Big Broad Banks:

How Does Cross-Selling Affect Lending?

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Abstract

Using unique micro-data that contain the internal information on all corporate customers of a large Northern European bank, I show that combining loan and non-loan products (cross-selling) has two benefits. First, it increases credit supply, especially in recessions. Second, it increases the likelihood of receiving lenient treatment in delinquency. I argue that non-loan relationships play an important role in determining credit supply and debt renegotiation, not only by (i) mitigating information asymmetries (as suggested in earlier literature), but also by (ii) increasing the profitability of the relationship. Exploiting an exogenous and differential change in certain products' profitability due to the Basel II implementation, I estimate the causal effect of this new profit channel on credit supply. A 20 percent decrease in non-loan products' profitability (1) reduces credit supply to affected firms by 10.5 percent (500,000 USD) compared with unaffected firms, and (2) reduces likelihood of receiving lenient treatment for affected firms by 58 percent (23 pp) compared with unaffected firms, conditional on being delinquent.

Keywords: relationship banking, cross-selling, credit allocation, debt renegotiation

JEL Classification: G01, G21, G28

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1 Introduction

The revenue composition of the banking industry is changing. Non-loan revenue has been contributing to nearly half of the net operating revenue of large banks since the early 2000s.[1] Given that bank loans are the predominant source of external finance in most countries (Gorton and Winton 2003; Allen et al. 2013), it is important that we investigate the implications of this worldwide prevalence of non-loan products in large banks' business models for bank lending. More specifically, do non-loan products in a relationship affect credit supply?[2] If so, what are the underlying mechanisms? While most of the previous literature attribute the source of synergy in a relationship to the reduced information asymmetry, the main goal and contribution of this paper is to document causally that profit from a non-loan relationship alone affects credit access.[3]

There are at least three challenges in answering these questions: (1) a lack of data that uncover the full picture of the relationship between firms and lenders over time; (2) challenges in disentangling credit supply from credit demand; and (3) identification concerns related to causally identify how profit from non-loan relationships affect credit supply.

This paper studies how cross-selling affects credit supply in a banking relationship, and identifies the underlying mechanisms. To address the first challenge, I explore an internal database from a major Northern European bank to observe detailed relationship information on the universe of its corporate borrowers in Sweden. To separate credit supply from demand, I investigate how the maximum amount of credit the bank is *willing to lend* to a firm—an internal credit supply measure that is not contaminated by the firm's demand for credit—is affected by the non-loan profit it generates from this firm.[4] I illustrate with a simple framework that two economic forces:

[1] See Figure 1 for a description of the world as of 2014, and US and Sweden for the period of 2002 to 2012.

[2] Puri and Rocholl (2008) documents the importance of retail cross-selling by showing that retail customers demand and end up with more highly under-priced issues from their banks, who are also the lead underwriters.

[3] For studies documenting banks' informational advantage, see for e.g., James (1987); James (1992)< Yasuda (2005); Bharath et al. (2007); Freixas and Rochet (2008); Hale and Santos (2009); Schenone (2010); Ivashina and Kovner (2011); Srinivasan (2014); Giannetti et al. (2017); Liberti and Petersen (2017); Neuhann and Saidi (2018).

[4] Degryse et al. (2016) is the first in using this measure. Identifying credit supply has been a challenge in the literature, because common measures, such as loan amount granted or the size of credit lines, are equilibrium outcomes of both the firm's demand and the bank's supply. Loan application data as in Puri et al. (2011) would be ideal but difficult to obtain. Khwaja and Mian (2008) make a significant contribution to this empirical challenge. However, their strategy relies on firms having multiple banking relationships, which is not common in Northern European countries, since the majority of firms only have one bank relationship (Ongena and Smith 2000).

the increased return to the relationship (the less-documented profit channel) and the reduced information asymmetry (the well-documented information channel) both give rise to credit supply. In order to provide causal evidence on the profit channel, I exploit an exogenous shock to the profitability of certain non-loan products due to implementation of the Basel II Accord. To be specific, I test whether the bank becomes less friendly to firms whose non-loan products purchased before the shock became less profitable (affected group), compared with firms that purchased unaffected products (unaffected group) in a difference-in-differences setting.

I begin my analyses by documenting two benefits when combining loan and non-loan products in a relationship. First, it increases the bank's willingness to lend, especially during recessions. Second, it increases the likelihood that firms receive lenient treatment in delinquency.

Next, I investigate the channels underlying these effects. There are two mechanisms through which cross-selling can affect a bank's lending decision, and I illustrate how they both increase the credit supply in a stylized model building on Holmström and Tirole (1997). First, the profit earned from non-loan products simply increases the net present value of the relationship.[5] As a firm purchases more and more services from the bank, the bank holds a share in the firm's future profits.[6] Also, the implicit equity stake allows the bank to benefit from the continued survival of the firm, making it more willing to renegotiate in financial distress. Second, the additional information gathered from cross-sold products can help to alleviate information asymmetry and moral hazard problems, and make bank lending more informed.[7] Both channels increase pledgeable income and the bank's willingness to supply credit.

In order to identify the profit channel, I exploit variation in the profitability of certain products caused by a plausibly exogenous change in their capital requirements after the implementation of Basel II. The products I examine became significantly different in their profitability due to the

[5]Compared with loans, cross-sold services and products are less regulated, have higher margins, and carry much less credit risk. Therefore, banks have an incentive to sell these products to maximize profits. A negative example in the retail market is the cross-selling scandal at Wells Fargo in 2016. https://www.bloomberg.com/news/articles/2018-10-22/wells-fargo-to-pay-65-million-to-new-york-over-cross-selling

[6]See, e.g., Rajan (1992); Petersen and Rajan (1995); Loranth and Morrison (2012); Srinivasan (2014)

[7]For example, a bank can learn about a firm's detailed cash flow condition through managing its transaction accounts; they can learn about the riskiness of the business, financial or liquidity conditions, future profitability, and their customer profiles through offering sales-solution services, etc. (Fama 1985; Srinivasan 2014). See, for example, Stiglitz and Weiss (1981); Ramakrishnan and Thakor (1984); Diamond (1984); Diamond (1991); Holmström and Tirole (1997); Berger et al. (1999); Loranth and Morrison (2012)

change in the amount of equity capital the bank would need to reserve when offering them. This allows for a difference-in-differences test in which a firm is considered to be affected if any of the products it purchased before the shock was assigned higher capital requirement. Unaffected firms are borrowers who, before the shock, purchased products that were unaffected by Basel II, even though the products were in the same product group as the affected products.

