamond 1984; Fama 1985). Within this framework, firms have access to loans which generate a positive net present value (NPV) for the bank and prices are adjusted according to the risk, so that riskier borrowers pay a premium.

Based on this general framework, there are numerous potential explanations for the expected reaction from banks when capital requirements change. Several studies build on the Modigliani and Miller (1958) (MM) theorem, which states that a company's value is independent of its capital structure. From the banking perspective, Mehran and Thakor (2011) argue that capital regulation affects the systemic risk of the financial system but does not spill over as a regulatory cost to the bank's owners or credit holders. Increased costs from a higher weight of more expensive equity financing versus loans are neutralized due to lower risk premiums. The weighted average cost of capital (WACC) is not affected and does not spill over to investors or creditors, because the investor's risk is similarly reduced and the value of a bank is the NPV of the investment opportunities from its assets. In essence, this means that capital regulation affects the risk premium of loans and equity, while access to new investment opportunities may be financed by additional loans or equity. Moreover, more capital reduces the risk of moral hazard and public bail-out.

Contrary to the MM approach (i.e. that reduced return requirements counterbalance the use of more expensive equity), Diamond and Rajan (2000) argue that regulation is inefficient and impacts profitability negatively when regulation increases. We call this the 'negative NPV effect', which is the focus of a series of studies that have identified additional explanations as to why NPV would be impacted by capital regulation. On the debt side, there are studies on changed credit worthiness due to regulation. For instance, regulation of deposits (deposit insurance) reduces incentives for bank monitoring (Demirgüç-Kunt et al. 2015) and spill over to the cost of funding (Hughes 1999). Moreover, capital regulation could also have an impact on the value of equity and hence the value of the assets. First, banks require consideration of their function as a liquidity provider to the financial markets, which should require additional risk premium from investors (Berger and Bowman 2013). Second, efficiency is influenced by regulatory requirements (Zhao et al. 2010). Third, exposure to risk is not necessarily linear with respect to bank capitalization. Hence, banks with higher capital levels could also be forced to take on higher risks in their loan portfolio. Several empirical studies support this

view, reporting a U-shaped relationship between capitalization and risk (Haq and Heaney 2012; Lindblom and Willesson 2012), and many of the worst performing banks in the recent financial crisis were among the highest capitalized (Lindblom and Willesson 2012). A number of observations on NPV following regulation are positive to the bank, but negative to its clients. Pelzman (1976) suggested that regulation increases entry barriers, which spill over to clients through lower competition and higher prices. Furthermore, the study by Beck et al. (2004) on competition and loan access in 74 countries suggests that more concentrated financial markets influence the availability of firm financing, but that for larger size firms, with access to capital markets, this effect is smaller.[2]

These arguments are linked to the pro-cyclical nature of banking. During good times, when NPV is higher (i.e. more projects are profitable), risk-taking increases, which could be exacerbated by the nature of the capital regulations in effect (see Athanasoglou et al. (2014), for a review). This may also be explained by signalling, that is, high-quality banks signal their quality monitoring capacity by increasing the risk of their asset portfolio (Lucas and McDonald 1992), or reaching for yield, that is, increasing the risk of their asset portfolio to cover losses from regulation, which is beneficial for banks that are not risk averse (Kahane 1977: Koehn and Santomero 1980). The latter increases the probability of failure despite higher capital requirements and can further be linked to the previous observations that highly capitalized banks tend to adopt high risk/return strategies.

Based on the seminal paper by Diamond and Dybvig (1983), there is also a stream of literature that links capital regulation to deposit insurance, arguing that deposit insurance has a negative impact on depositors' incentives for monitoring and hence reduces the pressure on banks to maintain prudent capital levels (Santos 2001; Demirgüç-Kunt et al. 2015). However, recent regulatory discussions are mainly concerned with the moral hazard problem, in which banks take on excessive risk because tax payers are expected to cover the downside risk (Calomiris and Kahn 1991). Risk-sensitive capital requirements (the Basel Accords) limit risk-taking by imposing higher capital requirements on riskier assets (Chorafas 2011: 8–10). The effect is that banks may favour (or invent new) less risky assets (as defined by the Basel Committee) over more risky assets such as SME lending.

[2] However, well-capitalized banks may also hold an additional capital buffer because they anticipate a downturn in the economy or have resources available to invest in future investment opportunities.

Access to debt by SMEs can also be explained by what Stein (1998) calls the 'Crowding out effect'. The crowding out effect differs from the positive NPV effect in that capital restrictions force banks to turn down loans regardless of whether they would positively contribute to firm value. Stein (1998) argues that this adds a dimension to 'market frictions' through adverse shocks by exogenous factors (falling profits, decline in collateral value (real estate prices), or rising interest rates). Due to capital requirements, banks cannot access short-term funding without further increasing equity in order to qualify for the minimum capital requirements. Accordingly, VanHoose (2008) argues that capital regulation may affect individual bank lending in the short term because capital requirements ties-up risk-based capital. A bank must consequently increase its equity levels (reinvest profit or issue new shares) to be able to attract additional loans. It is not only the growth opportunities (new loans) that could be negatively impacted by capital restrictions. Due to the increasing risk of bank losses during a recession, the requirement for additional funding is also dependent on reduced supply of loans, not only growth opportunities. To minimize this risk of pro-cyclicality, the Basel III requirements include a 'countercyclical buffer' that varies depending on economic conditions.

