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Bank Lending Channel, the Risk-Capital-Efficiency Relationship and Loan Determinants in Sweden

Abstract: I examine (1) the existence of a bank lending channel, (2) the risk-capital-efficiency relationship and (3) loan determinants for Swedish banks during the 2000s. I build my own unique dataset of quarterly bank data and complementary non-bank data. I find no evidence of a bank lending channel using a system of equations that corrects for lagged effects. Furthermore, using a Seemingly Unrelated Regression (SUR) approach, I find a weak contemporaneous effects between risk and efficiency, risk and capital but no bi-directional relationship between capital and efficiency. Finally, I find that deposits, liquid assets and loan loss reserves to be the most appropriate factors for forecasting bank loans to firms and households.

Keywords: Bank Lending Channel, Bank Risk, Bank Capital, Bank Efficiency, Bank Loan Determinants

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1. Introduction

One of the main purposes of the financial system is to provide financing to firms and households in order to finance economic activity, generate wealth and economic growth. This occurs either through market funding or bank funding. The relative importance of these types of funding differ across countries, as funding in European countries is predominantly based on bank funding while funding in the U.S. is predominantly based on market funding (Ehrmann et al., 2001). To properly understand how monetary policy is transmitted to credit growth, one has to study the credit channel, which consists of the balance sheet channel and the bank lending channel (Bernanke and Gertler, 1995). The balance sheet channel deals with the borrower's financial position and the role it plays in the monetary policy transmission mechanism (demand side) while the bank lending channel deals with the effect of monetary policy changes through the shift in supply of intermediated credit extended by commercial banks (supply side).

In the aftermath of financial regulations and comprehensive structural changes to the European banking system in the 2000s (Goddard, 2007) and the response to the financial crisis of 2007-2010, it seems both interesting and relevant to reinvestigate the bank lending channel in Sweden. Previous studies have found and concluded the existence of and the importance of a bank lending channel from the mid-1980s to the mid-1990s and from 1998-2003 (Hallsten, 1999; Westerlund, 2003).

Another relevant topic in the banking community are how to design reforms that will result in a stronger and more resistant banking sector. Two of the main points in the Basel III proposal are capital and liquidity (Basel Committee, 2011) and the research branch in banking that studies capital often study its relationship with risk and efficiency based on previous empirical evidence. To the best of my knowledge, the bi-directional relationship between these three factors have not been studied in Sweden before.

The motivation and purpose for this thesis is threefold: (1) The bank lending channel in Sweden alone has been studied minimally in the past and the two studies that I know of are at least a decade old. Therefore, I think it is appropriate and relevant to investigate the possible existence of a bank lending channel in Sweden and the possible effectiveness of the monetary transmission mechanism through it. (2) The intricate

relationship between bank risk, bank capital and bank efficiency could be of high value for regulators given the improved focus on bank risks after the financial crisis of 2007-2010. This relationship has been studied in the U.S and Europe as a group, but not in Sweden alone. Therefore, this is the second purpose of this thesis as such a study also could help improve our understanding about the Swedish banking sector. (3) Finally, it is of general interest, in particular for financial regulators such as the Swedish Riksbank to better understand the determinants of bank lending to Swedish non-financial firms and households. This could be valuable from a forecast perspective but also from a model development perspective. Therefore, the third and last purpose of this thesis is to better understand which economic factors best determine bank lending to non-financial firms and households in Sweden. These economic factors can either be considered to be supply side factors or demand side factors. Supply side factors - derived directly from the Swedish banks - indicate whether bank lending is driven by the banks' financial position or performance. Demand side factors - derived from sources that the Swedish banks cannot control directly - such as macroeconomic indicators, price indices, wages etc - indicate whether bank lending is driven by firms and households.

One unique feature of this paper is that I build my own dataset of bank specific-variables directly calculated from the financial reports of banks. This ensures higher precision for the data used and increased possibilities to customize and build new bank-specific variables that take into account banks' risks and performance. Also included in my dataset are macroeconomic information commonly used in the bank lending research area, but also factors relating to macroeconomics previously not used in the bank lending research field.

The thesis proceeds in the following way. Section 2 consists of a review of the banking literature related to topics this study examines. Section 3 consists of a brief description of the Swedish banking industry and bank lending to firms and households in Sweden. Afterwards, in section 4, a brief illustration of the purpose of this thesis is outlined. In section 5, the data used in the thesis is explained and briefly about the modifications done to it for the purpose of regression analysis. In section 6, the methodology used to answer the questions of this thesis is presented and estimation equations illustrated. Section 7 reviews and analyzes the results and section 8 discusses

the limitations of this study and gives suggestions to future research topics. In section 9, the conclusion to this thesis is presented.

2. Literature Review

2.1 The Bank Lending Channel

2.1.1 The role of the bank lending channel in a larger context

The bank lending channel is commonly seen as a component in the much larger economic system called the money transmission mechanism. The monetary transmission mechanism describes how monetary policy through open market action affects the economy. In the long run, the economy is affected primarily through factors such as economic growth, productivity and long-term average unemployment. However, in the short run, monetary policy affects inflation and the real economy through consumption, production, investment and employment (Mankiw, 2006). There are different mechanisms that describe monetary policy on the economy and the four common ones are: the interest rate channel, the credit channel, the exchange rate channel and the cost channel. These channels are tightly intertwined and together with factors such as households' and firms' expectations about the future, they determine the effect of monetary policy on the economy.

2.1.2 The evolvement of the bank lending channel

The roots of the research done on the bank lending channel can be traced back to the studies done on the Depression during the 1930s. Back then, researchers tried to find the links between the financial system, money and economic activity[1]. When the concept of the money channel was established, researchers focused on the effects that the monetary transmission mechanism - through the money channel - had on the economy using a IS-LM framework. The theoretical framework of that research focused on two assets - money and bonds - and a single summary statistic interest rate for all credit market

[1] See Gertler (1988) for a more complete historical overview

conditions. Bonds and loans were seen as perfect substitutes on the asset side of banks' balance sheets since both are inversely related to the interest rate. The key role of the banking sector in such a framework is to create money by issuing demand deposits, which is reflected on the liability side of its balance sheet. On the asset side of the banks' balance sheets, they invest in bonds just like the household sector. The dynamics of this transmission is well explained by Kayshap and Stein (1993): a decrease in reserves reduces banks' ability to issue demand deposits and consequently holds fewer bonds (net value). The households will then hold less money and more bonds. If prices do not instantaneously and fully, households will have less real money and an increase in real interest rates will occur to maintain equilibrium. This can then affect investment and then aggregate economic activity.

Early objections to the limitations of the money channel and its inability to explain aggregate economic activity came from Roosa (1951), who also identified the importance of the lender. In the 1960s, the simple two-asset/one-interest-rate model was deemed insufficient in capturing the workings of monetary policy and studies such as Brainard (1964), Tobin and Brainard (1963), Tobin (1970) and Brunner and Meltzer (1963, 1972, 1988) proposed general equilibrium multi-asset models which featured imperfect substitutability between different assets, including bank loans. Later papers that acknowledged the unique features of bank loans were Blinder and Stiglitz (1983) that revived the loanable funds theory and Friedman (1984) that find the interaction of money and credit to determine the real economic activity.

In the lending view, there are three assets: bonds, bank loans and money and they differ from one another in meaningful ways. The addition of bank loans change the dynamic between bonds and loans since monetary policy can independently affect loans and consequently result in substitution effects between bonds and loans. For example, a decrease in reserves that leads to a decrease in the money supply will probably not have much impact on the interest rate of publicly held bonds but could lead banks to cut back on loan supply. As a result, the cost of loans relative to bonds increase and firms that rely on loans could be forced to reduce investment (Kashyap and Stein, 1993).

The micro foundations of the lending view, was laid about two and a half decades ago by Bernanke and Blinder's (1988) extension of the IS-LM model. The authors stated

three pillars for the lending view to hold as a distinctive one: (1) intermediated loans and open-market bonds must not perfect substitutes; (2) imperfect substitutability between deposits and market financing must hold and (3) price frictions of adjustments to both bank and corporate balance sheets must hold. If either of condition (1) and (2) does not hold, then bank lending view cease to exist and we are back to the money view.

Finally, Bernanke and Gertler (1995) disentangle the lending view into the balance sheet channel (a demand side view based on the idea that the wealthier the borrower is, the lower should the external finance premium be) and the bank lending channel. The essence of the bank lending channel is that monetary policy may affect the external finance premium by shifting the supply of intermediated credit, most commonly loans by commercial banks. Banks play a special role in the economy since they can deal effectively with informational problems and other frictions in the credit markets. As an illustration of its importance, a disruption or reduction to bank loan supply may cut off or incur significant costs to bank-dependent borrowers (small and medium-sized firms for example), increasing the external finance premium and reduce real economic activity (Bernanke and Gertler, 1995).

2.1.3 U.S research on the bank lending channel

In the area of bank size and bank lending, Kashyap and Stein (1995) investigates whether the lending volume of small banks are more sensitive to monetary policy than that of large banks (size defined by total assets as proxy). They find that this is the case and one possible reason could be the difference in loan portfolio composition between the two types. However, an alternative view from the demand side of bank lending is given by Berger and Udell (1994), where small banks often grant loans to small firms that face procyclical demand. As an extension, Kashyap and Stein (2000) finds that small and illiquid banks are the ones most sensitive to changes in monetary policy while Kishan and Opiela (2000) find that bank asset size affect banks' ability to raise funds and maintain loan growth during times of contractionary policy.

Regarding capitalization, Bernanke and Lown (1991) show that there is a causal link between low capital-asset ratios and low lending growth in subsequent time periods. This result is supported by Kishan and Opiela (2000), who conclude that undercapitalized banks are more sensitive to changes in monetary policy, supporting the idea that small

undercapitalized banks are unable to raise alternative funds to continue financing loans during times of contractionary policy. As an expansion, Kishan and Opiela (2006) finds that during times of monetary easing, small well-capitalized banks' credit growth outpaces that of undercapitalized banks.

2.1.4 European research on the bank lending channel

Bank loans are the most important source of financing in the European countries and especially within the corporate sector, mirroring that of the U.S which relies more heavily on stock market capitalization and the issuance of debt securities (Ehrmann et al., 2001).

Many studies have investigated the relationship between common bank characteristics - such as size, capitalization and liquidity - and the bank lending channel and the results have been mixed. For example, Chatelain et al (2003) show that monetary policy shocks generate more rapid lending response in France and Spain compared to Germany and Italy. Bank size as a factor explains credit growth in Spain, but is rejected in France, Germany and Italy. The insignificance of the size factor is supported by Gambacorta (2005). In contrast, liquidity is a significant determinant of bank lending in France, Germany and Italy but not in Spain (Chatelain et al, 2003; Gambacorta, 2005). Other studies that examine the relationship between the bank characteristics and bank lending find that size liquidity and capitalization are relevant factors in Netherlands (De Haan, 2001). In Portugal, only capitalization is a significant determinant (Farinha and Marques, 2001) while in Greece both size and liquidity are significant determinants (Brissimis et al., 2001). In Finland, liquidity plays a marginal role (Topi and Vilmunen, 2001) while only capitalization is a significant determinant in Ukraine (Golodniuk, 2006).

Also, there is a group of papers that study the bank lending channel in the Euro area by employing panel data methods where multiple countries are included. Altunbas et al. (2002) study eleven EMU countries and finds that lagged (but not contemporaneous) changes of monetary policy is statistically significantly related to changes in loans. Moreover, the author finds that there is a positive relationship between total lending and total securities and interbank borrowing. Altunbas et al. (2009) introduces bank risk as a factor in analyzing the functioning of the bank lending channel of monetary policy as a way to take into account the use of financial innovation (for example the use of credit derivatives) used by the banks. The main finding is that bank risk play an important role

in determining the banks' loan supply and low-risk banks can better shelter their lending from monetary changes since they have better access to uninsured fund raising.

From a model development standpoint, one of the earlier studies to apply the use of regression analysis in bank lending was Kashyap and Stein (1995). Later bank lending research used regression models on panel data, due to the increased availability of data and the improvements made to statistical software packages. Using such a methodology, Ehrmann et al. (2001) present several findings about the monetary policy transmission in the Euro area. They find that bank lending contracts significantly after a monetary tightening on both country and Euro level. Also, less liquid banks react more strongly to monetary policy changes than liquid banks while size and capitalization seem to be less important factors. Their results oppose to findings in the US, where small and lowly capitalized banks react more strongly to monetary policy changes, but the author concludes that this difference may be due to difference in the structure of banking markets between Europe and US. Ashcraft (2006) investigates the aggregate lending response to monetary policy for different types of banking markets and whether the macroeconomic state output is affected by the level of aggregate bank lending. The author employs a time-series regression approach to study how loan levels are affected by the level of deposits on an aggregate level including many different control factors. The bank variables include log of total bank assets, the liquidity ratio, the equity ratio, information about the bank loan portfolio composition and the internal capital generation. This regression is run first on bank level and then modified slightly in order to include loan growth on U.S state level. The main results are that: (1) stand-alone bank lending is sensitive to changes in the federal funds rate while affiliated bank lending is generally unaffected by monetary policy; (2) the aggregate elasticity of economic output to bank lending is small and (3) bank loans are special but not special enough to play an independent role in the transmission mechanism of monetary policy.

2.1.5 The bank lending channel and the global financial crisis of 2007-2010

The global financial crisis of 2007-2010 and the devastation brought to the global economy provided an opportunity for researchers in finance and banking to re-examine the function of the bank lending channel and the causes to the breakdown of bank funding during crisis times.