I first show that affected products became 20% less profitable due to Basel II. Consistent with the prediction of the model, the bank decreased the credit limited to affected firms by 10.5 percent. This translates to a decrease of 3.5 million SEK (roughly 500,000 USD in 2007), compared with unaffected firms (those that purchased unaffected products in the same product category before the shock). Lenience in delinquency also decreased by 58% (23 pp) to affected firms, even though they are not more likely to be delinquent. In addition, I find that the bank's information acquisition behavior was indeed unaffected. Therefore, any difference in the treatment received by the affected and unaffected firms is arguably due to the change in profitability. This shows that cross-selling profits play an economically and statistically significant role in banks' credit allocation decisions.

In order to provide evidence in support of the information channel, I examine how adding or dropping a certain non-loan product affects a bank's information acquisition behavior. I employ the firm reviewing intensity, which is measured as the months between two consecutive reviews of the firms, as a measure of the bank's information of its borrowers.[8] The intuition is that any change in this measure likely reflects change in the information environment that the bank is exposed to. I document that firms who picked up or dropped certain non-loan products with the bank experience changes in the frequency in which the bank reviews them. This result supports the notion that banks receive more information from the products they sell to their borrowers.

My paper contributes to the literature by documenting two novel benefits associated with non-loan relationships for corporate borrowers. It increases credit supply, especially in recessions. It also increases lenience in delinquency. The key innovation of the paper—the identification of the profit channel—sheds light on our understanding of why banks engage in relation-

[8]The time between two events when the bank requests financial statements from a borrower.

ships with borrowers.[9] The benefits are not only due to the informational synergies, but also increased return to the banks' investment in its relationship with borrowers. The provision of these services helps tie the firm to its creditor in the long run, making the creditor more willing to extend funds (Petersen and Rajan 1995). To the best of my knowledge, this is the first paper that demonstrates the causal effect of the profit channel.

My findings have important policy implications regarding regulation of the scope and breadth of banks' activities and the ongoing switching of some firms from relationship-oriented to transaction-oriented financial intermediaries. Since financial intermediaries' cross-selling businesses affect their credit allocation and debt renegotiation decisions, regulators should take financial intermediaries' non-loan business into account when deciding on optimal policies. Although both the profit and the information channels have the effect of boosting pledgeable income, they may have different policy implications. If information is the pure driving force, any seemingly risk-taking behavior by the banks—for example lending to cross-buyers with lower ratings—is well justified. It could simply mean that external proxies for credit risk are not taking into account the full informational advantage of banks. Regulations that limit the scope of banks' business models, and the rise of recent transaction-oriented lending (FinTech), could potentially lead to a contraction in credit supply due to deterioration in the information that banks receive from borrowers. This might be an even more important issue in a recession, when funding is limited and adverse selection is a particularly severe problem. However, if the profit channel prevails, then policy makers and regulators need to trade off the potential conflicts of interest and the benefit of multi-producing.[10] On the one hand, the increase in return to the relationship offers lenders a long-term role in the relationship, which might help mitigate the debt-equity holder conflict that leads to credit constraints or excessive liquidation of distressed firms.[11] On the other hand, this also potentially gives rise to capital misallocation and evergreening behaviors by the bank.

Even though my test is executed in a traditional banking context, application of the results can

[9] Boot (2000) states: "Existing empirical work is virtually silent on identifying the precise sources of value in relationship banking."

[10] See, e.g., Demsetz and Strahan (1997); Laeven and Levine (2007); Liberti (2011); Strahan (2013); Baghai and Becker (2018); Cortés et al. (2019).

[11] Debt-equity holder conflict refers to the conflict between bank as a debt-holder and entrepreneur as an equity-holder to the firm in distress.

be extended more generally to every institution whose customers face the trade-offs of combining loan and non-loan products (Stulz 2019; Parlour et al. 2019; Philippon 2019).[12]

The remainder of this paper is organized as follows. Section 2 details the data and variables used in the study. Section 3 presents the baseline findings. Section 4 provides new suggestive evidence on the informational channel and causal evidence of the profit channel with the guidance of a simple theoretical framework. Section 5 reviews the paper's contribution to the literature. Section 6 concludes.

2 Data

This section details (1) how the final sample is constructed, (2) how the key dependent variable—internal credit limit—is measured, (3) how I measure non-loan relationships. A brief description of the non-loan products offered by the bank is included in the appendix (A.1).

2.1 Sample construction

Two datasets are used in this paper. The first one is the unique and comprehensive dataset containing all corporate accounts of a major Northern European commercial bank. This bank is one of the largest banks in Northern Europe, and is ranked among the 40 largest banks in Europe, with hundreds of billions of euros in total assets. Data are available from April 2002 to December 2012, and cover all corporate customers' exposure with the bank at a monthly frequency. For each customer, I observe what products they have, the prices charged (including fees and interest rate, if any), and dates when the account is set up and is supposed to end (some products don't have a maturity date). For customers with total assets above a certain threshold, an internal rating is assigned. Observations are missing for October 2009 in the raw data. Since the internal rating is a key variable for this study, I limit the sample to the period after 2004.[13]. The second dataset

[12] Amazon, Alibaba, Apple, Tencent, and several traditional technology companies are in the process of developing credit products for qualified existing customers.

[13] With this dataset Degryse et al. (2016) investigate the non-exclusivity of lending relationships; Cerqueiro et al. (2016) study the role collateral plays in the design of debt contracts, provision of credit, and incentives of lenders to monitor borrowers. Cerqueiro et al. (2019) study the real effects of loss in collateral value. Becker et al. (2015) study the predictability of internal rating over business cycle.

is from the Swedish Company Registration Office (Bolagsverket). The dataset contains financial outcomes and ownership structure of the universe of limited liability companies in Sweden at yearly frequency.