Banks may aim to avoid regulation by changing parts of their business profile, which results in *regulatory arbitrage*. According to Willesson (2017: 71ff), regulatory arbitrage may be a strategy or transactions arrangement for the purpose of avoiding effects of regulation, by utilizing regulatory inconsistency. Thus, if the expected effects on the loan portfolio are not materialized, this would imply that regulatory arbitrage is at work. However, regulation can have an impact on the loan portfolio as a consequence of regulatory inconsistency above and beyond the nature of the portfolio's risk profile. Firstly, as observed by Calem and Follain (2007), banks involved in real estate activities before Basel II was introduced found they were better off adopting the new regime, which resulted in early adoption of the new regulations. Secondly, observed differences between accounted and real (monitored) risk may result in regulatory arbitrage (Blaško and Sinkey 2006; Calomiris and Mason 2004). Accordingly, specific bank products may be favoured not for economic profitability reasons but because of regulatory compliance and the bank's maximization of profit given certain regulatory restrictions.

Finally, *bank monitoring* of risk also includes a set of theoretical explanations for regulatory spillover effects. Here the focus is placed on the role of asymmetric information in creating frictions that allow banks to differentiate their lending strategies. Having a long-term relationship leads to better

understanding of the client's risk and historical data that can be used to monitor clients more accurately. As noted by Berger and Udell (1995), the optimal type of lending depends on the level of information asymmetry of the firm and the extent to which hard information is available or not. Moro et al. (2012) argue that, because most SMEs lack pledgeable equity and are also considered to be information opaque, they are forced to rely on relationship-based lending. The reliance on soft information accessed through the relationship mitigates information opaqueness and allows SMEs access to bank lending (see Berger and Udell 1995, 2002; Baas and Schrooten 2006; Van Caneghem and Van Campenhout 2012).

Many authors have sought to empirically assess the impact of stricter capital requirements on bank behaviour. Reviewing the empirical research on the design and impact of bank regulation, Jakovljević et al. (2015) conclude that '[E]mpirical results on the effects of microprudential regulation (in terms of banks' capital level and performance) have been far from conclusive'. These authors go on to note that empirical research fails to provide definitive answers to whether regulatory policies affect banks' risk-taking and lending behaviour. This is consistent with Wilson et al. (2010), who refer to the variation in the business cycle and the pro-cyclical nature of bank capital, with the inherent implication that borrower access to finance also varies pro-cyclically. As addressed by the VanHoose (2007, 2008) literature surveys, there is a great deal of controversy regarding the channels through which bank lending is affected by stricter capital requirements. Although it is quite clear that a short-term effect does actually exist, it is much less clear whether the effects continue to exist in the longer term. In a recent study by Bridges et al. (2014), the short-term effect is confirmed and shown to be strongest for commercial real estate followed by corporate lending. Most loan growth recovers within three years. Accordingly, it seems highly relevant to continue investigating the empirical problem of the extent to which capital regulation has an impact on bank lending to SMEs. Hence, in the next section, we present our methodological approach aimed at addressing the multiple theoretical explanations outlined above.

3 Research Methodology

In accordance with our theoretical framework, we can identify four strategies, with implications for the lending channel, that banks may pursue in order to adapt to a change in capital regulation: (1) change in risk, (2) change in price, (3) change in volumes, and (4) change in portfolio

composition. As changes in these factors may not only be a result of regulation but also reflect the bank's risk profile, competition (between banks and access to non-bank funding opportunities), or economic conditions (interest rate levels and GDP), we require an analytical framework that allows us to control for demand-side effects.

Our main determinant is the use of bank loans by Swedish SMEs. In the pecking order of equity, non-bank loan, and bank loan, there is ample support for the claim that bank lending is in fact the cheapest source of long-term funding. Based on the framework developed above, we seek to identify changes in the lending channel due to regulation, based on the banks' regulatory responses. If these hypotheses cannot be rejected, this would be indicative of a disparity between the intended effect of the regulation and the actual effects on the distribution of loans. This would imply that there is a spillover in the value chain from regulation to the real economy through access to bank lending.

Regulation and banking responses could affect both the supply and demand of loans. The supply of loans can be traced through changes in volumes or in prices. The latter also affects the demand for loans, but demand factors are also associated with the supply of other funding sources, such as equity and non-bank loans. The four hypotheses each deal with possible changes to supply and demand.

Methodologically, our study is inspired by previous research investigating various determinants of bank lending supply, both in terms of loan volumes and lending rates. For example, Francis and Osborne (2012) study asset and liability changes arising from regulation. To identify changes in assets, they use changes in total assets, risk-weighted assets, and loans.[3] These relationships are estimated using fixed effect regressions and the generalized method of moments (GMM). Burgstaller and Scharler (2010) use an integrated approach to assess the impact of interest rate changes on loan rates. The loan rate is a function of the changes in interest rates. These results are controlled by using the capital ratio (to control for possible spillover on the loan supply) and volumes (to control for infinitely elastic loan supply). The (absolute) loan volume is estimated by economic activity, inflation, and interest rate changes.