Ivashina and Scharfstein (2009) gives a description of the impact of the financial crisis from 2006 to 2008 on bank lending and the real economy. The study focus on large bank loans issued in the U.S and some stylized facts are: New lending in 2008 was significantly below new lending in 2007, even before the peak period of the financial crisis; The decline in new loans accelerated during the financial crisis, falling by 36% during the peak of the crisis while real investment loans and restructuring loans have decreased to a similar extent; Non-investment-grade loans fell by 50% relative to the prior period, while investment grade loans fell by 19% and during the peak period of the financial crisis, revolving credit facilities declined by 39% and term loans by 26%. Given these facts, the authors focus on two lending factors: (i) the extent in which banks were financed by short-term debt rather than insured deposits and banks exposure to credit-line drawdowns. The authors conclude that the lending decline could have reflected a drop in demand from firms that scaled back expansion during the crisis, but that there was a significant supply effect as well since banks with less access to deposit financing and at greater risk of credit line drawdowns reduced lending more than other banks. Another key insight is that a drop in the supply of credit puts an upward pressure on interest rates, lowering lending even further and potentially exacerbating the liquidity issues during a crisis.

Kwan (2010) focuses on the crisis from a perspective of the extent and mechanism of credit tightening. effects. The main findings are that the average commercial and industrial loan spreads were 23% higher during the crisis than during pre-crisis and that the average loan spread increased by about one percentage point. Also, large and medium-sized banks tightened their loan rates more than small banks, but small banks charged more in fixed fees as compensation. Surprisingly, small loans tightened less than large loans, implying that bank-dependent borrowers may have been better off than large borrowers. Finally, the bank characteristics that seem to have the most effect on loan prices are loan portfolio quality, capital ratios and the amounts of unused loan commitments.

Gambacorta and Marques-Ibanez (2011) argue that the financial crisis highlighted the importance of bank lending channel on credit provision, since structural changes to banks' business models and market funding patterns had modified the monetary

transmission mechanism in both Europe and the U.S. Due to financial deregulation, financial innovation and the use of the "originate and distribute" approach to loans and the large increase in size of assets held by institutional investors, banks' funding became more correlated with the perceptions on the financial markets, especially during times of financial crisis. Furthermore, the authors argue that standard bank-specific variables (size, liquidity and capitalization) cannot fully capture the new dimensions of the bank lending channel and that short-term funding and securitization activity are main factors related to banks' ability to withstand adverse shocks. A thought-provoking question is whether the changes to the bank lending channel during the financial crisis of 2007-2010 will persist or disappear as the crisis subdues and new regulatory changes are implemented.

2.2 Bank Risk, Bank Capital and Bank Efficiency

In the two decades prior to the global financial crisis of 2007-2010, European banking underwent numerous fundamental and lasting changes. Some of these changes are increased levels of globalization, more use of technology and improved sophistication of technology, banking industry deregulation and increased European integration (Goddard et al. 2007). Due to these changes, there has been an increased emphasis on efficiency in the banking industry. As a consequence of the increased efficiency, competition among banks has increased as well and in the short-term this could result in more (maybe excessive) risk-taking as increased competition reduces the market power of banks, reducing their charter value (Fiordelisi, 2010). Furthermore, a decline in bank charter value combined with banks' limited liability and a rather flat deposit insurance could potentially encourage banks to take more risks (Matutates and Vives, 2000). One possible countermeasure developed by the financial regulators in order to reduce risky practices by banks is the increased focus on capital in the new Basel III proposal. For example, the Basel Committee focus on reforms that intend to raise the quality and quantity of the regulatory capital base and enhance the risk coverage of the capital adequacy framework (Basel Committee, 2011).

Early research on the relationship between bank risk and bank capital can be traced back to the 1970s. Back then, the research focus was on the effects of capital regulation

on risk-taking incentives. Later the focus shifted to the effectiveness of banking capital regulation. The overall consensus from these studies doubted the effectiveness of such measures as Koehn and Santomero (1980) illustrates. The authors find that higher required levels of the capital to asset ratio leads to ambiguous results in terms of the average probability of failure, recommending serious consideration to the discontinuance of bank regulation using capital-ratios altogether.

The introduction of Basel I in 1988 generated new interest in the effectiveness of bank capital regulation. A significant contribution to the existing literature was made by Hughes and Mester (1998, 2009). They argued that bank efficiency was an important component when studying the relationship between bank capital and bank risk and that both capital and risk are likely to be determined by efficiency. The argument is that efficient banks can be allowed greater flexibility by financial regulators in terms of capital leverage and overall risk profile while inefficient banks with low capital levels may be willing to take higher risks to compensate for lower returns ceteris paribus. From economical theory standpoint, the inefficient banks may display tendencies of moral hazard.

Two studies that were influential for the future research in the research area of bank risk, capital and operational efficiency are Berger and de Young (1997) and Kwan and Eisenbeis (1997), both studies in the U.S. The first study uses Granger causality tests to test a number of hypothesis related to loan quality, bank capital and cost efficiency. The authors find that problem loans precede reductions in measured cost efficiency; measured cost efficiency precedes reductions in problem loans and that reductions in capital at low-capitalized banks precede increases in problem loans. The authors also argue that cost efficiency may be an important indicator of future problem loans and problem banks. Kwan and Eisenbeis (1997) use a simultaneous equations method in order to measure the tradeoffs between risk, capitalization and measured inefficiencies. The authors find that the three variables are simultaneously determined. Also, they find that less efficient credit institutions took on more risk to offset the inefficiency, thereby transferring risks to deposit insurance funds. Additionally, less efficient credit institutions tend to be less well capitalized, a result that according to the authors may be attributed to differences in the quality of management.

Altunbas et al. (2007) replicates the previous two studies in an European setting and do not find a positive relationship between inefficieny and the risk-taking by banks. Instead, inefficient banks seem to hold more capital and take less risk. Furthermore, evidence is also found that the financial strength of the corporate sector can affect bank risk-taking and capital in a positive way. In general, the findings in Europe yield contradictory findings in the relationship between bank risk, bank capital and operational efficiency (Fiordelisi et al., 2010).

In the past decade and in the banking environment recently illustrated, a number of studies have focused on the impact of capital on bank risk. For example, Repullo (2002) shows that if intermediation margins are small resulting that the banks' franchise values will be small, introducing capital requirements can ensure the existence of prudent behaviour and reduced gambling behaviour as banks' equity is at risk. Gropp and Heider (2009) finds that deposit insurance and capital regulation played a secondary role and that in general the determinants of the leverage of non-financial firms carry over to banks. Another research branch investigates the relation between operational efficiency and bank risk. For example, Casu and Girardone (2006) finds that the degree of bank concentration is not necessarily related to the degree of bank competition while the relationship between competition and efficiency is a complicated one. Increased competition forces banks to be more efficient but increased efficiency does not seem to create more competitive banking systems.

2.3 Determinants of Credit Growth

One branch within the research field of credit growth is to study how credit growth is related to economic growth. Levine (2005) suggest that countries with well-functioning banks and markets grow faster since a well-functioning financial system alleviates external financing constraints that could possibly hinder firm and industrial growth. these financing constraints could for example be alleviated by increased credit issuance by banks. An alternative view is that finance helps to promote economic growth through improved resource allocation and productivity growth (Beck et al, 1999; Wurgler, 2000). Regardless of two aforementioned views, there are strong empirical suggestions that there

is a significant positive relationship between credit growth and economic growth. Furthermore, researchers have also examined the causality of this relationship and most results indicate that financial deepening spurs economic development (Egert, 2006). One logical question to then ask is what drives credit growth?

In a general economic framework used, banks are the intermediaries between borrowers (users of capital) and the lenders (providers of capital) and bank loans the primary financing form. Supply-side factors are factors that are created from banks' accounting information and demand-side factors do not directly relate to the banks, but rather reflect on the economic environment or economic attitudes. Most studies that aim to investigate credit growth usually include demand-side factors such as GDP of some kind, a representative interest rate and inflation. One example of this is Calza et al. (2003). An additional factor could be housing prices (Hofmann, 2001).

Recent studies that have examined the determinants of credit growth have studied areas of the world that that can be considered to be financially underdeveloped or in the process of economic transition. For example, in a study of six economies in the South Pacific, Sharma and Gounder (2012) find that rising average lending and inflation rates are detrimental to credit growth while deposits and asset size contribute to credit growth. A more comprehensive study is done by Guo and Stepanyan (2011) that examines the determinants of bank credit to 38 developing countries. The main conclusion is that funding, primarily through deposits including both domestic and foreign, contribute positively and systematically to credit growth. Additionally, by reversing the relationship between credit growth and economic growth, the authors find that stronger economic growth leads to higher credit growth and higher inflation.

3. Banks and Financing in Sweden

This section provides a description of the Swedish bank credit market and the largest Swedish commercial banks, together with two subsections about the bank financing to firms and bank financing to households.

3.1 Swedish Bank Credit and Swedish Banks

Swedish banks represents the largest credit providing group among all credit providing financial institutions in Sweden. The total amount lent by Swedish banks was 3264 BSEK in December 2012. About 36 percent of total loans were allocated to non-financial firms, 30 percent allocated to households and rest were allocated to the public sector, financial firms and foreign borrowers (Svenska Bankföreningen, 2013)[2]. Currently, four major banks dominate the Swedish banking industry: Handelsbanken, Nordea, SEB and Swedbank. These four banks account for about 75 per cent of the asset base of the aggregate asset size of all banks. The next group of banks in terms of size include banks such as Danske Bank, Länsförsäkringar Bank, SBAB Bank and Skandiabanken and these four banks are also among the ten largest banks in Sweden (Sveriges Riksbank, 2012).

The four major banks also have significant operations abroad. About 70-85 percent of the total lending by Handelsbanken, SEB and Swedbank is in Sweden while about 25-30 percent of total lending of Nordea is to Swedish clients. The majority of the rest of the total lending of Nordea is in the Nordics as about 80 percent of total lending for Nordea can be attributed to the Nordic market. Also, with the exception of SEB, the rest of the four major banks have significant lending operations through fully owned mortgage institutes (Sveriges Riksbank, 2012). Furthermore, all four major banks operate as large limited companies today even though this was not the case at the start of the study period for this thesis. For example, Swedbank used to be part owner of many smaller savings banks in Sweden in the late 1990s.

Two of these four banks have transformed significantly over the study period. Swedbanks' two predecessors Sparbanken and Föreningsbanken merged in 1997 to create Föreningssparbanken. First in 2006, Föreningssparbanken changed its name to Swedbank. Furthermore, Nordea is the result of successive mergers and acquisitions of the following five banks between 1997 to 2000: Nordbanken (Swedish), Merita Bank (Finnish), Unibank (Danish), Tryg-Baltica (Danish) and Kreditkassen (Norwegian). The two other banks, Handelsbanken and SEB have remained relatively unchanged during the study period of this thesis.

[2] See graph 1 in appendix for the development of bank loans in Sweden to firms and households.

The four other banks started their banking operations in Sweden during either the 1980s or 1990s. SBAB originated as financier of government mortgage loans in the 1980s and has during the majority of its history been a mortgage loan institute before becoming a bank in 2011. Danske Bank is a Danish financial group, established in Sweden in 1996 through the acquisition of Östgöta Enskilda Bank, and is today the fifth largest bank in Sweden after the "big four". Both Länsförsäkringar Bank and Skandiabanken are banks that are subsiduaries to larger insurance companies and both banks started their operations in the middle of the 1990s.

3.2 The Bank Financing of Swedish Non-Financial Firms

The majority of Swedish non-financial firms' financing comes from bank credits (Sveriges Riksbank, 2011b). Other funding sources are money and bond markets either locally or globally (Gunnarsdottir and Lindh, 2011). Therefore, the development of different types of credit markets affects the debt financing for Swedish non-financial firms. The recent financial crisis showed that a shift in the composition of financing may be underway since banks all around the world became less inclined to lend to firms (Chui et al, 2010). Thus, the limited bank credits granted to firms in the time period after the crisis increased the demand for bond financing and this occurred especially in 2009 (Fitch, 2010). Swedish firms followed suit and issued record amounts of corporate bonds in the euro market in 2009 (Gunnarsdottir and Lindh, 2011). These days, the relative importance of bank credits has rebounded back to pre-crisis levels but new regulation in Basel III may affect the debt financing for Swedish firms in the long run.

Bank credits exist in many different forms. A bilateral loan is probably the most common one. Bilateral loans are provided to one borrower by one lender and usually smaller firms use bilateral loans as their main debt-financing source. These loans are often called relationship loans as lending banks have built client relationships with borrowing firms over years and thus there is a level of trust between lender and borrower. A syndicated loan is provided to one borrower by more than one lender. Thus, large firms are able to attain loans that exceed a single banks loan limit. Additionally,

firms often have credit facilities in place which are loan programs where the borrower can draw funds by request.

One consequence of the financial crisis of 2007-2010 is a change in the composition of debt financing for Swedish firms. Key factors pushing this development are the continuing development of a currently underdeveloped bond market and the forthcoming introduction of Basel III in 2013-2018 and Solvency II in 2014. The development of a corporate bond market in Sweden would probably initially attract the largest Swedish firms as they can afford to bear the costs of bond issuing (credit rating attainment, administration etc) even though a few Swedish medium-sized firms have issued bonds for the first time (Gunnarsdottir and Lindh, 2011). Regarding the changes in regulation, it is at this time still unclear how it would change the debt financing structure for firms.