To construct the final dataset used in the empirical analyses, the bank dataset and financial dataset are merged with each other. The selection criteria are (1) the borrower must have been assigned an internal rating, and (2) the borrower is a limited liability firm. Criterion (1) makes it possible to control for the bank's internal evaluation of borrowers' time varying profile including risk and investment opportunities. Criterion (2) makes it possible to control for firm level observable characteristics including total asset size, age, leverage level, industry category, etc. As a result, non limited liability firms, non Swedish firms, and firms that never borrowed from the bank are excluded from the final sample. The final dataset is an unbalanced panel of monthly observations of 35,000 unique limited liability borrowers' exposure, both in terms of loan and non-loan products, with yearly financial information from both the balance sheets and income statements. A detailed description of the profiles of borrowers is presented in Table 1.

2.2 Measuring credit supply with internal credit limit

Identifying credit supply is challenging. Petersen and Rajan (1994) identify firms' access to credit by observing whether the firm is late in trade credit repayment. Other papers use loan application outcome and proxy granting a loan for obtaining credit supply.[14] Even though I observe all of the loans this bank has made over the years, simply running a regression on loan origination would yield biased estimates, because observed loan amount or size of credit line are the equilibrium outcome of demand and supply. For example, cross-buyers could have more loans from the bank because they have more investment opportunities, and therefore more demand for credit. The internal dataset provides a unique variable to overcome this challenge.

In the internal bank dataset, each firm is assigned an internal credit limit. Decisions related to this variable are made during the "commitment review" meetings, where the credit committee

[14]Even though loan application perfectly observes whether a loan is granted or not, one could still be concerned that some firms might have stayed away from applying, especially when loan rejection has externalities. Therefore, we observe only firms that are more likely to have been granted a loan.

at each region reevaluate the bank's exposure to each firm. The limit is determined mostly based on the firm's repayment ability. Loan officers' opinions (soft information) are also considered in the making of these decisions. The frequency of these meetings can be annually, quarterly, or monthly depending on the type of firms, and the type of exposures the bank has toward them. In the dataset, I observe monthly changes in this variable that are larger or equal to 1,000 USD happen to 90% of the limited liability borrowers. The internal limit indicates the maximum amount this creditor is willing to lend to a borrower. Changes in this variable represent changes in loan supply (Degryse et al. 2016).

2.3 Lenience in delinquency

Loan performances are monitored by the bank. Whenever there is delay in repayment for 90 or more days, either in pre-contracted principle amortization or interest repayment, a mark is made at the individual loan level. Subsequently, the bank could be lenient to the delinquent borrower by pausing or waiving interest payment, or it could seek repayment via formal procedures. I define lenience in delinquency as a dummy variable that equals one if the bank waives or pauses interest payment for the delinquent loan, and zero otherwise.

2.4 Profit at firm-product-month level

In the internal dataset, net profit is recorded at firm-product-month level. The measure is developed in order to calculate the return on investment for every customer, and it is risk-adjusted according to the bank. Loan officers and their respective branches are also evaluated internally, based on how much risk-adjusted profit they generate; even though no monetary benefit is awarded, the measure is used for promotion and performance evaluation.[15] An average firm generates 47,000 Swedish Krona (roughly 7,000 USD as of 2009) for the bank in non-loan profit per year, which contributes to around 20 percent of the bank's total profits earned from an average firm.

[15] According to this bank, the variable is an accurate measure of profitability, since operational cost, expected losses, and other costs are already considered in production of the profit measure.

2.5 Measuring non-loan relationships

I measure cross-buying, or non-loan relationships, in two ways. First, I use the natural logarithm of profits generated from non-loan products. Second, I use the number of distinct non-loan products. An average borrower has about two non-loan products per year. non-loan products contribute 47,000 SEK net profit from to the bank, in addition to the interest income. This number corresponds to about 0.3 percent of the borrower's total assets (Table 1).

The two variables complement each other in terms of the specific type of information they reflect about the non-loan relationship. The first measure captures the intensity and how profitable the non-loan relationship is to the bank at a given point in time, while the second one sheds light on the breadth of the relationship.

3 Baseline results

In this section, I test how non-loan relations correlates with credit supply, especially in recessions, and when a firm is delinquent.

3.1 Non-loan relationship and credit supply

The key variable for measuring credit supply is the internal credit limit generated by the credit office. As discussed in the data section, this measure is created so that loan officers can grant any loan application less or equal to the limit amount without asking for further confirmation from management. It indicates the maximum amount this creditor is willing to lend to a borrower, and represents the amount for which the bank's loan supply becomes vertical. An average borrower has a credit supply of 32 million SEK (Table 1). The main specification reads:

$$\text{Credit supply}_{f,t} = \beta \text{Non-loan relation}_{f,\text{year}-1} + \gamma X_{f,\text{year}-1} + A_f + B_{j,t} + C_r + \epsilon_{f,t}, \qquad (1)$$

where f is firm, j is industry, t is time (year-month), and r is internal rating (1(bad) - 21(good)). Regression coefficients are reported in Table 3. The dependent variable is the natural logarithm of the internal credit limit assigned to each customer at each month. Non-loan relation is measured

in two ways. In columns 1 and 2, it is measured as the natural logarithm of total non-loan profits generated by a customer from the previous year. In columns 3 and 4, it is measured as the raw number of non-loan products that were purchased in the previous year. In column 5 and 6, both measures are included in the same regressions. Firm (A), and industry by year-month (B) fixed effects are included in the tests to remove any factors that are nonvariant in each specific dimension that might instead cause the difference we capture. Standard errors are clustered at firm level and included within the parentheses under the coefficients. All of the coefficients are statistically significant at the 1 percent statistical level. Internal rating (C) fixed effects are included in even number columns. In column 2, an increase of 1 percent (474.17 SEK) in non-loan profit is expected to increase loan supply by roughly 0.028 percent (9,182.6 SEK). Alternatively, a one-standard-deviation increase in non-loan profit, which translates to 205% $(= 97182/47417)$ increase from the mean, corresponds to a 3.2% $(= (1 + 205\%)^{0.028} - 1)$ increase in credit limit.