We concentrate on one country, Sweden, for which we have more detailed and broader datasets for banks and SMEs than the cross-country

[3] The determinants are delta GDP, prices, and general credit conditions (measured as provision to total assets and charge offs to total assets).

databases available for similar purposes. There are several benefits in restricting our analysis to Sweden. First, part of the data we have access to on a national basis cannot be observed from the cross-national dataset. This means that we can draw on a broad spectrum of SMEs and achieve higher accuracy. Second, we can analyse a sample of firms that is only limited by time and selection constraints. In doing so, we partly limit the possibility of more general analyses related to banking environments. In the rest of the world, we would benefit from being able to identify each firm and bank relationship. However, Swedish legislation (the Bank Secrecy Act) limits the availability of doing so as well as the possibility of testing the association between SMEs and their respective bank/s. Finally, Sweden has moved ahead of many other EU countries in terms of implementing stricter capital regulations at a faster pace, which means that the Swedish case may be used as an example of what is to be expected when other EU countries follow suit.[4]

3.1 Data

We draw on three different sets of data, focusing our analysis on the period 2006–2016. Panel A is composed of two of these datasets. The *first* part of the panel contains a number of nonstationary country variables assumed to affect the pricing of loans and access to loans provided by banks and a measure of regulatory changes. The key variable here is the regulatory measure, which is calculated on the basis of both changes in risk weight and capital requirement given the risk weight. The time period under study covers three regulatory frameworks for capital, Basel I, Basel II (from 2007), and Basel III (from 2013). In Sweden, Basel II became effective as of February 2007, whereas Basel III gradually became effective from January 2013 onwards. Based on the standardized approach for credit risk in Pillar I of the Basel Accords, Basel II allowed greater diversity in terms of the number of risk-weight categories. The risk-weight categories were

[4] In terms of previous empirical literature analysing the importance of loan infrastructure, Sweden is generally considered a country with good access to finance and solid financial stability, as well as one where SMEs fund themselves partly through bank lending. According to the World Bank statistics, 6.7 per cent of the firms find access to finance to be their biggest obstacle, while 35.5 per cent of the firms in the country use bank loans as part of their financing. These factors imply that the results are not influenced by financial and infrastructure development. Unlike many other countries, Sweden's banking system experienced limited disturbances during the 2007–2008 financial crisis (Elliot 2016).

kept constant in the Basel III standardized approach, the actual capital requirement being gradually increased instead. The regulatory variable is based on non-disclosed compliance data from one of the big four banks. The remaining variables are used to control for opportunity costs of capital, an issue that is addressed in previous literature. In addition, we control for changes in the corporate tax rate during the period under study, as it may impact the opportunity cost between loans and equity financing. In 2009, the corporate tax rate was reduced from 28 per cent to 26.3 per cent and in 2013 was further reduced to 22 per cent. We also control for negative interest rates, because these may affect the banks' intermediation, fundamentally because deposit rates are higher than the market interest rate. Additional country-level data come from IMF (GDP/capita) and the Riksbank (market interest rates averages).

The *second* part of the panel is mainly obtained from annual entity-level balance sheet data, collected through the SNL database for the period 2006–2016. From SNL, we collected total assets, total net loans, total equity, Tier 1 common capital (CET1), capital adequacy method, total risk-weighted assets, interest income, interest expense, net interest income, operating income, fee and commission income, fee and commission expense, net income before taxes, and net income. As there are large numbers of missing values for the smaller banks, we complement the SNL data with non-public data from the Swedish Savings Banks Association for the period 2006–2016. This dataset contains a large number of balance sheet and income statement variables which we used to manually compile a comparative data sample for Swedish savings banks. As all Swedish savings banks are small, their corporate lending goes almost exclusively to SMEs.[5] It is worth noting that the figure for corporate lending by banks is an aggregate number and not limited to SMEs.

The firm-specific data are collected from Business Retriever and include detailed balance sheet and income statement information for all Swedish joint stock firms. Consistent with the EU definition of SMEs, we collect data on all firms with less than 250 employees, less than €50 million in turnover, and less than €43 million in total assets.[6] We exclude micro-firms

[5] The Savings Bank data covers all the savings banks but is unbalanced due to a number of mergers among the banks during the period under study.

[6] For the sake of simplicity, we use a SEK-to-EUR ratio of 10-to-1. The EURO/SEK spot price has varied between a lowest value of 8.20 and a highest value of 11.64, presenting an average value of 9.33 during the period under study (currency data from the Riksbank).

(firms with less than 10 employees) leaving us with a sample of 33,820 firms for which we have 2007–2016[7] data on number of employees, return on equity, liability interest, debt/equity ratio, turnover, operating profit/loss (EBIT), external interest costs, profit/loss for the year, cash and bank balances, total assets, total equity, long-term liabilities to credit institutions, total current liabilities, granted bank overdraft, and used bank overdraft. We also collected industry characteristics, which results in 29 different industries.

3.2 Empirical Strategy

We approach our hypotheses by determining access to bank funding and prices as separate regressions. Each hypothesis observes a change in banking strategy followed by a separate analysis of changes in the SME data due to SME characteristics. We identify the spillover from regulation via the assumption that regulatory cost shows up in the banks' prices, cut-offs, or increased collateral and in SME access to bank loans, prices, or their risk profile. This implies that regulation has an impact on the price or volume of loans either through (1) a reduction in bank lending as a share of total lending, (2) higher lending rates, or (3) changing attitudes towards risk. We identify the determinants on the basis of the changes in bank characteristics and regulatory changes. The bank characteristics include controls for risk, loan pricing, and loan supply.