3.3 The Bank Financing of Swedish Households

The dominant stock of credit to households in Sweden is mortgage loans, where approximately 90 percent of the total loan value to households consists of mortgage loans (Finansinspektionen, 2010). The rest of the stock of credit consists of consumption loans. As a result, the focus of this section will be on mortgage loans and how the development of the Swedish housing market in the 2000s can help explain the development in loan to households.

The amount of loans to households has increased steadily over the past 15 years, where the period of 2004 to 2010 shows a comparatively higher rate of loan increase than the rest of the period. Key reasons to this are low costs associated with new loans and increasing home prices in general (Statens Bostadkreditnämnd, 2010).

From a price perspective, Sweden has had the highest increase in housing prices compared to eight other European countries during 1995 to 2010 and Sweden is the only country who did not have a significant drop in housing prices during in the aftermath of the global financial crisis of 2007-2010. Instead the prices increased at a slower pace. One key reason is the limited supply of homes as the Swedish home market is characterized by the low investment in homes and the low amount of new homes build (Statens

Bostadkreditnämnd, 2010). A key reason to this are the relatively high building costs in Sweden (Englund, 2011). From the demand side, a relatively large percentage of the population own their homes in Sweden (66 percent compared to 41 percent in Germany). This, together with a highly regulated home rental market with low vacancies has created a surge in demand for homes the past one and a half decade. Another contributing factor in the demand increase in homes is urbanization, especially to the largest cities of Stockholm, Gothenburg and Malmö (Statens Bostadkreditnämnd, 2010).

From a loan cost perspective, the interest rate on mortgages has been relatively low in Sweden compared to eight other European countries. Also, interest costs on mortgages are tax deductible and transaction costs associated with home purchases are low. All this inexpensive financing have created a situation with high debt increases and high loan-to-value ratio on new loans which has resulted in significant growth in mortgage loans (Statens Bostadkreditnämnd, 2010).

Given that high home prices are positively correlated with high levels of bank credits to households, what factors seem to explain house prices? Claussen et al. (2011) argue that the three relevant factors are the available income of households, a mortgage interest rate and household financial wealth. Other relevant factors could be household financial debt, but this is more relevant in a highly regulated credit markets. Furthermore, in an non-regulated credit market - the Swedish credit market was deregulated in the middle of the 1980s - credit growth is determined by the same factors as house prices (Claussen et al., 2011)

4. Contribution to Banking Research

This part highlights the key question this paper intends to answer. I choose not to use a hypothesis framework since results for my key questions have been fairly mixed overall depending of geography and methodology. The three main questions this paper intends to shed light on are:

(1) Was there a bank lending channel from the late 1990s/early 2000s to the early 2010s in Sweden?[3]

(2) What is the relationship between risk, capital and efficiency in the Swedish banking industry?[4]

(3) What economic factors are the best determinants for bank loans to Swedish firms and households from a forecast perspective?

Also, other interesting findings that come from these research topics will be discussed and analyzed as well.

5. Data

The data used in this paper is original data extracted from either bank financial reports or published material from various economic institutions and trade organizations. All data used are on a quarterly basis and the data can be divided into two broad categories: bank-specific data and non-bank data.

Bank-specific data are collected from quarterly and annual reports from the largest four commercial banks in Sweden: Handelsbanken, Nordea, SEB and Swedbank. In addition, data from four other banks that are among the ten largest in Sweden based on total assets - Danske Bank, Länsförsäkringar Bank, SBAB Bank and Skandiabanken - are collected to complement and expand the dataset. All financial reports can be found on each banks website. The bank data collected is unbalanced due to availability issues and descriptive statistics about individual banks can be found in tables 1 and 2 in the appendix. The earliest observation is that of Handelsbanken in Q4 1996 and the last one being Q4 2012 for all eight banks. Since this study focuses on Sweden, the data collected on *bank lending to firms*[5], *bank lending to households* and *total bank loans* are attributed to Sweden alone. The rest of the data are in general collected on group level[6]. Collected

[3] Earlier research conluded that there was evidence of a bank lending channel (Hallsten, 1999; Westerlund, 2003).
[4] To the best of my knowledge, no such study that studies the interrelationships between bank capital, risk and efficiency has been done in Sweden before.
[5] For some banks, lending to non-profit organizations and associations are included in bank loans to firms.
[6] The reason why data is collected on group level is because in general banks do not have balance sheet items for Sweden alone.

income statement items are *Net Interest Income*, *Revenue*, *Operating Costs*, *Net Operating Income*, *Net Income*, *Loan Loss Reserves* and balance sheet items are *Total Assets*, *Total Equity*, *Liquid Assets*[7], *Securities*, *Total Loans*, *Deposits* and *Interbank Lending* and *Borrowing*.

In general, for all banks except Nordea and Danske Bank, I use group level information to construct variables since about 70-90 percent of lending operations can be attributed to Sweden. For Nordea and Danske Bank, where lending in Sweden make up about 25-30 percent and 10-15 percent of total lending, certain adjustments are done. As a consequence for Nordea and Danske Bank, Sweden specific income statement items are collected and the group balance sheet items are weighted according to total lending in order to create economic factors. A rather homogenous interest rate environment[8] in then Nordics is a supporting factor to this approach[9]. Furthermore, I have chosen to exclude observations of Nordea before 2001, since extensive and complicated corrections would be needed otherwise due to the successive mergers or Nordic Banks into Nordea. Furthermore, note that the panel of bank data is unbalanced and that the dataset of the largest four banks is relatively balanced.

The non-bank data is collected from Swedish government agencies such as the Swedish Energy Agency (Swedish: Energimyndigheten), Statistics Sweden (Swedish: Statistiska Centralbyrån), the Swedish Riksbank (Swedish: Riksbanken) and the National Institute of Economic Research (Swedish: Konjunkturinstitutet). All non-bank data are collected on a quarterly basis from Q4 1996 to Q4 2012. From the website of the Swedish Energy Agency, national data on an *electricity spot price index* is collected. Form the website of Statistics Sweden, data collected include macroeconomic data such as Swedish *GDP*[10], Swedish *Unemployment*[11], Swedish *Inflation*[12] but also household data such as *Average availible income per capita*, *Debt as a percentage of household income* and *Debt as a percentage of financial assets*. Additional data collected from Statistics Sweden are National *Real estate price index*. From the website of the Swedish Riskbank, interest rates such as *STIBOR 3M*

[7] Cash and cash equivalents.
[8] See graph 2 in the appendix.
[9] As an illustration, if the interest rate for loans were much higher (lower) in the other Nordic countries, a smaller (larger) loan base would be needed to generate the same revenues, the fraction of lending to Sweden would then be understated (overstated).
[10] Real in millions of SEK.
[11] In percentage of total Swedish population between the ages of 18 to 74 years old and seasonally adjusted.
[12] *Konsumentprisindex* in Swedish, a normalized price index of a representative basket of goods and services.

Fixing[13], *STIBOR 1W*[14], *BoObl 2Y*[15] but also *firm default rate*[16]. From the website of the National Institute of Economic Research, *three indices* about the economic confidence level of Swedish households are collected. One on an *aggregate level*, one relating to the *macro economy* and the last one relating to the *microeconomics of individual households*. Note that the non-bank data varies over time but not between banks.

All data collected can be considered to be of highest quality and reliability since commercial banks are required by Swedish law to report annual financial information to Finansinspektionen (Swedish regulator of financial firms) and quarterly financial information to the stock exchanges, since most of them are listed companies. The data published by Swedish government agencies and research institutes, who are public authorities in their respective fields, can be considered to be the best available in Sweden.

Transformation of data into estimation variables are described in detail in each subsection of the methodology. Also note that tables in appendix B explains in more detail how certain economic factors are calculated.

6. Methodology

In this section, the methodology of all three topics is discussed and explained. In particular, the estimation specifications and the economic intuition behind the economic factors included in the estimations in each study topic is explained.

6.1 Estimation Methods, Adjustments and Statistical Tests

The two common types of models used for panel data studies are fixed effects models and random effects models. The main difference between the two model types are that fixed effects models assume that the error component and independent variables are *correlated* while random effects models assume that the error component and independent variables are *uncorrelated* (Gujarati, 2003). Intuitively, it seems plausible that factors

[13] The average interbank lending interest rate with a three month maturity.
[14] STIBOR with one week to maturity.
[15] The average rate on Swedish mortgage bonds with two year maturity
[16] Percentage of firms that default in a given quarter.

difficult to quantify such as bank culture and bank reputation could be correlated with bank-specific factors such as bank deposits and liquidity but a formal test is needed to determine model choice. Thus, I will use the Hausman Test, first developed by Hausman (1978), to determine which model type to use. Also, the panel data used in this study includes few banks N and a relatively larger number of time periods t. Therefore, the difference between the estimated coefficients in the two types of models is probably small while the fitting of fixed effects models and random effects models is appropriate (Gujarati, 2003).

One potential problem in the model estimation is the presence of autocorrelation and unit roots. The problem with the presence of autocorrelation is that standard errors tend to be underestimated while the presence of a unit root means that a series is non-stationary, implying that the mean and the variance changes over time. To control for this, the Breusch Godfrey test for autocorrelation and unit root tests[17] were performed for all series on the level. The results showed significant evidence of the presence of autocorrelation and the existence of a unit root in almost all series at a p-value cutoff level of 5%. In order to ensure that all data series are stationary and to avoid possible autocorrelation, all factors are first differenced (Woolridge, 2001). Then, autocorrelation tests and unit root tests are rerun and this time, no unit roots nor the presence of autocorrelation are found in any series at a 5% rejection level.

Another potential problem could be the presence of heteroscedasticity in the data. The presence of heteroscedasticity could potentially invalidate statistical tests on significance and violate certain model assumptions. To adjust for possible heteroscedasticity in the data, larger standard errors that are robust to heteroscedasticity are always used in estimations[18].

The Akaike Information Criterion[19] (AIC) will be used to evaluate the relative quality of the forecast models to firms and households. Basically, AIC provide a method for model selection based on information entropy and the measure deals with both model complexity and goodness-of-fit.

[17] The xtunitroot command was used to check for unit roots and bgodfrey for autocorrelation in STATA.
[18] I use vce(robust) in all model estimations
[19] See Akaike (1974) for details.

6.2 The Bank Lending Channel in Sweden

In order to study the bank lending channel in Sweden, I choose to employ the methodology used by Altunbas et al (2002). The estimation specification is a fixed effects panel data approach[20] and index i refers to bank i and index t refers to quarter t:

$$\Delta LOAN_{i,t} = \alpha_i + \beta_1 \Delta STIR_{i,t} + \beta_2 \Delta SECU_{i,t} + \beta_3 \Delta INBB_{i,t} + \beta_4 \Delta GDP_{i,t} + \beta_5 \Delta STIR_{i,t-1} + \beta_6 \Delta SECU_{i,t-1} + \beta_7 \Delta INBB_{i,t-1} + \beta_8 \Delta GDP_{i,t-1} + \beta_9 \Delta LOAN_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

$$\Delta SECU_{i,t} = \alpha_i + \beta_1 \Delta STIR_{i,t} + \beta_2 \Delta INBB_{i,t} + \beta_3 \Delta GDP_{i,t} + \beta_4 \Delta STIR_{i,t-1} + \beta_5 \Delta INBB_{i,t-1} + \beta_6 \Delta GDP_{i,t-1} + \beta_7 \Delta SECU_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

$$\Delta DEPO_{i,t} = \alpha_i + \beta_1 \Delta STIR_{i,t} + \beta_2 \Delta INBB_{i,t} + \beta_3 \Delta GDP_{i,t} + \beta_4 \Delta STIR_{i,t-1} + \beta_5 \Delta INBB_{i,t-1} + \beta_6 \Delta GDP_{i,t-1} + \beta_7 \Delta DEPO_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

$$\Delta INBB_{i,t} = \alpha_i + \beta_1 \Delta STIR_{i,t} + \beta_2 \Delta STIR_{i,t-1} + \beta_3 INBB + \varepsilon_{i,t} \quad (4)$$

Here, $\Delta LOAN_{i,t}$ is the change in total bank loans, $\Delta STIR_{i,t}$ is the change in short-term interest rate, $\Delta SECU_{i,t}$ is the change in bank securities holdings, $\Delta INBB_{i,t}$ is the change in interbank borrowings, $\Delta GDP_{i,t}$ is the change in Gross Domestic Product and $\Delta DEPO_{i,t}$ is the change in deposits. All variables with index t-1 are one-quarter lagged variables of the previously mentioned ones. Also, I choose a short-term market rate as the proxy for monetary policy stance (STIBOR 1W) as suggested by Bernanke and Blinder (1992).

The purpose of including bank securities holdings and interbank deposits are to control funding effects on loans. Since the bank lending channel only includes supply-side effects, the purpose of including GDP is that it can be seen as an aggregate demand factor and control for demand effects on loans. Also, by including both contemporaneous variables and lagged variables, I am able to control for both types of responses.

[20] Implementation of the Hausman Test indicates that a fixed effects model is preferred to a random effects model.

From an interpretational standpoint, there is primarily evidence of a bank lending channel if the short-term interest rate (STIR) significantly affects total loans (LOAN). The effect of short-term interest rate (STIR) on securities (SECU) and deposits (DEPO) could suggest bank lending channel adjustments that could possibly weaken the effect of the bank lending channel as mentioned by Altunbas et al. (2002).