In both column 3 and 4, an additional non-loan product which corresponds to the difference between borrowers in the 50th and 25th percentiles or the difference between the 75th and 50th percentiles—increases the credit limit by roughly 9 percent (2.9 million SEK). Including both measures of non-loan relationship in the same regression specifications in column 5 and 6 yield statistically similar results, although the economic magnitude decrease slightly.

I then test whether this relationship is more pronounced in recessions, as predicted by theory (Bolton et al. 2016). The specification is the same as in (1) except for the "Recession" dummy.[16]

$$\text{Credit supply}_{f,t} = \beta_1 \text{Non-loan relation}_{f,\text{year}-1} + \beta_2 \text{Non-loan relation}_{f,\text{year}-1} * \text{Recession dummy}_t + \gamma X_{f,\text{year}-1} + A_f + B_{j,t} + C_r + \epsilon_{f,t}. \quad (2)$$

Regression coefficients are reported in Table 4. All of the coefficients on the non-loan relation measures are statistically significant at the 1 percent statistical level. In column 2, an increase of 1 percent (474.17 SEK) in non-loan profit is expected to increase loan supply by roughly 0.027 percent (8,854.7 SEK) in normal times, and an additional 0.005 percent (1,472 SEK) in recessions.

[16] Recession is a dummy variable that equals one if real GDP growth has been negative for two consecutive quarters, which corresponds to periods from 2008Q3 to 2009Q1 (the Great Recession), and 2012Q3 to 2012Q4 (European debt crisis).

In column 4, an additional non-loan product—which corresponds to the difference between borrowers in the 50th and 25th percentiles or the difference between the 75th and 50th percentiles—increases the credit limit by 8.4 percent (2.9 million SEK), and an additional 0.007 percent (2,296 SEK) in recession time.

Including both measures of non-loan relationship in the same regression specifications in column 5 and 6 yield statistically similar results, although the economic magnitude decreases slightly. However, the correlation between number of products purchased and credit supply is not statistically significant during recession times, when non-loan profit is added as a covariate.

In sum, non-loan relationships are associated with higher credit supply, and it seems there is an even stronger effect for crisis times, when credit constraints are especially severe. However, non-loan profit seems to be the key predictor for access to credit supply during recession times, instead of number of products a borrower purchases.

3.2 Non-loan relationship and treatment in delinquency

I then show that cross-selling also plays a role when a bank is deciding whether to extend leniency to a delinquent loan. Conditional on a firm being delinquent on its loan repayment, which often indicates financial distress, the bank has two options in terms of how it handles such a situation. It could seek repayment by formally initiating a bankruptcy or reorganization process (Strömberg 2000), or it could extend help to the firm and rescue it from the difficult situation. The choice between these two actions depends on how the bank evaluates its trade-off. There are two reasons the bank might be more lenient towards cross-buyers.[17] The first is reduced information asymmetry: All else equal, a bank is more likely to know the exact cause of delinquency when it concerns a borrower the bank has multiple exposure to. The second reason is the bank's long-term incentive in the firm. The bank's share in the firm's future surplus will disappear once the firm defaults. By offering help when a firm is in distress, the bank faces a trade-off between the loss of future income generated by the firm if the bank allows the firm to

[17] Many practitioners confirm that they often reach out to relationship borrowers when they are delinquent on their payments, especially when it is an illiquidity rather than an insolvency issue, and offer various solutions to resolve the distress. Some common examples of help offered include investigation and advice on the cause of delinquency, pause or waive interest payments, and sometimes an additional loan to ease the liquidity problem.

default, and the payment it is willing to give up so that the firm can regain financial health.[18] The empirical specification used to test the effect of cross-buying on the bank's willingness to help when a firm is delinquent on its loan repayment is as follows:

$$\text{Lenient}_{i,f} = \beta \text{Non-loan relation}_{f,\text{year}-1} + \gamma_1 X_{f,\text{year}-1} + \gamma_2 Z_i + B_{j,t} + C_r + E_p + \epsilon_{i,f}, \qquad (3)$$

where i is loan, f is firm, p is loan type, *year* is the year when delinquency happened, t is the time when delinquency (year-month) started, r is internal rating of the firm at the time of delinquency, and j is industry. The dependent variable is a dummy that equals one if the bank pauses or waives interest payments on the delinquent loan. Each unit of observation is a unique loan. B is industry by time of delinquency (year by month) fixed effects, absorbing industry specific macro trends, business cycle, and other time-varying factors that might cause the effect instead. C is the internal rating fixed effects absorbing the firm's credit-related risk at the time of loan issuance. E is loan type fixed effects. Firm-level controls X include length of relationship, firm age, size, and leverage level (all lagged by 1 year). Loan-level controls Z include loan size, contracted maturity, and whether the loan is secured.

Coefficients from ordinary least squares regressions are shown in Table 5. The specifications are the same throughout all three sets of tests using three measures of non-loan relationship, except that internal rating fixed effects is only included for even-numbered columns.

Without controlling for internal rating fixed effects, the coefficient in column 1 indicates that a 205 percent (97,182 SEK), which corresponds to a one-standard-deviation increase in non-loan profit, increases the probability of lenient treatment by 4.3 (=205*0.021) percentage points. Given that the average ratio of lenient treatment is 39.9 percentage points (Table A1), this translates to a 10.8 percent (=4.3/39.91) higher chance of getting lenient treatment compared with the average delinquent firm. After including internal rating fixed effects in the even-numbered columns, the economical significance decreases. This demonstrates how important the internal rating is when banks are making decisions about distressed firms. In column 2, the coefficient decreases to 1.5% from 2.1% in column 1. A one-standard-deviation increase in non-loan profit increases the

[18] Debt renegotiation is also a possibility here, and adds additional hold-up cost for the bank.

probability of lenient treatment by 3.08 (=205*0.015) percentage points, which translates to a 7.7 percent (=3.08/39.91) higher chance compared with what an average firm gets.