We expect to determine the SMEs' share of bank loans (BANKSHARE) and their prices paid for the loans (LOANPRICE), which we expect to be interrelated. Our main determinant is the indication of regulatory impact, together with a set of variables to determine the characteristics of banks (BANK_CHAR) associated with different regulatory responses. Finally, we control for these results against different SME characteristics (SME_CHAR) and variables reflecting economic development (ECON).

$$BANKSHARE = f\begin{pmatrix} LOANPRICE, SME\_CHAR, BANK\_ \\ CHAR, REGULATION, ECON \end{pmatrix}$$

$$LOANPRICE = f\begin{pmatrix} BANKSHARE, SME\_CHAR, BANK\_ \\ CHAR, REGULATION, ECON \end{pmatrix}$$

[7] Data for medium-sized firms for 2016 is not included because of database restrictions.

Endogeneity concerns are likewise taken into consideration. We use random effect regressions as the primary econometric approach. The results are also checked using alternative statistical test methods. Each of the four hypotheses focuses on different aspects of why and how regulation influences bank lending to SMEs. The study also benefits from the characteristics of the banking sector. The Swedish banking market is dominated by four big banks, accounting for approximately 75 per cent of the market in terms of deposits and lending (Elliot 2016). We focus the analysis on these banks, as SMEs are more likely to take loans from these banks. The remaining banks operating on the corporate market comprise a few commercial banks and a number of smaller savings banks. We use insights from savings banks to deepen the analysis of regulatory responses, especially those associated with monitoring capacity. We address each of the regulatory responses employing the following strategies. Details of the strategies, the tests, and the variables used to analyse the strategies are presented together with the results.

3.3 The Negative NPV Effect

The analysis of the NPV effect is based on the assumption that supply and prices are affected by regulatory changes, being the result of a change in cash flow or discount rate in order not to reduce the value of the bank's assets. We address this regulatory response by analysing corporate lending, risk, and prices by banks as a first step. The NPV effect is observed if we identify changes in the capitalization of banks and loan assets associated with regulatory costs. The spillover of the bank response is observed if we can find support from regulation to both the SME borrowing and pricing. This implies there is a general impact on the bank from the regulatory variables, after controlling for firm characteristics and risk. We further identify spillover from regulation via the assumption that the impact on banks also affects SME lending, that is, increasing capital requirements may impose regulatory costs on banks that are passed on to SMEs via a reduction in bank loans as a share of total lending, the charging of higher prices, or changing risk attitude.

3.4 The Crowding Out Effect

The crowding out effect builds on the same relationship as the NPV effect but is affected by short-term restrictions in capital access. The crowding out effect is identified as an impact on SME lending when capital is

restricted due to economic conditions, regulations, or bank capitalization. The latter reflects the ability to absorb short-term effects. More precisely, SMEs are forced to postpone investments if capital is a restriction of making profitable, risk-adjusted investments or search for other investment opportunities with a different risk profile. We use the financial crisis as a separate case and consider capital restrictions and GDP over the full time period. The banking stage of this analysis compares the development of corporate lending with respect to capitalization in order to distinguish between reduced demand for loans and supply restrictions following crowding out. The spillover of the crowding out effect is analysed on the basis of differences between small and medium-sized firms in terms of economic and regulatory conditions.

3.5 The Regulatory Arbitrage Effect

The regulatory arbitrage effect implies that banks make adjustments in order to maintain their level of risk, while minimizing the effect of regulation. We focus on strategic regulatory arbitrage, which is closely related to the NPV effect. The conceptual difference lies in the attention given to a gap between actual risk and capital requirement for that risk. This implies that banks adjust to avoid possible regulatory costs rather than adjusting their assets to cover these regulatory costs. We study this from a bank perspective by looking at changes in the ratios of in risk-weighted assets to loan assets and to equity. The spillover to SMEs is analysed by identifying the regulatory impact on prices and bank lending together with differences between firms based on industry and risk. The former assumes that bank loans are more attractive to some industries that will then supposedly have a lower gap between regulation and risk. The latter—which can be seen as a combination of reaching for yield and regulatory arbitrage strategies—assumes that banks emphasize risk that yields a higher return on equity capital.

3.6 The Monitoring Effect

The monitoring effect response is approached from a relationship banking versus formal decision models perspective. We expect banks that are more involved in relationship banking to manage their loan asset risks differently from banks using formal decision models. The difference will lie in how the banks analyse information asymmetries. The relatively higher level of

information asymmetries of SMEs will consequently lead to lower aggregate probability of getting loans, or they will likely pay higher risk premiums. We approach this question by comparing the volumes of the banks' corporate lending, loan prices, and loan risk between savings banks and the four big banks. Savings banks in Sweden have a history of relationship banking, are distributed within limited geographical regions, and have historically been involved in the development of local society. The spillover of their possible monitoring capacity is approached to analyse existing information asymmetries. Consequently, we should not only identify changes in SME lending but also differences between small and medium-sized firms arising from regulation in terms of bank lending and prices.