In addition to estimate equations (1)-(4) for the whole data sample, I also estimate equations (1) and (4) by dividing the whole sample into two subgroups in two different settings: one setting with large and small banks according to average total assets and one setting with well-capitalised and undercapitalised banks according to the average capitalisation calculated by equity to total assets.

As a robustness check, the short-term interest rate as proxied by STIBOR 1W will be changed to STIBOR 3M Fixing to see whether the estimation results seem to be dependent on choice of interest rate.

6.3 Risk, Capital and Bank Efficiency in Sweden

To study the relationship between bank risk, bank capital and bank efficiency in Sweden, I choose to use a modified version of the methodology used by Altunbas et al (2007). Since this study is focused exclusively on banks operating in Sweden, the country-specific variables that focus on taking into account banking system differences across countries are excluded. Therefore, only the bank-specific variables with the addition two proxies for interest rate environment and overall firm solvency will be included. The estimations are fixed effects models[21] and index i refers to bank i and index t refers to quarter t[22]:

$$\Delta LLR_{i,t} = \alpha_i + \beta_1 \Delta CAP_{i,t} + \beta_2 \Delta BEF_{i,t} + \beta_3 \Delta NLTA_{i,t} + \beta_4 \Delta LAODEP_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 \Delta GVB2Y_t + \beta_7 \Delta FDR_t + \varepsilon_{i,t} \quad (5)$$

$$\Delta CAP_{i,t} = \alpha_i + \beta_1 \Delta BER_{i,t} + \beta_2 \Delta NLTA_{i,t} + \beta_3 \Delta SIZE_{i,t} + \beta_4 \Delta ROE_{i,t} + \beta_5 LAODEP_{i,t} + \beta_6 \Delta GVB2Y_t + \beta_7 \Delta FDR_t + \varepsilon_{i,t} \quad (6)$$

[21] According to the Hausman Test.
[22] This approach is called the Seemingly Unrelated Regression (SUR) approach, see Zellner (1962).

$$\Delta BER_{i,t} = \alpha_i + \beta_1 \Delta CAP_{i,t} + \beta_2 \Delta LLR_{i,t} + \beta_3 \Delta SIZE_{i,t} + \beta_4 \Delta NLTA_{i,t} + \beta_5 LAODEP_{i,t} + \beta_6 \Delta GVB2Y_t + \beta_7 \Delta FDR_t + \varepsilon_{i,t} \quad (7)$$

Here, $\Delta LLR_{i,t}$ is the change in loan loss reserves, $\Delta CAP_{i,t}$ is the change in capital using equity to assets as the proxy, $\Delta BER_{i,t}$ is the change in bank cost efficiency (inversely related to inefficiency) using the bank efficiency ratio as the proxy (total operational cost to total revenue), $\Delta LTA_{i,t}$ is the change in loans to assets, $\Delta SIZE_{i,t}$ is the change in total assets, $\Delta ROE_{i,t}$ is the change in return on equity, $\Delta LAODEP_{i,t}$ is the change in liquid assets to deposit ratio, $\Delta GVB2Y_t$ is the change in interest rate of a Swedish government bond with two years maturity and finally $\Delta FDR_{i,t}$ is the change in firm default rate.

The intuition behind the system of equation to estimate is that it allows to study the simultaneous effects between banks' risk, capital and efficiency. Also, I control for two of the country-specific control variables suggested by Altunbas et al. (2007), the government bond (GVB2Y) that serves as a proxy for the interest rate environment and firm default rate serves as a proxy for the solvency level of Swedish industry since these two are not directly bank-related . From a variable choice standpoint, loan loss reserves (LLR) serves as a proxy for bank risk; capital (CAP) is calculated using equity to asset ratio, and the proxy for efficiency is the bank efficiency ratio calculated as total operating losses divided by total revenue[23]. As explained in Altunbas et al. (2007), the purpose of net loans to assets (NLTA) is to control for rapid loan growth that increases risk and could negatively affect bank capital and efficiency. The liquid assets to deposit ratio controls (LAODEP) for banks that could be more efficient and need less capital since they carry more liquid assets. Lastly, the size of banks as measured by total assets (SIZE) is controlled for as large banks could take advantage of economies of scale that may influence risk, capital and efficiency.

From an interpretational standpoint, the coefficients of the three variables used as dependent variables should be statistically significant to suggest relationships between risk, capital and efficiency.

[23] The bank efficiency ratio is an indication of how much revenue a bank can generate for every Swedish Krona spent.

In addition to estimating equations (5)-(7) for the total data sample, I also estimate equations (5)-(7) by dividing the whole sample into two subgroups in two different settings: one setting with large and small banks according to average total assets and one setting with most efficient and least efficient banks according to the average bank efficiency ratio.

6.4 Determinants of Bank Loans to Firms and Households

The purpose of this section is to build a simple forecast model. The dependent variable in all estimations in this section are either bank, loans to firms (LOAN(Fi)) or bank loans to households (LOAN(HH)). In the model specifications, all non-linear variables are linearized[24] and all variables are first differenced since bank credit can be autocorrelated over time (Kishan and Opiela, 2000; Altunbas et al., 2002). Another possible reason why change in bank credit to households could display autocorrelation over time in Sweden is due to autocorrelation in the price change of house prices (Englund and Ioannides, 1997), since credit for home purchases is the dominant factor determining the amount of credit issued to households[25]. The estimation equations are:

$$\Delta LOAN(Firm)_{i,t} = \alpha_i + \beta_1 \Delta LOAN(HH)_{i,t-1} + (\beta_2 + \beta_3 Crisis_t)\Delta FirmVar_{\mathrm{i,t}} + \varepsilon_{i,t} \quad (8)$$

$$\Delta LOAN(HH)_{i,t} = \alpha_i + \beta_1 \Delta LOAN(HH)_{i,t-1} + (\beta_2 + \beta_3 Crisis_t)\Delta HHVar_{\mathrm{i,t}} + \varepsilon_{i,t} \quad (9)$$

$$\Delta LOAN(Firm)_{i,t} = \alpha_i + \beta_1 \Delta LOAN(HH)_{i,t-1} + \sum_{1}^{k} (\beta_2 + \beta_3 Crisis_t)\Delta FirmVar_{\mathrm{i,t,k}} + \varepsilon_{i,t} \quad (10)$$

$$\Delta LOAN(HH)_{i,t} = \alpha_i + \beta_1 \Delta LOAN(HH)_{i,t-1} + \sum_{1}^{k} (\beta_2 + \beta_3 Crisis_t)\Delta HHVar_{\mathrm{i,t,k}} + \varepsilon_{i,t} \quad (11)$$

[24] Using the natural logarithm of the variables.

[25] See figure 1 in appendix for an overview of the credit growth to firms and households in Sweden during the period 1996-2012

FirmVar is a variable found in table 9 in appendix while HHVar is a variable found in table 10 in the appendix. Index i is for bank i, index t for time t and index k for variable number k in a combined estimation. Crisis is the crisis dummy.

The supply side factors for both bank loans to firms and bank loans to households are the same[26]. The supply side factors are all accounting based factors that should reflect the financial performance or financial position of individual banks. Factors such as Return on Assets (ROA), Return on Equity (ROE), Net Interest Margin (NIM) and Net Loan Losses (NLL) are indicators that reflect financial performance of a bank during a quarter while factors such as the size of total asset (SIZE), Capitalization (CAP), Loans to Assets (LTA), Liquidity (LIQ), Loan Loss Reserves (LLR) and Deposits (DEP) are indicators that reflect the financial status.

The economic intuition behind performance factors such as ROA and ROE is that better performance encourages the banks to issue more credit, which is their core business. NIM should be positively related to bank credit since higher net interest margin should encourage banks to issue more credit since it is profitable while NLL should be negatively related to bank credit since higher levels of loan losses should discourage banks from issuing more credit. Among the factors that are indicators of financial condition, SIZE, CAP, LIQ and DEP should all be positively related to bank credit. This is because well capitalized banks with larger asset bases should be able to issue more credit. Also, more liquid banks with large deposit base should also be able to issue more credit. On the other hand, LTA should be negatively correlated with bank credit since the higher the risk, meaning the higher the fraction of loans to assets, the more sensitive the bank is to defaults in its credit portfolio. LLR should also be negatively correlated with bank credit since the more reserves a bank keeps for potential loan losses in the future, the less optimistic the bank should feel about the prospect of further credit issuance in the near future. In total, there are ten bank-specific or supply-side factors tested in this study[27].

Among the demand-side factors, some reflect the general economy, some reflect industry input factors and some reflect households economic allocation of resources and

[26] The subset of supply-side factors for FiVar and HHVar are identical.
[27] For details regarding the supply-side factors relating to bank credit to firms and households, please see tables 9 and 10 in appendix.

attitudes towards the economy. Demand side factors common to both firms and households are among others Gross Domestic Product (GDP), Unemployment (UEP), Inflation (INF) and Real Estate Price Index (REPI). GDP should be positively related to bank credit since economic growth is dependent on investment while in order for investment to occur, financing is needed. However, the opposite could also be true as there is an endogeneity issue, or reverse causality problem (Altunbas, 2007) where loans could drive GDP. In this section, regarding endogeneity problems, I use lagged versions of both the dependent and independent variables in order to mitigate possible endogeneity bias as done by Gambacorta and Marques-Ibanez (2011). On the contrary, higher UE is an indicator that firms and households should cut back on further investment in order to save and as a consequence to reduce external financing, including bank credit. The relationship between INF and bank credit is not completely clear since higher levels of inflation could force firms and households to seek more loans for financing or refinancing purposes. On the other hand, higher levels of inflation could discourage firms and households to seek bank credit in the first place if additional financing is considered to be expensive or financially unsustainable. The relationship between RE with bank credit is somewhat unclear since higher real estate prices could force firms to seek additional credit for certain real estate purchases but also discourage firms from real estate purchases and the need for additional external financing in the first place.

Factors that could explain firm-specific bank credit levels are Interest Rate (IR) proxied by STIBOR 3M, Firm Default Rate (FDR), Energy Costs (EGY) proxied by electricity price index and Real Estate Price Index (RE). IR should be negatively related to bank credit since higher interest rates on credit should decrease the demand for additional credit. In reality, additional risk-premium is added to credit given to a specific firm loan and that interest rates with three months to maturity best reflect the financing needs for firms and funding rollover purposes. Also, FDR and EGY should also be negatively related to bank credit since higher default rate among firms in general limits their aggregate ability to get additional external financing while higher energy costs to firms encourages savings and reduces the appetite for additional investment. In this study, energy prices is viewed as a key input factor for industrial production and an

alternative economic intuition could be that higher energy prices leads to higher higher firm costs and consequently lower firm profits. The reaction to this would be constraining costs, which would include financing costs from bank credit.

Factors that could explain household specific bank credit levels are Income per Capita (IPC), Debt as a fraction of Household Income (DOI), Debt as Fraction of Financial Assets owned by Households (DOFA), Real Estate Price Index (RE_N), Mortgage Bond Interest Rates (MB2Y) and three different household confidence indices (CI_Ag, CI_Ma and CI_Mi) regarding the economic future. Both IPC and FA could both be positively or negatively related to bank credit since higher income and more financial wealth could enable households to finance larger bank loans but also reduce the need for external financing. Both debt factors, DOI and DOFA should in general be negatively related to additional bank credit since higher debt levels would incur higher financing costs which ceteris paribus should deter households to borrow more. MB2Y should be negatively related to additional bank credit since higher financing costs should discourage households to borrow more. The three confidence indices CI_Ag, CI_Ma and CI_Mi could all be positively related to additional bank credit since the more confident households are about the different aspects of the economy, the more they should be willing to borrow for investment and consumption[28].

Crisis is a control variable for the global financial crisis of 2007 to 2010 and is 1 from the third quarter of 2007 to the second quarter of 2010, all other quarters being 0. The intention of including the Crisis dummy is to see whether certain factors are amplified during times of financial crisis.

7. Empirical Results and Discussion

[28] For details regarding the demand-side factors relating to bank credit to firms and households, please see tables 9 and 10 in appendix.

7.1 The Bank Lending Channel in Sweden

Table 4 shows how changes in total loans (LOAN), securities (SECU), deposits (DEPO) and interbank borrowing (INBB) for Swedish banks respond to changes in monetary policy as using a short-term interest rate as the proxy for monetary policy. In the setting with LOAN as the dependent variable, one can see that none of the independent variables display any statistical significance. In the setting with SECU, GDP is weakly statistically significant and positively related to securities, possibly indicating that banks prefers to use external financing as the method of choice to fund future demand in loans. Interestingly, both securities and deposits are negatively and statistically significantly related with themselves lagged one period. This could mean that both variables have some form of path dependency or that they represent some kind of funding adjustment mechanism. However, as Achen (2000) illustrates, the inclusion of a lagged variables could sometimes be redundant and dominate the estimation in some cases. I choose nevertheless to maintain the same system of equations as Altunbas et al. (2002) for ease of comparison. Lastly, interbank borrowing seems to decrease as the short-term interest rate increases, which makes economic sense as borrowing from other banks becomes more costly. Overall, the lack of statistical significance among the independent variables in the LOAN setting and the fairly limited significance of the short-term interest rate suggest that there is no evidence of a bank lending channel or that funding.