In column 3 and 4, an additional non-loan product—which corresponds to the difference between borrowers in the 50th and 25th percentiles or the difference between the 75th and 50th percentiles—increases the likelihood of receiving lenient treatment by 2 percentage points, which corresponds to a 5% (=2/39.91) increase relative to the average delinquent firm.

When including both measures of non-loan relationship in the same regression, as presented in column 5 and 6, number of non-loan products become statistically insignificant while both the economic and statistical significance remain similar for the non-loan profit measure. This indicates that profit, rather than number of products, is the key determinant of receiving lenient treatment in case of delinquency.

3.2.1 Non-loan relationship and delinquency probability

A natural question that arises when seeing observing lenience in delinquency is whether cross-selling causes the bank to lend more efficiently, or gives the bank incentive to loosen its lending standards? I therefore test whether stronger non-loan relationships lead to higher delinquency. Consistent with earlier literature, I define a loan as being delinquent if interest payments or scheduled amortization has been late for 90 or more days. The empirical specification reads:

$$\text{Default}_{i,f} = \beta \text{Non-loan relation}_{f,\text{year}-1} + \gamma_1 X_{f,\text{year}-1} + \gamma_2 Z_{i,f} + B_{j,t} + C_r + E_p + \epsilon_{i,f}, \qquad (4)$$

where f denotes the firm, i the loan, *year* is the year of loan issuance, and t the time of loan issuance (year-month). Each unit of observation is a unique loan. The dependent variable $Default$ is equal to one if the loan (i) of firm (f) ever became delinquent, and zero otherwise. B is industry by issuance time fixed effects, absorbing macro trends, business cycle, and other time-varying factors that might instead cause the delinquency outcome.[19] C is the firm level internal rating fixed effects that absorbs the firm's credit-related risk at the time of loan issuance. E is loan type fixed effects that control for factors related to the riskiness of the type of loan. Firm-level controls

[19] For example, the time-varying riskiness of the loans the bank issues.

X include length of relationship, firm age, size, and leverage level (all lagged by one year as of the time of loan issuance). Loan-level controls Z include loan size, contracted maturity, and whether the loan is secured.

Table A6 reports results for ordinary least squares regressions. Higher non-loan profit is associated with higher delinquency probability (column 1), however the effect is statistically insignificant after including internal rating fixed effects (column 2). This indicates that internal rating is a good predictor of delinquency. Having more products is associated with higher delinquency probability, and the effect survives the inclusion of internal rating fixed effects. However, if we take a closer look at which specific product purchase is more associated with higher delinquency in column 7 and 8, it seems factoring—which is usually used by firms in distress—is the key driver of such correlation.

Overall, I interpret the results as consistent with the hypothesis that cross-buying contributes to the formation of a valuable banking relationship.

4 Identifying the mechanisms

Why would non-loan relationships bring benefits shown in Section 3? In this section, I first illustrate with a simple theoretical framework how two channels—information synergies and profit maximization—can independently affect a bank's credit allocation decisions. I then provide some new suggestive evidence of the information channel, and causal evidence of the profit channel (which is under-documented in the literature and therefore the main contribution of this paper).

4.1 Theoretical framework

Following the seminal paper by Holmström and Tirole (1997), I show that a bank increases the supply of credit to customers who receive bundled loan and non-loan products,[20] a for-

[20]Much theoretical research has been devoted to solving the coexistence of loan and non-loan products in a bank (Kashyap et al. 2002; Kanatas and Qi 2003; Laux and Walz 2007; Loranth and Morrison 2012, etc), yet the focus has been on investment banking services. Assuming the reusability of information, i.e., the bank pays a firm-specific sunk cost of monitoring initially, and after that the updating cost is much lower (Rajan 1992; von Thadden 2004), as firm

tiori increases investment, in a stylized continuous-investment model.[21] I illustrate two channels through which non-loan products have an impact on the lending decision: First, the bank learns proprietary information about the entrepreneur, and this translates into an informational advantage for the bank (the information channel); second, purchasing production inputs from the bank instead of external suppliers increases the bank's profit (the profit channel). The two channels are independent. The purpose of the theoretical framework is to illustrate that both channels have the same prediction in terms of credit supply. Therefore we rely on empirical tests to tell the two channels apart.

4.1.1 A stylized model

I show with a stylized model how bundling increases debt capacity. There are two periods, $t = 0, 1$ in the model. Constant returns to scale in the investment technology is assumed. An investment $I \in [0, \infty)$ yields income IR, in the case of success, and 0 in the case of failure at time $t = 1$. A competitive lending market is assumed, so the bank makes zero profit from its loan business. The bank charges interest rate r for its loan to the entrepreneur. r can be viewed as the opportunity cost of the bank's funds, which is exogenous to the model. The probability of success is $p \in \{p_L, p_H\}$, and the probability of failure is $1 - p$. There is no time discounting. The borrower initially has cash A, and must therefore borrow $I - A$ to finance a project of size I. In order for the project to take place, one unit of non-credit service is needed as input for every unit of investment. The entrepreneur chooses to buy this service between the market (which can be viewed as a FinTech firm or another bank) and the lending bank. This non-credit service costs C to produce, and is priced at $C(1 + m)$ by any service provider, with m being the margin.

The entrepreneur has a choice between choosing the good project (Table A), in which case she

and bank repeatedly interact with each other, bank learns more about the firm and reduce information asymmetry (Brealey et al. 1977; Ramakrishnan and Thakor 1984; Fama 1985). Black 1975 suggests that banks have a cost advantage in making loans to depositors. The ongoing history of a entrepreneur as a depositor provides information that allows a bank to identify the risks of loans to depositors and to monitor the loans at lower cost than other lenders. Similarly, banks also enjoy information synergies by providing other services to the firms. However, the fact that the pure profit from bundling loan and non-loan services has not been considered in a theoretical framework before.