4 Results

4.1 Regulatory Responses by Banks

The descriptive analysis of the banking data reveals some changes in bank strategies that may be related to the gradually increasing capital requirements between 2006 and 2016. Although short-term interest rates increase initially, after the financial crisis, they first fall and then gradually continue at negative levels during the last two years of observation.

GDP grows steadily over the period, as does bank capitalization. The banks use more equity to finance their assets during the period, and the ratio of loans to total assets is consistent over time, except during the financial crisis (2007/2008). The regulated riskiness of the banks' assets is reduced and moves in the opposite direction to the regulations. Nonetheless, prices increased over the period under study.[8] At the same time, we observe that the banks present more homogenous pricing and risk. The trend for the savings banks follows the market leaders, except for regulated risks, where savings banks show stable and consistent regulated risk over time.

Complementing these trends with analysis of the four regulatory response theories, we find support for three of the four regulatory responses. We observe attributes related to the NPV effect. There is a difference in prices, risks, and loans, while corporate loans tell the same story: a lower ratio of equity to RWA and lower levels of lending. From

[8] A significant drop is observed under and directly after the financial crisis, which may indicate a lag from the significant interest rate decrease. However, it could also be related to the fact that borrowers had to implicitly fund bank losses after the financial crisis (see Lindblom et al. (2011) for an assessment of Swedish banks' changing risk and return strategies during the financial crisis).

this perspective, the lower ratio of RWA to total assets is surprising, but could reflect the banks' initial attempts to reduce regulatory requirements. Changing the focus from the assets to the liability side, the observation may be a result of regulatory arbitrage, in which banks are trying to avoid having to raise additional capital. The crowding out effect is indicated by the capital requirement and GDP. The data do not allow us to observe differences in corporate lending, as they do not separate aggregate corporate lending from specific SME lending. As to monitoring capacity, we do observe a difference in the ratio of risk-weighted assets to total assets, which varies more for the big four as well as decreasing more for these banks. There is also a difference in terms of the financial crisis that affects the big four more than the savings banks. The latter observation comprises the essence of the monitoring effect. However, we cannot distinguish this potential monitoring effect as it is not related to regulation and could also correspond to the risk-weighted assets of the loan portfolio. Lending to the corporate sector is found to decrease more for the big four.

4.2 Regulatory Spillover from Banks to SMEs

The spillover from the banks' responses is analysed via the SMEs. In line with the motivation of our study, we observe that firm size is a key determinant of the share of banking loans used to finance the firm. This factor is observed both for the full sample and when the sample is split into small and medium-sized firms. The basic model shows this factor, as well as additional endogenous firm characteristics, including risk. The model captures the model assumptions, although the overall determination is only 17 per cent. Overall, this means that we manage to determine part of the differences among firms, but these are not very predictive in the full sample. The basic model for loan prices shows that the price is higher for firms lending more and lower for larger firms. The overall determination on the full sample is 5 per cent, but higher for the smaller firms. Although we identify the determining impact of firm differences, firm characteristics do not determine the changes in either the share of bank loans or prices.

4.3 The NPV Effect

The analysis of the NPV effect is based on a determination of loan access and return affected by regulation. We find that regulation has a (statistically) positive effect on both the level of bank loans and prices, supported

by the spillover from banks. Furthermore, lending supply (loan to total asset) affects the share of bank capital. This is in line with the expectations and can be argued to be a spillover from regulatory costs.

The ratio of equity to risk-weighted assets is seen to negatively affect the share of bank capital. This may be an indication of reaching for yield. Consequently, banks strive to increase the gap between regulated risk and actual risk, and increase the return on each share of equity. The effect is more significant for small firms. The results also show that equity does not affect the share of loans for medium-sized firms. This is an opportunity for smaller firms to access bank lending. From a banking response perspective, regulatory arbitrage is a possible complementary response (see more below).

We find that the banking variables have an impact on prices. Loan prices are positively influenced by lending supply, but are negative on risk. Both of these effects could arguably be related to spill over from regulation: assuming that the banks spill over regulatory costs to their assets. Once again, smaller firms are better determinants. However, we find no evidence that this is caused by regulation. The results of both of these dependent variables suggest that an NPV effect is a possible response strategy that impacts banks and spills over to SMEs, although the results are not very robust (Table 13.1).

4.4 Crowding Out

The analysis of the crowding out effect considers the prevailing economic conditions. We did not observe any such effect on the banking industry responses. However, SME lending may possibly be treated differently by banks from other types of corporate lending, which means that it is not showing up in the aggregated banking data. For instance, banks could rearrange their corporate loan portfolio to larger firms in which they have higher stakes if these firms face liquidity shortages or if banks are declining new business opportunities. However, we find no evidence for any impact of the crowding out effect on the analyses of the SME data. We do find that economic conditions have an impact on lending to smaller firms, but not to medium-sized firms. Nonetheless, we find no evidence for the opposite conditions, which comprises the essence of the hypothesis.