In table 5 where the data sample is divided into two kinds of smaller groups, additional patterns emerge. Large banks only seems to react to lagged short-term interest rate and the relationship is negative which makes economical sense as higher short-term interest rate is followed by lower loan amount due to higher financing costs of credit. For small banks, increase in total loans is preceded by an increase in lagged securities and contemporaneous interbank borrowing. It suggests that smaller banks initially use securities as a means to fund future loans and that interbank borrowings is used for contemporaneous adjustments of loan financing. Also, the strong statistical significance of lagged total loans could be a reflection of good bank loan relationships or lock-in effects or simply overcrowding as mentioned by Achen (2000). In the division of the data sample into two groups based on high and low capital banks, high capital banks seem to make contemporaneous loan funding adjustments using interbank borrowings while low

capital banks use securities as a means for contemporaneous funding adjustments. Lastly, switching the short-term interest rate from STIBOR 1W to STIBOR 3M does not generate significant differences in results.

These results are in some ways in contrast to those found by Altunbas et al. (2002) who finds evidence of a bank lending channel in the European banking sector as a whole using data from 11 EMU countries. However, the evidence regarding the existence of a bank lending channel in Sweden in this paper is consistent with the results by Altunbas et al. (2002) regarding the lack of evidence of a bank lending channel in France, Germany and Spain. In contrast to Hallsten (1999) and Westerlund (2003) who concludes the existence of a bank lending channel, the evidence overwhelmingly points to the lack of a bank lending channel. This could be the result of comprehensive structural changes early in the 2000s as suggested by Goddard (2007) or in the wake of the financial crisis of 2007-2010 suggested by Gambacorta and Marques-Ibanez (2011). Also, in combination with different funding patterns, this result could indicate significant changes to the monetary transmission mechanism in Sweden. Examples of structural changes are financial deregulation and financial innovation that might fundamentally change the role of banks and their operations.

The lack of evidence on a bank lending channel has significant economic implications. For instance, changes in monetary policy might not be enough to affect loan supply in order to stimulate financing of firms and consequent economic growth. Also, given the contradictory evidence by (Hallsten, 1999; Westerlund 2003) that there is a bank lending channel, it is of interest to find out why the bank lending channel does not seem to display any evidence of existence in this study. Is there a fundamental change in the existence and efficiency of the bank lending channel or is this something specific for the study period of this thesis? New ideas and more comprehensive and sophisticated methods could be needed in order to answer this question.

7.2 Risk, Capital and Bank Efficiency in Sweden

In the area of risk, capital and efficiency seen in tables 6 to 8, there are some interesting observations to be made. Using Loan Loss reserves as the dependent variable,

capitalization is negatively related to loan loss reserves which are consistent with economic theory. Also, bank efficiency is weakly statistically significant, somewhat supporting the ideas by Hughes and Mester (1998, 2009) that bank efficiency is related to risk at least. Interestingly, large banks are negatively related to bank risk while smaller banks are positively related to bank risk. From an economic standpoint, it seems logical that the more efficient a bank is, the greater the risk it can take since its efficiency to generate revenue makes up for the additional risk. This argument would then support the result of the small banks. Therefore, this could be an indication of another mechanism that works in the opposite direction for larger banks. Also, Return on Equity is negative for larger banks, meaning that the more efficient they are, the less risk they take. Finally, in table 6, Firm Default Rate seem to suggest that the higher the fraction of firms that default – as an indicator of corporate solvency – the higher the risk of the bank. This effect is even more statistically significant for small banks. This result seems consistent with economic intuition as more reserves need to be made when corporate borrowers become increasingly insolvent.

Looking at table 7 with capitalization as the dependent variable, we see that changes in size and return on equity are negatively related to capitalization. Both these effects are statistically significant for the total sample and the small banks. For the first observation, size, this could be interpreted as mentioned by Bouwman (2009) that small banks benefit from having capital in any economic condition, but as the bank grows larger, the benefit of having much capital deteriorates. Continuing on Bouwmans' argument, small banks can simply fail even during normal times so more capital serves as a cushion. Larger banks on the other hand could be protected by regulators because they are "too-big-to-fail", i.e. they are systemically important to the banking sector. The second observation regarding the change in return on equity and the change in capitalization could be that for return on equity to be high, financial leverage through expansion of the asset side is needed to generate this high return on equity. By expanding the asset side by funding using liabilities, equity to assets (the capital variable here) increases simultaneously. Since this is only significant for small banks, this could mean that this leverage is easier for them to attain due to smaller balance sheets. Lastly, the change in interest rate on 2 year Swedish government bonds is negatively related to

change in capital, possibly meaning that as the interest rate environment changes and financing costs of bank loans increases, more borrowers are unable to refinance their loans, causing credit losses to affect costs, which consequently affects equity levels.

In table 8, using bank efficiency ratio as the dependent variable, we see only size is statistically significant. This means that a positive change in size (total assets as proxy) is followed by a positive change in efficiency, meaning that banks overall become more efficient the larger they become. This could very well be an indication of economies of scale in the banking industry as mentioned by Altunbas et al. (2007). Furthermore, since this variable is especially significant for large banks, it could mean that the economy of scale is effective once the bank reaches a certain size.

Overall, tables 6 to 8 suggest that capital and efficiency seem to affect risk even though the statistical evidence is weak. Capital seem to weakly explain risk but neither capital nor efficiency explains one another. Therefore, due to the weak evidence of the relationship between risk and efficiency, my results are in a strict sense more closely to those of Altunbas et al. (2007), who find no positive relationship between inefficiency and risk-taking. Thus, I find no (or weak) evidence of moral hazard that lowly capitalized banks take on higher risks. These results are in contrast to the findings of Fiordelisi et al. (2010) who find that cost efficiencies increase banks future risks. Also, Fiordelisi et al. (2010) documents a relationship between efficiency and bank capital that does not seem to exist in Sweden. However, Fiordelisi et al. (2010) use Granger Causality techniques which differ from this paper and Altunbas et al. (2007).

The limited evidence on the relationship between risk-efficiency and capital-risk could suggest a few things. Assuming that one would accept the weak evidence, financial regulators could use capital and operational efficiency as a way to determine levels of loan loss reserves for individual banks for future financial reforms. Maybe this could be done by banks themselves as a mean of self-regulation as banks themselves set up prudent levels of reserves based on the relationship between risk, capital and efficiency.

7.3 Determinants of Bank Loans to Firms and Households

7.3.1 Determinants of Bank Loans to Non-Financial Firms

In table 11 in the appendix, the results from the estimations made using bank loans to firms[29] as the dependent variable are presented. Based on statistical significance as selection criteria, I select four variables to examine further. These four factors are: Liquidity (LIQ), Loan Loss Reserves (LLR), Deposits (DEP) and Energy Price (EGY).

The lagged Liquidity coefficient displays high levels of statistical significance. Its sign implies that an increase in liquidity is followed by an increase in loans the next period. Also, the interaction term is non-significant, implying that change in liquidity during times of financial crisis does not seem to amplify the effect of liquidity. This finding is in contrast to that of Gambacorta and Marques and Ibanez (2011) who find that liquidity matters most during times of crisis. One reason could possibly be different responses to the crisis of 2007-2010 between Sweden and the U.S or differences in the liquidity bank loan relationship between the two banking systems. The coefficients of lagged change in Loan Loss Reserves and its interaction term suggest that an increase in reserves are followed by a decrease in bank loans to firms, with an additional amplifying effect in a time of crisis. This means that the more reserves banks have to set aside for potential loan losses, the less the bank will lend out in the near future. This makes economic sense as banks themselves may view the level and/or change in loan loss reserves as a risk indicator for the future. The statistical significance of the deposit coefficient and its crisis interaction term suggest that the more deposits the bank carries, the more funds are available for issuance of bank credit in the next quarter, with a reversal effect during times of crisis. This reversal effect means that increases in deposits during times of crisis are followed by a decrease in lending to firms. One possible explanation could be that additional deposits are used for other purposes that lending, for instance payments for outstanding debt obligations or other forms of financial obligations to a counterparty that is about to default. Furthermore, one can also question whether clients are willing to add additional deposits to their banks during times of crisis. Lastly, among the non-bank variables (demand-side variables), the Energy Price and its' crisis interaction term are the only ones with statistical significance. The sign of lagged

[29] The reference to firms always means non-financial firms

Energy Price suggest that a positive change in energy prices is followed by a negative change in bank loans to firms. This makes economic sense. The interaction term is positive, meaning that increase in energy price in times of crisis is followed by an increase in bank loans. One possibility could be that firm need additional short-term financing as input factors become more expensive but one could question the willingness of banks to grant additional credit to firms in financial distress during times of financial crisis. From a model choice perspective among the four discussed economic factors, Energy Price is the best one since it has the lowest AIC value followed by deposits.

7.3.2 Determinants of Bank Loans to Households

In table 12 in the appendix, the results from the estimations made using bank credit to households as the dependent variable are presented. From the estimations, I find four variables of particular interest based on statistical significance on primarily the lagged independent variable that is not lagged bank loans to households. These four factors are: Liquidity (LIQ), Loan Loss Reserves (LLP) and Deposits (DEP) and Inflation (INF). For Liquidity, Loan Loss Reserves and Deposits, the signs of the coefficients are the same as before. The only differences are minor changes in statistical significance (even though they are all still statistically significant. Given the similarities, between the coefficients of these variables and those from the setting with bank loans to firms as the dependent variable, one could question the information content in these two variables from a research standpoint and whether bank lending to firms and bank lending to households share very similar properties. From the banks perspective, given an infusion of liquidity or deposits, the bank should lend to the group that generates the highest return. This observation could possibly serve as a future research topic to look into the choice of loan type given a liquidity or deposit infusion. Interestingly, the statistical significance of Inflation and its crisis interaction term suggest that an increase in inflation is followed by an increase in loans to households, while a reversal effect occurs during a time of crisis. This reversal effect means that higher inflation during crisis times reduces bank loans. These results would be consistent with the idea that households, with the approval of the bank, use bank loans as a means to finance consumption and investment during in normal times and reduce such behavior during times of financial crisis.

From a model-fit perspective, the estimation with Liquidity displays the lowest AIC value, -1175.28, followed by the setting with Inflation.

On a more general level, it seems that certain bank factors can help explain bank loans issued in Sweden. The statistical significance of the three factors Liquidity (LIQ), Loan Loss provisions (LLR) and Deposits (DEP) for both types of credit (firms and households) suggest so together with Energy Price for firms only and Inflation (INF) for households only. Given that three these factors are significant for both types of credit, I believe that financial regulators could monitor these factors more closely in order to maintain a stable banking sector. Another application could be to use these to fine-tune their current prediction tools or maybe even develop new ones, thereby improving prediction accuracy.

8. Limitations and Suggestions for Future Research

The limitations of this study are a few. Firstly, I have only tested a limited number of factors, and all these factors are inspired from either previous literature, economic theory or from discussions with my tutor at Riksbanken. Thus, there could be better economic factors that predict bank credit not thought of in this study. Secondly, this study is specific for Sweden only. Thus, the results may not be applicable on a cross-country level since there could be significant differences in banking environment and lender behavior between countries. Thirdly and lastly, since banking groups do not report balance sheet items exclusively restricted to Swedish operations, some of the tested independent variables are not Sweden-specific per se. However, given that the majority of lending of most of the banks studied is in Sweden and that the interest rate environment is fairly homogenous in the Nordics, I believe that this is the best possible solution to this problem at the moment. One encouraging point is that bank reports are becoming increasingly more detailed due to increasing banking regulation and this is a positive sign for future bank loan research.

For future research, one avenue would be to redo this study at a later period in time when there is more data available. Due to the infrequent reporting of banks and limited information in bank reports early on in this study, it would be of interest to see whether the conclusions drawn from this paper are the same later on. Lastly, a study of qualitative nature that investigates the reasoning behind loan decision processes in Swedish banks could further help us understand the significance of bank behavior.

9. Conclusion

In this study, I have investigated (1) the existence of a bank lending channel in Sweden during the 2000s, (2) the bi-directional relationships between risk, capital and (3) the best variables to use for prediction purposes.

I find no evidence of a bank lending channel in Sweden using the method employed by Altunbas (2002). This result contradicts earlier results found by Hallsten (1998) and Westerlund (2003). The reason to this could be due to significant structural changes in competition, business models, regulation and innovation as suggested by Goddard (2007). Also, it is of key importance to find out why there is no bank lending channel from a more qualitative point of view and whether the lack of evidence on bank lending channel is short- or long-term.

I also find very limited evidence of the bi-directional relationships between risk-efficiency and capital-risk. Also, there seems to be no relationship between capital and efficiency.

Finally, using a panel data method controlled for autoregressive effects, I find that Liquidity (LIQ), Deposits (DEP) and Loan Loss Reserves (LLR) display statistical significance for both firms and households and thus they can be used as potential forecast variables for both bank loans to firms and bank loans to households. Additionally, Energy Price could be suitable as a forecast variable for bank loans to firms only while Inflation (INF) seems suitable as a forecast variable for bank loans to households only.