[21] My case with a simple borrowing relationship is similar to the case without monitoring in this original paper, while the bundling case is developed further based on the case with monitoring. I choose to study a variable investment case to avoid the discontinuities in credit demand faced by fixed investment models.

derives no private benefit and the probability of success is p_H, and choosing the bad project, that is, enjoying some private benefit,[22] but reducing the probability of success to $p_L = p_H - \Delta p < p_H$. The private benefit is equal to $B > 0$ per unit of investment. It can be reduced to $b \in (0, B)$ if the bank carries both lending and non-lending activities. This assumption captures the information or monitoring benefits for the bank from providing the service.

I assume that the project is viable only if the entrepreneur exerts effort. That is, the project has positive NPV per unit of investment if she works, and negative NPV otherwise, i.e.,[23]

$$p_{\mathrm{H}}R - (1+r)(1+m)C - (1+r) > 0, \tag{5}$$

$$p_{\mathrm{L}}R + b - (1+r)C - (1+r) < 0. \tag{6}$$

These conditions will ensure that the investment has positive (resp. negative) NPV when the bank exerts effort (resp. shirks) for any choice of the service provider by the entrepreneur.

Let R_e denote the entrepreneur's reward per unit of loan investment in the case of success. The entrepreneur's incentive compatibility constraint determines that R_e is a function of the entrepreneur's private benefit (agency cost). To keep the equilibrium investment finite, I also assume that pledgeable income — expected income after taking into account the agency cost — is smaller than the total investment, irrespective of the choice of service provider:[24]

$$p_{\mathrm{H}}(R - \frac{b}{\Delta p}) < (1+r)C + 1 + r. \tag{7}$$

[22]The entrepreneur's private benefit from misbehaving is also assumed to be proportional to investment.

[23]Note condition (5) implies $p_{\mathrm{H}}R - (1+r)C - (1+r) > 0$, which is the assumption for positive NPV when exerting effort in the bundled case, and condition (6) implies $p_{\mathrm{L}}R + B - (1+r)(1+m)C - (1+r) < 0$, which is the assumption for negative NPV when shirking in the unbundled case.

[24]Pledgeable income per unit of credit investment is $p_{\mathrm{H}}(R - R_e)$, where $(\Delta p)IR_{\mathrm{e}} \geqslant IB$ in the unbundled case and $(\Delta p)IR_{\mathrm{e}} \geqslant Ib$ in the bundled case. Note condition (7) implies $p_{\mathrm{H}}(R - \frac{B}{\Delta p}) < (1+r)(1+m)C + 1 + r$, which is the assumption to insure finite investment in the unbundled case.

Table A: Project description

	Good project	Bad project with bundling	Bad project without bundling
Pr(Success)	p_H	p_L	p_L
Private benefit	0	Ib	IB

Case 1: Borrow from the bank and purchase from the market I start with the case in which the firm engages in a single-dimensional relationship with the bank, i.e., the firm only borrows from the bank, while she buys the non-loan service from the market.

The entrepreneur's **Incentive Compatibility Constraint** reads:

$$(\Delta p) IR_{\mathrm{e}} \geqslant IB. \tag{8}$$

Funding requires that the pledgeable income exceeds the bank' investment plus interest payment. The total cost of the project is the sum of the loan (I) and what it costs to purchase the non-loan-service ($I(1+m)C$), therefore the bank's **Individual Rationality Constraint** reads:

$$p_{\mathrm{H}} \left(IR - IR_{\mathrm{e}}\right) \geqslant (1+r)(I - A + I(1+m)C). \tag{9}$$

In equilibrium, the bank's **IR** binds. Therefore, the entrepreneur wants to maximize I because his utility is simply the project's NPV:

$$\Phi_e = \left(p_{\mathrm{H}} R - 1 - r - (1+r)(1+m)C\right) I, \tag{10}$$

which is increasing in size I; therefore, the size of the investment and also debt capacity is determined by the entrepreneur's **IC** (8) and the bank's **IR** (9). Substituting (8) into (9), we get

$$I \leqslant kA, \tag{11}$$

where

$$k = \frac{1}{1 - \frac{p_{\mathrm{H}}(R - B/\Delta p)}{1+r} + (1+m)C}. \tag{12}$$

We easily obtain that the $k > 1$ from the assumption (7). Debt capacity is simply $k - 1$.

Case 2: Bundling In the bundling case, the entrepreneur buys the non-loan service from the bank. Two effects take place in such a relationship: First, the non-loan services work as an information gathering tool (or interaction platform), which reduces the scope of moral hazard by decreasing the entrepreneur's private benefits from B to b (information channel). Second, this changes the bank's income from only loan repayment to both repayment and cross-selling (profit channel).

The entrepreneur's **IC** changes because private benefit is reduced from B in (8) to b, and therefore reads:

$$(\Delta p) I R_{\mathrm{e}} \geqslant Ib. \tag{13}$$

The bank now provides both the lending and the non-loan-service. In sum, the **IR** for the bank when bundling is

$$p_{\mathrm{H}} \left(IR - IR_{\mathrm{e}} \right) \geqslant (1+r)(I - A + IC). \tag{14}$$

Compared to the bank's **IR** in the unbundled case (equation (9)), this is easier to satisfy because the investment needed from the bank decreases by mC. Bundling avoids paying the margin on the service to a third party.

The entrepreneur's utility is the same as in (10). Therefore, the size of the investment and also debt capacity is determined by the entrepreneur's **IC** (13) and the bank's **IR** (14). Substituting (13) into (14), we get

$$I \leqslant k' A, \tag{15}$$

where the new equity multiplier is

$$k' = \frac{1}{1 - \frac{p_{\mathrm{H}}(R - b/\Delta p)}{1+r} + C}. \tag{16}$$

We easily obtain that the $k' > 1$ from the assumption (7). Debt capacity is simply $k' - 1$.