Table 13.1 The influence of regulation and bank spillover to the bank share of SME loans and SME loan pricing

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
	BANKSHARE BASIS	*BANKSHARE REG RESPONSE*	*BANKSHARE SMALL*	*BANKSHARE MEDIUM*	*PRICE BASIS*	*PRICE REG RESPONSE*	*PRICE SMALL*	*PRICE MEDIUM*
	b	*b*	*b*	*b*	*b*	*b*	*b*	*b*
LOANPRICE	0.017***	0.019***	0.019***	0.016***				
stdRETURN	−0.000***	−0.000***	−0.000***	−0.000	0.000***	0.000***	0.000***	0.000
FIRMSIZE	0.039***	0.040***	0.046***	0.033***	−0.137***	−0.176***	−0.180***	−0.112*
TAXRATE	1.106***	4.387***	4.490***	3.035***				
REGULATION_DUM		0.151***	0.154***	0.099***		0.397***	0.407***	0.155***
BANKSHARE					1.267***	1.457***	1.475***	1.122***
Constant	−0.381***	−1.266***	−1.341***	−0.955***	2.536***	2.644***	2.665***	2.149***
N	60,119	60,119	57,714	2405	60,119	60,119	57,714	2405
R-sqr-o	0.169	0.183	0.209	0.073	0.051	0.059	0.057	0.033
P	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
sigma_e	0.108	0.107	0.107	0.104	1.112	1.088	1.094	0.929

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

4.5 Regulatory Arbitrage

The lower ratio of equity to RWA by banks, despite higher equity levels, indicates the use of strategic regulatory arbitrage as a regulatory response strategy. Furthermore, the risk adjustments made by banks may be related to avoidance of regulatory capital restrictions that affects funding costs rather than asset margins.

We analyse the consequences for corporate lending in the event of regulatory arbitrage. This exercise is somewhat tricky, as overall corporate lending decreases and the bank lending channel simultaneously becomes less important over the period under study. Bank competitiveness appears to be affected. It is not possible to analyse within the scope of this chapter whether this is because of regulation or whether it reflects a general trend. However, in terms of regulatory arbitrage, we are able to identify a change in risk as measured by SME returns and return risk. The relative proportion of bank capital decreases less over time for the quartile of SMEs with the greatest returns and greatest risks. This implies that, even if SMEs with a larger risk/return potential have been looking for alternative sources of funding, they are on average better off than firms included in the other risk and return categories in terms of access to bank lending. Furthermore, loan prices can be described as being consistent over time. These observations are possible additions to regulatory theory and regulatory responses defined as regulatory arbitrage: a general interest to observe the balance between capital requirements and risk. However, further analyses are required in order to distinguish more clearly between reaching for yield strategies and regulatory arbitrage considering regulatory loopholes in the management of overall risk levels. We are not able to perform these analyses with the existing data. Nonetheless, we wish to address this issue as a possible line of further research related to regulatory responses, banking intermediation, and how regulation affects the lending channel.

We find support for a possible regulatory arbitrage strategy reliant on differences between regulated risk and actual risks. Banks that wish to adjust their risk without additional capital can consequently increase loans to sectors that have a higher risk than the regulator suggests, and vice versa. Although we cannot link industry risk to the risk capital requirement, we find that regulation has a different outcome in the determination of loan share and prices depending on industry.

4.6 Monitoring

The fourth regulatory response affects bank monitoring. Regulatory responses differ between savings banks and the big four banks in terms of corporate lending. We analyse spillover from these monitoring differences assuming that formal risk assessment models are more important after regulation. The results indicated by our analysis of regulatory arbitrage contradict the assumption that monitoring capacity spills over to SME financing. Contrary to the assumption relating to the monitoring hypothesis, we find that the decrease in bank lending is lower for smaller banks than for medium-sized banks. However, the trend also includes the overall decreasing use of banks as a source for SME lending, which means that this result could be an artefact of competition from non-bank actors. Loan price differences are consistent with the regulatory regime, although the spread between prices is smaller for the smaller banks when faced with stricter regulation. Comparing small and medium-sized firms, we find no significant differences in terms of pricing between the two sets of firms. We cannot state that monitoring capacity has an impact on lending for SMEs due to regulation. The higher cost for the smaller banks is revealed under the NPV effect as part of the risk premium. However, regulatory factors influence the prices for smaller firms statistically, but not those for medium-sized firms.

To sum up these findings, we can state that the results are neither straightforward nor consistent with respect to the monitoring capacity of banks. Having said this, the analysis is limited to the banks' lending channel and those loans that are actually granted by the banks. Outside of the banks, increasing reliance on formal risk assessment models may be a reason why there is a lower level of lending to SMEs and why SMEs seem to find other funding sources to a greater extent.

5 Conclusions

This chapter discusses and analyses bank intermediation by studying the impact of regulation on the lending channel. The study is built upon alternative theories to analyse regulatory responses and spillover to firms' loan financing on a set of Swedish banks and Swedish SMEs over a ten-year period. Contrary to the MM theorem and arguments stating that banks have buffers that absorb changes in the external environment, the results of this study show that banks respond to regulatory changes in a way that

increases profitability over regulatory costs. The empirical results provide support for two alternative theories: (1) the NPV effect, which assumes that costs associated with regulation are transferred to clients leading to restrictions from some unprofitable loans, and (2) regulatory arbitrage, which suggests that banks use regulatory loopholes to avoid costs related to regulation. Furthermore, we find no evidence for the crowding out effect and very mixed results with respect to the monitoring effect.