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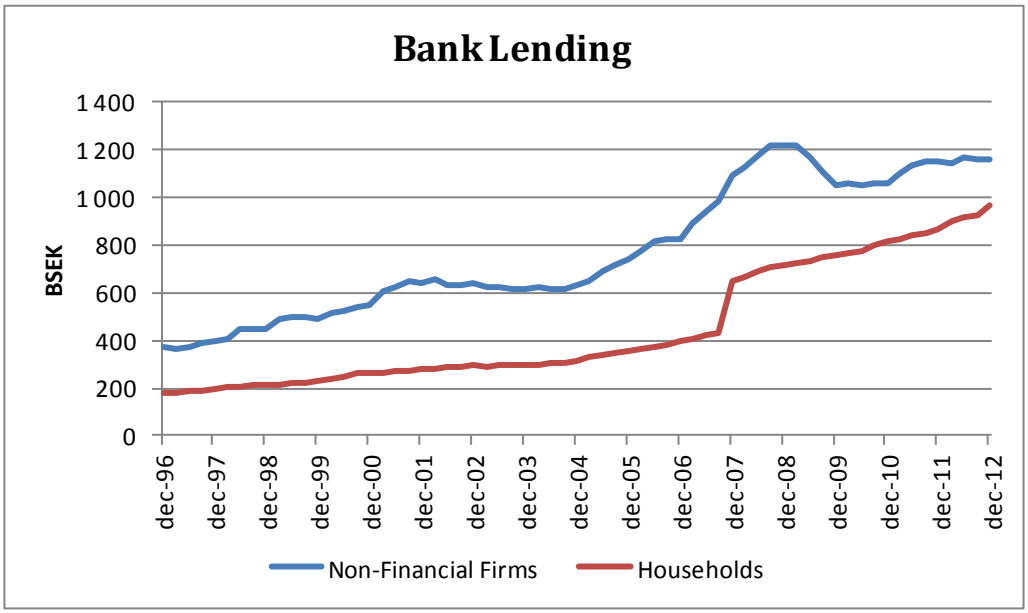
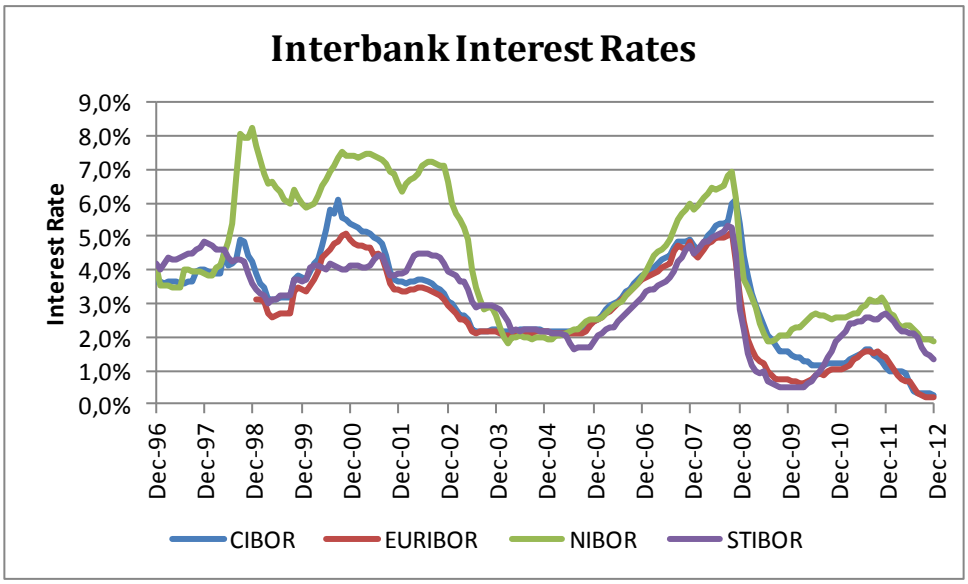
Appendix A. Graphs

Figure 1. Credit growth



The level of credit supplied by Swedish banks to Swedish firms and households in billions of SEK over the period of 1996-2012 is depicted. *Source: Swedish Riksbank, Finansmarknadsstatistik*

Figure 2. Monetary Policy Rates



The interbank interest rate for a loan with three months maturity is depicted for Denmark (CIBOR), the Euro Area (EURIBOR), Norway (NIBOR) and Sweden (STIBOR) over the period 1996-2012. All interest rates are given on a monthly basis using the monthly average interest rate.

Sources: Danish Nationalbank, European Banking Federation, Norges Bank and Swedish Riksbank

Appendix B. Summary Statistics and Regression Output

Table 1. Descriptive Statistics of the Four Larger Banks

	Data Series [unit]	Obs.	Mean	Median	Std. Dev.	Minimum	Maximum
Handelsbanken	Total Loans [MSEK]	65	1 019 666	863 475	389 028	281 441	1 686 289
	Firm Loans [MSEK]	–ıı–	596 155	507 540	197 685	195 978	973 152
	Household Loans [MSEK]	–ıı–	423 511	375 812	193 464	85 463	779 060
	Assets [MSEK]	–ıı–	1 555 856	1 322 151	552 629	571 123	2 546 583
	Equity [MSEK]	–ıı–	60 389	61 372	21 007	27 557	106 897
	Liquid Assets [MSEK]	–ıı–	264 372	217 798	148 495	63 836	621 829
	Deposits [MSEK]	–ıı–	402 822	341 406	173 484	167 507	728 572
	INBL [MSEK]	–ıı–	132 230	122 984	35 781	70 827	221 289
	LLP [MSEK]	–ıı–	3 406	3 216	1 075	1 776	5 836
	ROA [percent]	–ıı–	0,22	0,22	0,05	0,15	0,47
	ROE [percent]	–ıı–	4,31	4,09	1,08	2,77	8,59
	LTA [percent]	–ıı–	75,28	74,45	3,82	66,22	83,92
	NIM [percent]	–ıı–	0,36	0,36	0,05	0,27	0,60
Nordea	Total Loans [MEUR]	48	177 758	170 140	50 449	90 975	263 200
	Firm Loans [MEUR]	–ıı–	26 576	24 158	5 380	20 286	37 700
	Household Loans [MEUR]	–ıı–	24 678	24 100	9 388	11 914	43 400
	Assets [MEUR]	–ıı–	405 049	352 117	155 983	231 000	716 204
	Equity [MEUR]	–ıı–	17 055	15 434	5 558	11 000	28 216
	Liquid Assets [MEUR]	–ıı–	136 319	97 922	74 441	72 000	304 175
	Deposits [MEUR]	–ıı–	131 497	126 400	37 748	79 000	206 995
	INBL [MEUR]	–ıı–	14 437	15 471	9 406	293	33 985
	LLP [MEUR]	–ıı–	1 891	2 044	585	922	2 848
	ROA [percent]	–ıı–	0,21	0,21	0,04	0,10	0,31
	ROE [percent]	–ıı–	3,49	3,40	1,24	0,76	6,08
	LTA [percent]	–ıı–	64,11	66,32	5,34	53,02	70,42
	NIM [percent]	–ıı–	0,45	0,43	0,05	0,37	0,57
SEB	Total Loans [MSEK]	61	154 734	159 310	123 867	15 291	495 427
	Firm Loans [MSEK]	–ıı–	247 329	202 924	114 357	127 026	486 857
	Household Loans [MSEK]	–ıı–	174 395	123 628	115 214	62 919	423 826
	Assets [MSEK]	–ıı–	1 669 033	1 800 409	619 979	666 032	2 510 702
	Equity [MSEK]	–ıı–	63 803	52 933	27 108	27 967	113 618
	Liquid Assets [MSEK]	–ıı–	531 327	655 060	293 358	135 259	969 316
	Deposits [MSEK]	–ıı–	566 017	540 884	207 880	178 024	862 260
	INBL [MSEK]	–ıı–	13 569	3 947	23 133	157	98 903
	LLP [MSEK]	–ıı–	8 773	7 789	3 854	3 752	19 141
	ROA [percent]	–ıı–	0,18	0,17	0,07	0,02	0,41
	ROE [percent]	–ıı–	3,15	3,35	2,01	-4,93	7,00
	LTA [percent]	–ıı–	50,99	51,17	3,90	45,08	68,55
	NIM [percent]	–ıı–	0,43	0,43	0,07	0,30	0,55
Swedbank	Total Loans [MSEK]	63	827 461	744 900	294 401	266 780	1 254 200
	Firm Loans [MSEK]	–ıı–	406 801	377 900	107 224	248 300	623 000
	Household Loans [MSEK]	–ıı–	434 401	378 400	176 020	223 942	754 991
	Assets [MSEK]	–ıı–	1 265 663	1 093 478	429 683	658 159	1 965 043
	Equity [MSEK]	–ıı–	56 400	47 334	25 615	25 375	106 224
	Liquid Assets [MSEK]	–ıı–	211 012	169 281	140 381	34 659	572 152
	Deposits [MSEK]	–ıı–	359 221	309 711	131 545	190 355	630 594
	INBL [MSEK]	–ıı–	133 097	130 196	37 889	71 462	208 216
	LLP [MSEK]	–ıı–	7 922	4 698	6 951	2 080	27 132
	ROA [percent]	–ıı–	0,25	0,25	0,06	0,09	0,46
	ROE [percent]	–ıı–	3,52	3,60	2,30	-4,31	8,96
	LTA [percent]	–ıı–	80,54	81,42	4,23	68,55	88,02
	NIM [percent]	–ıı–	0,43	0,44	0,06	0,26	0,57

Table 2. Descriptive Statistics of the Four Smaller Banks

	Data Series [unit]	Obs.	Mean	Median	Std. Dev.	Minimum	Maximum
Danske Bank	Total Loans [MDKK]	37	276 260	271 084	42 675	225 264	403 520
	Firm Loans [MDKK]	–ıı–	91 303	99 500	21 765	48 000	126 100
	Household Loans [MDKK]	–ıı–	59 049	58 200	19 511	27 000	91 200
	Assets [MDKK]	–ıı–	2 949 475	3 194 762	567 492	1 826 000	3 599 070
	Equity [MDKK]	–ıı–	92 840	99 507	26 666	10 135	138 234
	Liquid Assets [MDKK]	–ıı–	722 552	772 745	215 716	418 951	1 090 657
	Deposits [MDKK]	–ıı–	55 341	57 368	17 606	26 131	88 089
	INBL [MDKK]	–ıı–	178 186	179 339	46 602	76 253	263 012
	LLP [MDKK]	–ıı–	888	814	374	322	1 450
	ROA [percent]	–ıı–	0,12	0,12	0,01	0,09	0,15
	ROE [percent]	–ıı–	4,17	3,22	6,01	-0,25	39,13
	LTA [percent]	–ıı–	58,20	57,61	3,71	51,34	67,47
	NIM [percent]	–ıı–	0,84	0,77	0,21	0,57	1,33
Länsförsäkringar	Total Loans [MSEK]	44	529 317	458 614	200 959	297 399	910 683
	Firm Loans [MSEK]	–ıı–	5 832	4 797	2 653	2 986	12 755
Bank	Household Loans [MSEK]	–ıı–	65 494	57 386	38 167	11 066	136 531
	Assets [MSEK]	–ıı–	89 626	73 834	56 246	16 500	197 159
	Equity [MSEK]	–ıı–	3 739	3 465	1 790	1 001	7 172
	Liquid Assets [MSEK]	–ıı–	14 352	6 550	14 153	524	39 902
	Deposits [MSEK]	–ıı–	30 699	27 415	13 014	14 305	62 396
	INBL [MSEK]	–ıı–	107 674	31 699	101 874	19 000	331 460
	LLP [MSEK]	–ıı–	14	12	27	-36	74
	ROA [percent]	–ıı–	0,08	0,08	0,03	-0,03	0,12
	ROE [percent]	–ıı–	1,13	1,11	0,61	-0,50	3,91
	LTA [percent]	–ıı–	83,44	83,00	7,43	68,75	95,36
	NIM [percent]	–ıı–	0,47	0,42	0,15	0,28	0,89
SBAB Bank	Total Loans [MSEK]	48	313 671	280 725	279 362	14 185	671 126
	Firm Loans [MSEK]	–ıı–	83 285	85 239	17 033	33 527	109 794
	Household Loans [MSEK]	–ıı–	95 228	103 880	45 003	31 948	161 904
	Assets [MSEK]	–ıı–	218 123	206 741	78 333	131 854	349 825
	Equity [MSEK]	–ıı–	6 125	5 963	1 418	4 015	8 761
	Liquid Assets [MSEK]	–ıı–	24 706	25 404	23 399	1	65 938
	Deposits [MSEK]	–ıı–	3 327	1	6 105	1	27 654
	INBL [MSEK]	–ıı–	11 706	8 300	11 055	87	35 427
	LLP [MSEK]	–ıı–	307	316	52	219	402
	ROA [percent]	–ıı–	0,09	0,09	0,05	-0,07	0,20
	ROE [percent]	–ıı–	2,05	2,23	1,33	-1,60	5,47
	LTA [percent]	–ıı–	84,97	82,45	9,90	67,58	97,83
	NIM [percent]	–ıı–	0,20	0,19	0,03	0,11	0,26
Skandiabanken	Total Loans [MSEK]	20	21 485	21 039	4 118	15 291	28 993
	Firm Loans [MSEK]	–ıı–	N/A	N/A	N/A	N/A	N/A
	Household Loans [MSEK]	–ıı–	21 485	21 039	4 118	15 291	28 993
	Assets [MSEK]	–ıı–	61 152	58 273	13 277	39 467	84 657
	Equity [MSEK]	–ıı–	2 485	2 578	420	1 595	3 195
	Liquid Assets [MSEK]	–ıı–	13 036	11 540	6 059	3 923	23 470
	Deposits [MSEK]	–ıı–	55 661	52 778	12 569	35 619	77 365
	INBL [MSEK]	–ıı–	4 493	3 459	2 577	738	9 831
	LLP [MSEK]	–ıı–	12	13	6	3	20
	ROA [percent]	–ıı–	0,09	0,07	0,18	-0,33	0,49
	ROE [percent]	–ıı–	1,77	1,33	2,66	-1,03	9,68
	LTA [percent]	–ıı–	74,00	72,35	6,22	65,32	87,08
	NIM [percent]	–ıı–	0,74	0,54	0,38	0,32	1,36

Descriptive Statistics for the four larger banks from either 1996, 1997 or 2001 to 2012. Calculations of ROA (Net Operating Income/Assets the previous period), ROE (Net Income/Equity the previous period), LTA (Loans/Assets) and NIM (Net Interest Income/Loans the previous period) are on a quarterly basis.