4.1.2 Predictions

We now show that it is optimal for the firm to bundle with the bank, i.e., $d' > d$. To solve for the conditions, we work backward:

$$\overset{k' > k}{\iff \frac{p_H}{\Delta p(1+r)} * \underbrace{(B-b)}_{\text{information channel}} + \underbrace{mC}_{\text{profit channel}} > 0} \tag{17}$$

Prediction 1: Bundling increases debt capacity if condition (17) holds.

Prediction 2a: The information channel always increases debt capacity by limiting the scope of the moral hazard problem.

Proof: It is easy to see that

$$\frac{p_H}{\Delta p(1+r)} * \underbrace{(B-b)}_{\text{information channel}} > 0$$

is always satisfied when $B > b$, since $\frac{p_H}{\Delta p(1+r)}$ is positive.

Prediction 2b: The profit channel increases debt capacity because bundling avoids paying the markup on the input to a third party. Instead, this markup becomes a profit of the bank who can then offer a larger loan to the firm.

Proof: It is easy to see that condition (17) is more satisfied when

$$\underbrace{mC}_{\text{profit channel}} > 0.$$

Both the information and profit channel increase debt capacity independently. We see from equation (17) that even if there is no information benefit ($b = B$), for example for products with little informational content, pledgeable income is higher thanks to the profit channel. Since the debt capacity benefit of bundling is increasing in m, a decrease in m implies a decrease in this

benefit.

4.2 Suggestive evidence on the information channel

Consistent with the earlier literature, I find cross-selling activities seem to bring informational scope of economies to a bank-firm relationship. I measure the informativeness of a banking relationship as the time between two consecutive reviews of the same firm. The intuition is that a bank is able to learn information about the borrower through the non-loan products that borrowers bought, and these information might in turn substitute the formal firm reviews. In Table A5, I compare this measure for firms before and after they purchased different non-loan products (column 1 and 2). For an average firm that started purchasing merchant acquiring services, time between two firm reviews increase by 6 months (35% relative to the average firm).[25] Leasing services seem to increase this interval by 3 months (18%). Factoring seems to increase this interval by 9 months (53%) to 1 year (71%).

To the contrary, when comparing this measure for firms before and after they stopped purchasing different non-loan products (column 3 and 4), I find that monitoring intensifies after firms drop the non-loan products, however the effect is only statistically significant for leasing (3 months or 18%). These results are robust to controlling for the size, age, leverage, and length of banking relation of the firm. Even though we should be cautious in interpreting these results, since adding or removing non-loan products might correlate with other within-firm and over-time factors that instead cause the change in reviewing intensity, these evidence are still suggestive of the information channel.

4.3 Causal evidence on the profit channel

For identification of the profit channel, I rely on the implementation of the Basel II rule at the bank in February 2007, which exogenously increased the capital requirements for and decreased the profitability of certain products. Some other products in the same product group were unaffected, and therefore qualify their users as an unaffected group. This allows for a

[25] The average time length between two firm reviews is 17 months (Table 1).

difference-in-differences test that helps to cleanly identify the profit channel. The identifying assumption is that in the absence of the treatment, both unaffected and affected groups would have received the same credit supply going forward.

4.3.1 The Basel II Accord and capital requirements for certain non-loan products

Basel II is the second of the Basel Accords, which are recommendations for banking laws and regulations from the Basel Committee on Banking Supervision.[26] The accord was first published in 2004, as an update to the first accord in 1986, but went through revisions for many years. A Swedish bank must apply to both the Nordic and local FSAs for approval to implement certain models in the rules. The process starts with banks submitting detailed plans to the supervisors. They will be either notified to revise and re-submit the plans if the supervisors do not approve the proposals, or given a green-light in terms of adoption of the rules. Therefore the timing of approval and adoption is rather exogenous.

While the main focus of the Basel I accord is on the lending side, Basel II recommends that some non-loan products are also subject to capital requirements. In addition, certain off-balance-sheet items, such as trade documentation products (letter of guarantee, documentary collection, etc.), are given a credit conversion factor so that the proper amount of capital is reserved in case default happens and exposure becomes on-balance-sheet items.[27] The complexity of the products banks offer means that accurate regulations that correctly access the riskiness of each product are hardly achievable. The reason behind this could either be that regulators' regulatory capital, toolkit, and knowledge about real-life banking business is limited, or that it simply incurs too much cost to take every single product that (especially large) banks offer into account when designing regulations. It could also be that the regulators are trying to limit the complexity of regulatory compliance, in which case a simpler and more concise rule is preferred. What happens, and what is most important for the purpose of this study, is that products in the same

[26] See original document from 2006 at https://www.bis.org/publ/bcbs128.htm

[27] The face amounts of certain specified off-balance-sheet items are assigned conversion factors, and the resulting credit-equivalent amounts are assigned to the appropriate risk category. Guarantees and other direct credit substitutes have a 100 percent conversion factor. Transaction-related contingencies, such as bid bonds, performance bonds, and standby letters of credit related to particular transactions, have a 50 percent conversion factor. Short-term, trade-related contingencies, such as commercial letters of credit have a 20 percent conversion factor.

Table B: Affected and unaffected products

Product groups	Affected	Unaffected
Trade documentation	Exporting documentary collection	Importing DC
Factoring	Non-recourse	Recourse
Leasing	If bank responsible for residual value	If not
Installment	If bank responsible for residual value	If not

product group were assigned different capital requirements, which provides a nice setting for testing the bank's incentive change when certain customers become less profitable for reasons unrelated to the fundamentals or their credit worthiness.

In February 2007, the bank was approved to start the implementation of the Basel II Accord. A simple illustration of the selection of affected and unaffected non-loan products is in the table below. For example, depending on who bears the residual risk of the property, leasing and leasing to customer have different capital charge. Depending on whether the firm leases directly from the bank or through a dealer in between, the capital charge ranges from 100 percent to zero. Second, trade-related documentation and import collection documents are considered risk free, while export collection documents are heavily charged in terms of capital. Third, one group of factoring services was charged 150 percent and became much less profitably afterward, while another group was charged 0 percent. I therefore define a product as being affected if the capital requirement in offering such a product increases due to Basel II. Products that are in the same product group but experienced no change in capital requirement are considered the unaffected in this paired relationship.