This chapter shows that policy makers require more comprehensive approaches in order to gain a better understanding of the need to consider alternative regulatory responses by banks in banking system analyses. There is a risk of not considering regulatory costs if the analyses are based solely on the MM theorem, which excludes regulatory responses. In this study, we find empirical support for the spillover of higher prices, a lower degree of bank loans, and possibly competition from non-bank sectors in order to finance SMEs. The last finding is contrary to the understanding that the smallest firms that are provided loans will partly benefit from regulation. This could have an impact on regulatory efficiency (regulatory deadweight loss), financial stability (higher risk in the financial world), and economic growth (higher funding costs should lead to lower investment volumes).

References

Acharya, V. V., Mehran, H., & Thakor, A. V. (2016). Caught between Scylla and Charybdis? Regulating bank leverage when there is rent seeking and risk shifting. *Review of Corporate Finance Studies, 5*(1), 36–75.

Admati, A. R., DeMarzo, P. M., Hellwig, M. F., & Pfleiderer, P. C. (2013). *Fallacies, irrelevant facts, and myths in the discussion of capital regulation: Why bank equity is not socially expensive*, Working Paper 13–7, Stanford University.

Aiyar, S., & Jain-Chandra, S. (2012). The domestic credit supply response to international Bank deleveraging: Is Asia different? *IMF Working Papers, 12*(258), 1–14.

Allen, B., Chan, K. K., Milne, A., & Thomas, S. (2012). Basel III: Is the cure worse than the disease? *International Review of Financial Analysis, 25*, 159–166.

Ashcraft, A. B. (2006). New evidence on the lending channel. *Journal of Money, Credit, and Banking, 38*(3), 751–775.

Athanasoglou, P. P., Daniilidis, I., & Delis, M. D. (2014). Bank procyclicality and output: Issues and policies. *Journal of Economics and Business, 72*, 58–83.

Baas, T., & Schrooten, M. (2006). Relationship banking and SMEs: A theoretical analysis. *Small Business Economics, 27*(2), 127–137.

BCBS. (2010, August). *An assessment of the long-term economic impact of stronger capital and liquidity requirements*. Bank for International Settlements, Basel.

Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2004). Bank competition and access to finance: International evidence. *Journal of Money, Credit and Banking, 36*(3), 627–648.

Berger, A. N., & Bowman, C. H. S. (2013). How does capital affect bank performance during financial crises? *Journal of Financial Economics, 109*, 146–176.

Berger, A. N., & Udell, G. F. (1995). Relationship lending and lines of credit in small firm finance. *Journal of Business, 68*, 351–382.

Berger, A. N., & Udell, G. F. (1998). The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking and Finance, 22*(6), 613–673.

Berger, A. N., & Udell, G. F. (2002). Small business credit availability and relationship lending: The importance of bank organisational structure. *The Economic Journal, 112*(477), F32–F53.

Black, F. (1975). Bank funds management in an efficient market. *Journal of Financial Economics, 2*, 323–339.

Blaško, M., & Sinkey, J. F. J. (2006). Bank asset structure, real-estate lending, and risk-taking. *The Quarterly Review of Economics and Finance, 46*(1), 53–81.

Bolton, P., & Freixas, X. (2000). Equity, bonds, and bank debt: Capital structure and financial market equilibrium under asymmetric information. *Journal of Political Economy, 108*(2), 324–351.

Bridges, J., Gregory, D., Nielsen, M., Pezzini, S., Radia, A., & Spaltro, M. (2014). *The impact of capital requirements on bank lending*. Working Paper No 486, Bank of England.

Burgstaller, J., & Scharler, J. (2010). How do bank lending rates and the supply of loans react to shifts in loan demand in the UK? *Journal of Policy Modeling, 32*(6), 778–791.

Calem, P. J., & Follain, J. R. (2007). Regulatory capital arbitrage and the potential competitive impact of Basel II in the market for residential mortgages. *Journal of Real Estate Finance and Economics, 35*(2), 197–219.

Calomiris, C., & Kahn, C. (1991). The role of demandable debt in structuring optimal banking arrangements. *American Economic Review, 81*, 497–513.

Calomiris, C. W., & Mason, J. R. (2004). Credit card securitization and regulatory arbitrage. *Journal of Financial Services Research, 26*(1), 5–27.

Chorafas, D. (2011). *Basel III, the devil and global banking*. Houndmills: Palgrave Macmillan.

Demirgüç-Kunt, A., Kane, E., & Leaven, L. (2015). Deposit insurance around the world: A comprehensive analysis and database. *Journal of Financial Stability, 20*, 155–185.

Diamond, D. (1984). Financial intermediation and delegated monitoring. *Review of Economic Studies, 51*(3), 393–414.

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy, 91*(3), 401–419.

Diamond, D. W., & Rajan, R. G. (2000). A theory of bank capital. *Journal of Finance, 55*(6), 2431–2465.

Diamond, D. W., & Rajan, R. G. (2001). Liquidity risk, liquidity creation, and financial fragility: A theory of banking. *Journal of Political Economy, 109*, 287–327.

Elliot, V. H. (2016). Institutional entrepreneurship and change: A contemporary history of the Swedish banking industry and its performance management systems. *Journal of Accounting and Organizational Change, 12*(2), 223–251.

Fama, E. F. (1985). What's different about banks? *Journal of Monetary Economics, 15*, 29–39.