Sources: Financial Reports from Handelsbanken, Nordea, SEB and Swedbank.

Descriptive Statistics for the four smaller banks from either 2001, 2002 or 2003 to 2012. Calculations of ROA (Net Operating Income/Assets the previous period), ROE (Net Income/Equity the previous period), LTA (Loans/Assets) and NIM (Net Interest Income/Loans the previous period) are on a quarterly basis.

Sources: Financial Reports from Danske Bank, Länsförsäkringar Bank, SBAB Bank and Skandiabanken.

Table 3. Descriptive Statistics of Non-Bank Data

		Obs.	Mean	Median	Std. Dev.	Minimum	Maximum
Macroeconomic Data	GDP [MSEK]	65	682 827	673 114	133 242	461 278	923 500
	Unemployment [percent]	–ıı–	7,25	7,40	1,23	4,90	10,50
	Inflation [percent]	–ıı–	0,33	0,37	0,57	-2,00	1,71
Firm Data	STIBOR 3M [percent]	65	3,11	3,31	1,26	0,48	5,18
	STIBOR 1W [percent]	–ıı–	2,95	3,25	1,28	0,35	4,81
	SSVX 3M [percent]	–ıı–	2,76	3,02	1,33	0,16	4,44
	Firm Default Rate [percent]	–ıı–	0,89	0,85	0,21	0,62	1,48
	Electricity Price Index [value]	–ıı–	299	258	163	84	833
	Real Estate Price Index						
	- Nationwide [value]	–ıı–	1,5	1,6	0,3	1,0	1,9
	- Stockholm [value]	–ıı–	1,7	1,7	0,3	1,0	2,1
Household Data	Income/Capita [SEK]	65	159 603	158 500	18 740	129 400	188 600
	Financial Assets [MSEK]	–ıı–	4 543 214	4 115 742	1 486 109	2 224 022	7 492 382
	Debt / Income [percent]	–ıı–	128	126	25	91	164
	Debt / Fin. Assets [percent]	–ıı–	38	38	4	30	45
	Mortgage Bond 2Y [percent]	–ıı–	3,67	3,63	1,27	1,35	5,69
	Confidence Indicator						
	- Aggregate [value]	–ıı–	8,1	8,7	11,5	-23,4	28,4
	- Macro Index [value]	–ıı–	-0,5	-1,5	25,8	-59,0	46,8
	- Micro Index [value]	–ıı–	8,2	8,8	5,7	-8,6	16,5

All data are for Sweden, Swedish firms or Swedish households on an aggregate level unless otherwise specified. STIBOR 3M is the Swedish interbank interest rate for a loan with three months to maturity and SSVX 3M is the interest rate on Swedish t-bills with three months to maturity. The Electricity Price Index is a nationwide index.

Sources: National Institute of Economic Research, Swedish Energy Agency, Statistics Sweden, Sveriges Riksbank

Table 4. Estimation Results from Tests on the Bank Lending Channel

	Dependent Variables			
	ΔLOAN	ΔSECU	ΔDEPO	ΔINBB
$\Delta STIR_{i,t}$	168.23	1391.148*	210.3877	-120.3517
	(342.6061)	(573.2484)	(339.3703)	(1279.993)
$\Delta SECU_{i,t}$	0.0019879			
	(0.0318299)			
$\Delta INBB_{i,t}$	0.0053008	0.139611	0.0946323	
	(0.04143)	(0.1202156)	(0 .091221)	
$\Delta GDP_{i,t}$	-0.2512803	-0.2561662	-0.3201449	
	(0.3088003)	(0.6033296)	(0.2617462)	
$\Delta STIR_{i,t-1}$	-477.9684	760.5695	358.6929	1233.427
	(279.2222)	(422.6758)	(410.4285)	(807.6821)
$\Delta SECU_{i,t-1}$	0.0285621	-0.4207372**		
	(.0675998)	(0.1316618)		
$\Delta INBB_{i,t-1}$	-0.0377596	0.1280671	0.0480007	-0.0930285
	(0.0413369)	(0.0764847)	(0.0559911)	(0.0800039)
$\Delta GDP_{i,t-1}$	0.4942992	0.5113587*	0.5881285	
	(0.3876899)	(0.2330593)	(0.4706219)	
$\Delta LOAN_{i,t-1}$	0.0421643			
	(0.1326203)			
$\Delta DEPO_{i,t-1}$			-0.201684**	
			(0.0637752)	
Intercept	7.135997*	2.066736	7.712553**	0.076682
	(4.174545)	(5.087148)	(2.170555)	(0.4484274)
R^2 (%)	3.9	18.1	4.6	3.7
N	354	354	354	354

The following are the regression results corresponding to equations (1)-(4) in the text. $\Delta LOAN_{i,t}$ is the change in total bank loans, $\Delta STIR_{i,t}$ is the change in short-term interest rate, $\Delta SECU_{i,t}$ is the change in bank securities holdings, $\Delta INBB_{i,t}$ is the change in interbank borrowings, $\Delta GDP_{i,t}$ is the change in Gross Domestic Product and $\Delta DEPO_{i,t}$ is the change in deposits. All variables with index t-1 are one-quarter lagged variables. The standard errors of the coefficients are in parenthesis. (*** $p<0.01$, ** $p<0.05$ and * $p<0.10$).

Table 5. Estimation Results from Tests on the Bank Lending Channel sorted on Asset Size and Capitalization

Subsamples	Dependent Variable: ΔLOAN = change in loans				
	All Banks	Large Banks	Small Banks	High Capital Banks	Low Capital Banks
$\Delta STIR_{i,t}$	168.23	271.9793	-102.5504	963.6899	-118.6662
	(342.6061)	(684.1792)	(155.975)	(796.5394)	(478.281)
$\Delta SECU_{i,t}$	0.0019879	-.0030723	0.0571904	0.0216507	-0.045946***
	(0.0318299)	(0.0304019)	(0.0293264)	(0.0967022)	(0.0055005)
$\Delta INBB_{i,t}$	0.0053008	-0.0052741	0.0335218**	0.3020637*	-0.0232691
	(0.04143)	(0.0860135)	(0.0046715)	(0.0869363)	(0.033319)
$\Delta GDP_{i,t}$	-0.2512803	-0.3331928	0.0848181	-0.1361415	-0.0960187
	(0.3088003)	(0.4801051)	(0.1218004)	(0.399437)	(0.4866007)
$\Delta STIR_{i,t-1}$	477.9684*	750.5507*	135.4788	129.9119	672.2408
	(279.2222)	(250.5647)	(271.9164)	(58.2783)	(490.837)
$\Delta SECU_{i,t-1}$	0.0285621	0.0267095	0.0794548**	-0.0781347	0.0312982
	(.0675998)	(0.0795538)	(0.0094745)	(0.1769894)	(.0768828)
$\Delta INBB_{i,t-1}$	-0.0377596	-0.0472371	0.0144179	0.2122455	-0.0653265
	(0.0413369)	(0.0914649)	(0.0063295)	(0.1250612)	(0.0398837)
$\Delta GDP_{i,t-1}$	0.4942992	0.8109117	-0.1590747	-0.0016666	0.6622008
	(0.3876899)	(0.5781523)	(0.0878553)	(0.6045772)	(0.3558693)
$\Delta LOAN_{i,t-1}$	0.0421643	0.0291935	0.433647***	-0.1201966	0.1155059
	(0.1326203)	(0.1428551)	(0.0383193)	(0.1105019)	(0.2109248)
Intercept	7.135997*	9.055577	2.049958*	9.610647**	5.378276
	(4.174545)	(6.709587)	(0.6777586)	(0.8033689)	(7.299614)
R^2 (%)	3.9	5.9	33.7	7.5	10.1
N	354	229	125	152	202

The standard errors of the coefficients are in parenthesis. See Table 4 for variable definitions. (*** p<0.01, ** p<0.05 and * p<0.10).

Table 6. Bank Risk Estimation using Loan Loss Reserves (LLR) as proxy

	Dependent Variable: LLR		
	All Banks	Large Banks	Small Banks
$\Delta CAP_{i,t}$	-31.33055*	-37.14926	-4.061277
	(17.24378)	(26.25866)	(3.797843)
$\Delta BER_{i,t}$	0 .0054378	-0.6243768*	0.0044581*
	(0.0202897)	(0.2264907)	(0.0017046)
$\Delta NLTA_{i,t}$	1.0481	2.055939	0.3912926
	(1.548244)	(2.601871)	(0.3327383)
$\Delta SIZE_{i,t}$	0.0005268	0 .0006927	-0.0000264
	(0.0004408)	(0.0006517)	(0.0000459)
$\Delta ROE_{i,t}$	-2.848761	-10.42409**	0.4637212
	(1.734984)	(3.320974)	(0.2701648)
$\Delta LAODEP_{i,t}$	-0.3507125	-0.6580963	0.0080666
	(0.5732251)	(1.135084)	(0.0110563)
$\Delta GVB2Y_{i,t}$	-16.43316	-29.63417*	-3.64521
	(9.881766)	(10.86104)	(3.607769)
$\Delta FDR_{i,t}$	840.0439**	1072.601	24.50225***
	(371.6844)	(498.023)	(1.87384)
Intercept	0.0491482*	0 .0725944	0.005344
	(0.0215327)	(0.0411571)	(0.0030412)
R^2 (%)	8.8	13.2	31.7
N	362	233	129

These are the regression results corresponding to equation 5 in the text. Here, $\Delta LLR_{i,t}$ is the change in loan loss reserves, $\Delta CAP_{i,t}$ is the change in capital using equity to assets as the proxy, $\Delta BER_{i,t}$ is the change in bank cost efficiency (inversely related to inefficiency) using the bank efficiency ratio as the proxy (total operational cost to total revenue), $\Delta NLTA_{i,t}$ is the change in net loans to assets, $\Delta SIZE_{i,t}$ is the change in total assets, $\Delta ROE_{i,t}$ is the change in return on equity, $\Delta LAODEP_{i,t}$ is the change in liquid assets to deposit ratio, $\Delta GVB2Y_t$ is the change in interest rate of a Swedish government bond with two years maturity and finally $\Delta FDR_{i,t}$ is the change in firm default rate. The standard errors of the coefficients are in parenthesis. (*** p<0.01, ** p<0.05 and * p<0.10).

Table 7. Bank Capital Estimation using Capitalization (CAP) as proxy

	Dependent Variable: CAP		
	All Banks	Large Banks	Small Banks
	-0.0000576	-0.0003995	0.0000786
$\Delta BER_{i,t}$	(0.0001967)	(0.0014562)	(0.0000544)
	0.0072382	0 .0003445	0.0153045
$\Delta NLTA_{i,t}$	(0.0068815)	(0.0092359)	(0.0087957)
	-0.0000116**	-0.0000145	-6.01e-06**
$\Delta SIZE_{i,t}$	(4.13e-06)	(5.95e-06)	(1.55e-06)
	-0.0653266***	-0.0056555	-0.0758009***
$\Delta ROE_{i,t}$	(0.0146919)	(0.0086536)	(0.007191)
	0.0000545	0 .0010144	-0.0005331
$\Delta LAODEP_{i,t}$	(0.0017004)	(0.0027723)	(0.0024368)
	-0.0638856**	-0.0917729*	-0.0133548
$\Delta GVB2Y_{i,t}$	(0.0247144)	(0.0334258)	(0.0558783)
	0.1138343	0 .65662	0 .2681967
$\Delta FDR_{i,t}$	(0.3281689)	(0.3803153)	(0.4219969)
	0.000214	0 .0004713	-0.0000577
Intercept	(0.0001258)	(0.0002478)	(0.0000595)
R^2 (%)	44.1	36.3	62.2
N	362	233	129

These are the regression results corresponding to equation 6 in the text. The standard errors of the coefficients are in parenthesis. See Table 6 for variable definitions. (*** p<0.01, ** p<0.05 and * p<0.10).

Table 8. Bank Efficiency Estimation using Bank Efficiency Ratio (BER) as proxy

	Dependent Variable: BER		
	All Banks	Large Banks	Small Banks
	3.775164	-0.8257745	12.75215
$\Delta CAP_{i,t}$	(4.92755)	(5.557819)	(18.69863)
	0.0042175	-0.0035985	0.856504
$\Delta LLR_{i,t}$	(0.0085107)	(0.0051262)	(1.210275)
	-0.4520986	1.043471	-2.677492
$\Delta NLTA_{i,t}$	(1.221221)	(0.8767605)	(2.159121)
	0.0000539**	0 .0000803*	0.00021
$\Delta SIZE_{i,t}$	(0.0000152)	(0.0000322)	(0.000118)
	0.1316059	0 .0140977	0.100887
$\Delta LAODEP_{i,t}$	(0.1217321)	(0.0642496)	(0.1376523)
	5.477021	0 .531888	17.38088
$\Delta GVB2Y_{i,t}$	(5.003269)	(0.7807839)	(16.65107)
	-7.360522	35.55448	-42.32902
$\Delta FDR_{i,t}$	(34.01071)	(27.64074)	(54.32991)
	-0.0001091	-0.0019368	0.0047428
Intercept	(0.0034391)	(0.0015443)	(0.0074474)
R^2 (%)	4.0	5.6	2.0
N	362	233	129

These are the regression results corresponding to equation 7 in the text. The standard errors of the coefficients are in parenthesis. See Table 6 for variable definitions. (*** p<0.01, ** p<0.05 and * p<0.10).

Table 9. Test Variables for predicting Bank Loans to Firms (FirmVar)

Variable	Description	Exp. Sign	Economic Intuition
ΔLOAN(Firm)	Dependent Variable. Calculated using Quarter-end value of Loans to Swedish Corporates.		
ΔLOAN(Firm)(1)	Lagged value of the dependent variable.	+	Positive change in past lending should be positively correlated with change in lending today.
ΔSIZE	Natural Logarithm of Total Assets.	+	Larger banks should be able to provide more credit.
ΔROA	Net Interest Income over Total Assets the previous period.	+	Banks with better financial performance should be able to provide more credit.
ΔROE	Net Income over Total Equity the previous period.	+	Banks with better financial performance should be able to provide more credit.
ΔCAP	Total Equity over Total Assets.	+	Better capitalised banks should be able to provide more credit.
ΔLTA	Total Loans over Total Assets.	-	The more the bank is loaned up, the more sensitive it is to defaults.
ΔNIM	Net Interest Income over Total Loans.	+	Larger net income from loans should encourage banks to provide more credit.
ΔLIQ	Natural Logarithm of Total of Liquid Assets.	+	More liquid banks should be able to generate more credit.
ΔNLL	Net Loan Losses.	-	Larger net loan losses should restrict future credit growth.
ΔLLR	Natural Logarithm of Loan Loss Provisions.	-	Larger loan loss provisions should encourage banks to restict further credit issuance.
ΔDEP	Natural Logarithm of Deposits.	+	Larger deposit base should enable banks to issue more credit.
ΔGDP	Natural Logarithm of Gross Domestic Product.	+	Positive GDP growth should indicate good economic times, encouraging firms to invest and seek bank credit.
ΔUE	Seasonally Adjusted Unemployment.	-	Larger unemployment should indicate bad economic times, discouraging firms to seek more bank credit.
ΔINF	Inflation using KPI.	+/-	Higher prices could both encourage firms to borrow more to finance additional purchases but also discourage from buying in the first place.
ΔSTIBOR3M	Bank Lending Rate to Swedish Firms using STIBOR 3M as proxy.	-	Higher interest rates should discourage firms to seek further bank credit.
ΔFDR	Firm Default Rate as the percentage of firms that enter bankruptcy in a given quarter.	-	Higher firm default rate should indicate bad economic times, discouraging firms to seek more credit.
ΔEGY	Energy costs using nationwide Swedish electricity price index as proxy.	-	Higher energy prices should indicate more costly input factors, discouraging firms to seek additional bank credit.
ΔRE_N	Real Estate Price Index covering Sweden.	+/-	Higher real estate prices could both encourage firms to borrow more to finance additional purchases but also discourage from buying in the first place.

*All variables with Δ refers to first-differenced variable.

Table 10. Test Variables for predicting Bank Loans to Households (HHVar)

Variable	Description	Exp. Sign	Economic Intuition
ΔLOAN(HH)	Dependent Variable. Calculated using Quarter-end value of Loans to Swedish Households.		
ΔLOAN(HH)(1)	Lagged value of the dependent variable.	+	Positive change in past lending should be positively correlated with change in lending today.
$\Delta SIZE_{i,t-1}$	Natural Logarithm of Total Assets.	+	Larger banks should be able to provide more credit.
$\Delta ROA_{i,t-1}$	Net Interest Income over Total Assets the previous period.	+	Banks with better financial performance should be able to provide more credit.
$\Delta ROE_{i,t-1}$	Net Income over Total Equity the previous period.	+	Banks with better financial performance should be able to provide more credit.
$\Delta CAP_{i,t-1}$	Total Equity over Total Assets.	+	Better capitalised banks should be able to provide more credit.
$\Delta RR_{i,t-1}$	Total Loans over Total Assets.	-	The more the bank is loaned up, the more sensitive it is to defaults.
$\Delta NIM_{i,t-1}$	Net Interest Income over Total Loans.	+	Larger net income from loans should encourage banks to provide more credit.
$\Delta LIQ_{i,t-1}$	Natural Logarithm of Total of Liquid Assets.	+	More liquid banks should be able to generate more credit.
$\Delta NLL_{i,t-1}$	Net Loan Losses.	-	Larger net loan losses should restrict future credit growth.
$\Delta LLP_{i,t-1}$	Natural Logarithm of Loan Loss Provisions.	-	Larger loan loss provisions should encourage banks to restict further credit issuance.
$\Delta DEP_{i,t-1}$	Natural Logarithm of Deposits.	+	Larger deposit base should enable banks to issue more credit.
$\Delta GDP_{i,t-1}$	Natural Logarithm of Gross Domestic Product.	+	Positive GDP growth should indicate good economic times, encouraging households to invest and seek bank credit.
$\Delta UEP_{i,t-1}$	Seasonally Adjusted Unemployment.	-	Larger unemployment should indicate bad economic times, discouraging households to seek more bank credit.
$\Delta INF_{i,t-1}$	Inflation using KPI.	+/-	Higher prices could both encourage households to borrow more to finance additional purchases but also discourage from buying in the first place.
$\Delta IPC_{i,t-1}$	Natural Logarithm of Income per Capita.	+/-	Higher income could both encourage households to borrow more to finance additional purchases but also discourage from buying in the first place.
$\Delta DOI_{i,t-1}$	Debt as Fraction of Household Income.	-	The larger the debt possessed by households, the less willing are they to incur more debt.
$\Delta DOFA_{i,t-1}$	Debt as Fraction of Financial Assets owned by Households.	-	The larger the debt possessed by households, the less willing are they to incur more debt.
$\Delta RE\_N_{i,t-1}$	Real Estate Price Index covering Sweden.	+/-	Higher real estate prices could both encourage households to lend more to finance additional purchases but also discourage from buying in the first place.
$\Delta MB2Y_{i,t-1}$	Bank Lending Rate to Swedish Households using mortgage bonds with 2Y to maturity as proxy.	-	Higher interest rates should discourage households to seek further bank credit.
$\Delta CI\_Ag_{i,t-1}$	Household Confidence Indicator on Aggregate Level.	+	The more confident households are about the economy, the more they are willing to borrow and invest.
$\Delta CI\_Ma_{i,t-1}$	Household Confidence Indicator on Macro Level.	+	The more confident households are about the economy, the more they are willing to borrow and invest.
$\Delta CI\_Mi_{i,t-1}$	Household Confidence Indicator on Micro Level.	+	The more confident households are about the economy, the more they are willing to borrow and invest.

*All variables with Δ refers to first-differenced variable.

Table 11. Estimation Results from using different Independent Variables to predict Bank Lending to Firms

Independent Variable	Lagged Bank Loan to Firm	Lagged Independent Variable	Crisis Interaction Term	AIC
ΔSIZE	-0.1916225	0.1000264	0.3117144	-759.5334
	(0.1593812)	(0.1257513)	(0.1516403)	
ΔROA	-0.1654151	0.7789706	14.66413*	-755.4737
	(0.1505333)	(0.6992469)	(6.73185)	
ΔROE	-0.1655814	-0.0592943	0.153599	-754.4288
	(0.1523217)	(0.0618723)	(0.1020792)	
ΔCAP	-0.1714739	-0.1504683	-3.971839	-754.8531
	(0.1488069)	(1.011186)	(2.545944)	
ΔLTA	-0.1614855	0.1211421	0.3348087	-756.5386
	(0.1474489)	(0.0849811)	(0.3038245)	
ΔNIM	-0.1696391	-9.230668	19.44278	-754.8184
	(0.1531897)	(5.258545)	(19.71419)	
ΔLIQ	-0.161397	0.0070067***	0.0728413	-756.7397
	(0.1497826)	(0.0012986)	(0.04156)	
ΔNLL	-0.167497	-7.149255	11.11655	-754.4244
	(0.1517581)	(4.151787)	(9.981868)	
ΔLLR	-0.1655631	-0.0046268*	-0.0038243*	-754.315
	(0.1529042)	(0.0021814)	(0.0016504)	
ΔDEP	-0.1799992	0.0148241***	-0.3604054**	-765.8182
	(0.1595621)	(0.0024567)	(0.1018717)	
ΔGDP	-0.1797801	-0.4714641	4.638034**	-766.3726
	(0.1446558)	(1.163062)	(1.820491)	
ΔUE	-0.1627489	-0.6756357	2.730849	-755.1293
	(0.1442348)	(0.6779423)	(4.578038)	
ΔINF	-0.1629584	-0.5182307	2.47612	-758.5474
	(0.1493163)	(0.8553726)	(1.932099)	
ΔSTIBOR3M	-0.1697354	1.551378	-0.0661526	-756.8855
	(0.1509951)	(1.745431)	(2.03877)	
ΔFDR	-0.1753358	-25.85168	-6.407717	-756.7821
	(0.1478907)	(16.23203)	(41.56041)	
ΔEGY	-0.1917056	-0.0253641**	0.3364985*	-769.207
	(0.147049)	(0.0073928)	(0.1404511)	
ΔRE_N	-0.1697144	0.0713434	-0.840918	-756.3452
	(0.1445855)	(0.1907764)	(0.4960975)	

Estimation results from Fixed Effects OLS estimations with bank loans to firms (LOAN(Firm)) as dependent variable and different firm-specific test variables. Equation specifications for these estimations is equation (8) in the main text. Each row represents one separate estimation and the coefficients from that estimation. Note: (*** p<0.01, ** p<0.05 and * p<0.10), (N=352).

Table 12. Estimation Results from using different Independent Variables to predict Bank Lending to Households

Independent Variable	Lagged Bank Loan to HH	Lagged Independent Variable	Crisis Interaction Term	AIC
ΔSIZE	-0.017339 (0.0427891)	0.0720596 (0.0609384)	-0.0654084 (0.084447)	-1164.188
ΔROA	-0.0135086 (0.0394343)	0 .742383 (0.5585888)	-1.087962 (2.04785)	-1162.13
ΔROE	-0.013251 (0.0394592)	0.0519022 (0.0358712)	-0.1041691 (0.0296426)	-1162.909
ΔCAP	-0.0140656 (0.0398491)	-0.3688319 (0.5137581)	-1.055347 (2.000879)	-1162.555
ΔLTA	-0.0124588 (0.0375382)	-0.0294354 (0.0557615)	-0.1314534 (0.1490979)	-1162.889
ΔNIM	-0.0141001 (0.0396918)	-1.310537 (5.251019)	1.647768 (8.8205)	-1162.02
ΔLIQ	-0.0072786 (0.0325454)	0.0107386 (0.0005741)	-0.004742 (0.0212371)	-1175.28
ΔNLL	-0.0139683 (0.0395778)	-1.438571 (4.287358)	7.943535 (6.067058)	-1162.609
ΔLLR	-0.0137754 (0.0395236)	0.0022964 (0.0008396)	-0.0025388 (0.0008712)	-1162.254
ΔINBL	-0.0132789 (0.040259)	-0.019001 (0.0081289)	0.0309384 (0.0209947)	-1181.607
ΔDEP	-0.0137158 (0.039376)	-0.00406 (0.0009909)	-0.1165968 (0.026566)	-1166.131
ΔGDP	-0.0134424 (0.0391742)	0.2789435 (0.1932134)	-0.9781022 (1.021121)	-1163.472
ΔUE	-0.0125487 (0.0377434)	-0.0325158 (0.4890675)	-1.407453 (1.473201)	-1163.479
ΔINF	-0.0103538 (0.039084)	0.6153388 (0.2574746)	-1.455165 (0.5046116)	-1166.167
ΔIPC	-0.0158621 (0.0417096)	-0.4934109 (0.7059326)	-0.5534976 (0.6947842)	-1163.076
ΔDOI	-0.020529 (0.0439301)	0.8752704 (0.516004)	-0.6979808 (0.3460285)	-1171.323
ΔDOFA	-0.0126094 (0.03846)	0.4582891 (0.3263657)	-0.9025863 (1.036206)	-1164.148
ΔRE_N	-0.0157522 (0.040235)	0 .2012014 (0 .137107)	-0.2984214 (0.2485726)	-1164.309
ΔMB2Y	-0.0145708 (0.039229)	-1.221309 (0.8125988)	0.7052769 (0.4393167)	-1165.312
ΔCI_Ag	-0.0136692 (0.038918)	0.000174 (0.0002607)	0.0003093 0.0009352)	-1162.66
ΔCI_Ma	-0.0138821 (0.0391176)	0 .0001004 (0.0001444)	0.0000888 (0.000507)	-1162.522
ΔCI_Mi	-0.0134053 (0.0390761)	0.0004844 (0.0005115)	0.0006428 (0.0014628)	-1163.17

Estimation results from Fixed Effects OLS estimations with bank loans to households (LOAN(HH)) as dependent variable and different household-specific test variables. Equation specifications for these estimations is equation (9) in the main text. Each row represents one separate estimation and the coefficients from that estimation. Note: (*** p<0.01, ** p<0.05 and * p<0.10), (N=352).