Francis, W., & Osborne, M. (2009). *Bank regulation, capital and credit supply: Measuring the impact of prudential standards.* Occasional Paper, 36.

Francis, W. B., & Osborne, M. (2012). Capital requirements and bank behavior in the UK: Are there lessons for international capital standards? *Journal of Banking & Finance, 36*(3), 803–816.

Grunert, J., & Norden, L. (2012). Bargaining power and information in SME lending. *Small Business Economics, 39*, 401–417.

Haq, M., & Heaney, R. (2012). Factors determining European bank risk. *Journal of International Financial Markets, Institutions and Money, 22*(4), 696–718.

Hughes, J. P. (1999). Incorporating risk into analysis of production. *Atlantic Economic Journal, 27*(1), 1–23.

Humblot, T. (2014). *Basel III effects on SMEs' access to bank credit*, Working Paper CR14-EFI06.

Jakovljević, S., Degryse, H., & Ongena, S. (2015). A review of empirical research on the design and impact of regulation in the banking sector. *Annual Review of Financial Economics, 7*, 423–443.

Kahane, Y. (1977). Capital adequacy and the regulation of financial intermediaries. *Journal of Banking and Finance, 1*(2), 207–218.

Koehn, M., & Santomero, A. M. (1980). Regulation of bank capital and portfolio risk. *The Journal of Finance, 35*(5), 1235–1244.

Lindblom, T., & Willesson, M. (2012). Financial crisis and EU-banks' performance. In J. F. de Guevara Radoselovics & J. Pastor Monsálvez (Eds.), *Crisis risk and stability in financial markets.* Houndmills: Palgrave Macmillan.

Lindblom, T., Olsson, M., & Willesson, M. (2011). Financial crisis and bank profitability. In P. Molyneux (Ed.), *Bank performance, risk and firm financing.* Houndmills: Palgrave Macmillan.

López-Gracia, J., & Sogorb-Mira, F. (2008). Testing trade-off and pecking order theories financing SMEs. *Small Business Economics, 31*(2), 117–136.

Lucas, D. J., & McDonald, R. L. (1992). Bank financing and investment decisions with asymmetric information about loan quality. *The Rand Journal of Economics, 23*(1), 86–105.

Mehran, H., & Thakor, A. V. (2011). Bank capital and value in the cross-section. *Review of Financial Studies, 24*, 1019–1067.

Mésonnier, J.-S., & Monks, A. (2015). Did the EBA capital exercise cause a credit crunch in the euro area? *International journal of central banking: IJCB, 11*(3), 75–117.

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review, 48*(3), 261–297.

Moro, A., Lucas, M., & Grimm, U. (2012). The debt structure of SMEs: An optimization model. *The Journal of Entrepreneurial Finance, 16*(1), 87–108.

Navaretti, G. B., Calzolari, G., & Pozzolo, A. F. (2015). Is special treatment for SMEs warranted? *European Economy. Banks Regulation and The Real Sector, 2*, 9–33.

Pelzman, S. (1976). Toward a more general theory of regulation. *Journal of Law and Economics, 19*, 211–240.

Santos, J. A. (2001). Bank capital regulation in contemporary banking theory: A review of the literature. *Financial Markets, Institutions and Instruments, 10*(2), 41–84.

Saurina, J., & Trucharte, C. (2004). The impact of Basel II on lending to small- and medium-sized firms: A regulatory policy assessment based on Spanish credit register data. *Journal of Financial Services Research, 26*(2), 121–144.

Sealey, C. W., Jr., & Lindley, J. T. (1977). Inputs, outputs and a theory of production and cost at depository financial institutions. *The Journal of Finance, 32*(4), 1251–1266.

Stein, C. (1998). An adverse-selection model of Bank asset and liability management with implications for the transmission of monetary policy. *RAND Journal of Economics, 29*, 466–486.

Van Caneghem, T., & Van Campenhout, G. (2012). Quantity and quality of information and SME financial structure. *Small Business Economics, 39*(2), 341–358.

VanHoose, D. (2007). Theories of bank behavior under capital regulation. *Journal of Banking and Finance, 31*(12), 3680–3697.

VanHoose, D. (2008). Bank capital regulation, economic stability and monetary policy: What does the academic literature tell us? *Atlantic Economic Journal, 36*(1), 1–14.

Vera, D., & Onji, K. (2010). Changes in the banking system and small business lending. *Small Business Economics, 34*(3), 293–308.

Wehinger, G. (2012). Bank deleveraging, the move from bank to market-based financing, and SME financing. *Oecd Journal: Financial Market Trends, 2012*(1), 65.

Willesson, M. (2017). What is and what is not regulatory arbitrage? A literature review and syntheses. In G. Chesini, E. Giaretta, & A. Paltrinieri (Eds.), *Financial markets, SME financing and emerging economies.* Houndmills: Palgrave Macmillan.

Wilson, J. O., Casu, B., Girardone, C., & Molyneux, P. (2010). Emerging themes in banking: Recent literature and directions for future research. *The British Accounting Review, 42*(3), 153–169.

Zhao, T., Casu, B., & Ferrari, A. (2010). The impact of regulatory reforms on cost structure, ownership and competition in Indian banking. *Journal of Banking and Finance, 34*(1), 246–254.