I further define a firm as being affected if it bought any affected product, and a firm as being unaffected if it bought only unaffected products, before February 2007. This is the strictest rule in terms of grouping the firms into two groups; any other rule will result in a larger estimated effect.[28]

The final dataset include 910 affected firms and 4,031 unaffected firms. A comparison of the loan- and firm-level variables with both t-statistic and normalized difference test can be found

[28]For example, the affected firm being a firm that bought only affected products, or the unaffected firm being a firm that bought any unaffected product.

in Table 2. [29] Firms from the two groups look rather similar. The only noticeable difference is that affected firms have better ratings, received better loan terms, and have more secured loan, in addition to having a larger credit limit. However, these differences are not considered substantial, given the results from normalized difference tests.

4.3.2 The effect of non-loan product capital requirement on credit supply

To verify that the effects are not driven by differences in the trajectories of the firms, I need to test whether the variables of interest evolved in a parallel manner in the period preceding the shock. In Figure 2b I plot the coefficient for each time period specified as follows:

$$\text{Credit supply}_{f,t} = \text{Affected}_f * \sum_{t=2004m1}^{t=2012m12} \beta_t D_t + \gamma X_{f,\text{year}-1} + A_f + B_{j,t} + D_r + \epsilon_{f,t}, \tag{19}$$

where f is firm, t is year-month, j is industry, and r is internal rating. The dependent variable is ln(internal credit limit). D_t is a dummy equal to one for time period t (year-month), and zero otherwise. A is firm fixed effect, B is time (year-month) fixed effects, and D is internal rating fixed effects. Affected_f is absorbed by firm fixed effects, and $\sum_{t=2004m1}^{t=2012m12} D_t$ is absorbed by time fixed effects. In addition to plotting the coefficient, I also plot both the level of mean internal ceiling for both affected and affected groups, as well as for the average firm borrowing at this bank in Figure 2a. Both figures provide evidence consistent with the identification assumption of parallel trends.

We then move on to the main difference-in-differences test. In Table 6 I test whether the negative shock to profitability of non-loan products had a negative spillover effect on the credit

[29] A t-statistic might suggest that two groups are significantly different, even though the actual difference is small if the sample is large enough. Therefore I also perform a normalized difference test of the variables. I follow Imbens and Rubin 2015 and calculate the normalized differences as

$$\bar{X}_1 - \bar{X}_0 / \sqrt{(S_1^2 + S_0^2)/2}, \tag{18}$$

where $i = 1$ refers to the treatment group and $i = 0$ to the unaffected group. $\bar{X}_i$ is the mean, and S_i^2 the standard deviation of matching variable X. Following Imbens and Rubin 2015, I consider an absolute value below 0.3 of the normalized differences being a reasonable threshold to identify substantial differences between two groups.

side, following the specification

$$\text{Credit supply}_{f,t} = \beta \text{Affected}_f * \text{Post}_t + \gamma X_{f,\text{year}-1} + A_f + B_{j,t} + D_r + \epsilon_{f,t}, \tag{20}$$

where f is firm, t is year-month, j is industry, and r is internal rating. The unit of observation is firm-year-month. Post is a dummy equal to one after Basel II implementation at the bank. The dependent variable is credit supply, measured as ln(credit limit). I also control for lagged ln(total assets), ln(years of relation), leverage, and firm age. Industry by time (year-month), firm, and internal rating fixed effects are also included. Affected_f is absorbed by A, and Post_t is absorbed by B. I cluster standard errors at the firm level.

The empirical results of OLS regressions in Table 6 show that after certain products become less profitable, the bank lowers the credit supply to the affected firms. I include several regression specifications and find robust and similar pattern. In column 1, I include firm, and time (year-month) fixed effects. I add internal rating fixed effects in column 2, and then firm level controls in column 3. In column 1 and 2, the economic magnitude is around 19 percent compared with unaffected firms. Given that the average credit supply is 33 million SEK, this translates to an on average decrease of 6.2 million SEK for the affected firm. The effect drops to 12 percent (about 4 mSEK) in column 3.

In column 4 to 6, industry by year-month fixed effects is included instead of year-month fixed effects in order to absorb any industry by time specific shock that might correlate with the bank's credit allocation decision. The economic magnitude is around 15 percent (5 mSEK) compared with unaffected firms. The magnitude drops to 10.5 percent (3.5 mSEK) once we include firm level controls in column 6.

Overall, I interpret these findings as evidence of how cross-selling-profit causally affect the bank's credit allocation decision.

4.3.3 The effect of non-loan product capital requirement on lenience in delinquency

Next, we turn to test whether the bank is less likely to internalize borrowers' distress if they become less profitable on the non-loan dimension. I conduct a similar Diff-in-Diff exercise as the

previous one, and present the results in Table 7. The purpose of this exercise is to test whether the bank is less likely to be lenient to affected firms relative to unaffected firms conditional on both being delinquent on their loan repayments, due to decreased non-loan profit they are able to generate from the affected firms. The table tests the following model:

$$\text{Lenient}_{i,f} = \beta_1 \text{Affected}_i * Post_t + \gamma_1 X_{f,\text{year}-1} + \gamma_2 Z_i + B_{j,t} + C_r + E_p + \epsilon_{i,f}, \tag{21}$$

where i is loan, f is firm, *year* is the year when delinquency happened, t is time (year-month) when delinquency happened, j is industry, r is internal rating, and p is loan type. A loan is considered affected if the firm is affected, and unaffected if the firm is unaffected. *Post* is a dummy equal to one after Basel II implementation by the bank in February 2007. Similar to the previous specifications, *Post* are absorbed by industry by delinquency-time fixed effects. The dependent variable is a dummy which equals one if the bank pauses or waives interest payments for the delinquent loan. B is industry by delinquency-time fixed effects, controlling for industry and time specific trends and factors that explain the bank's decisions. C is internal rating fixed effects, controlling for the firm's credit risk at the time of delinquency. E is loan type fixed effects, taking into account that different types of loans get different treatment in delinquencies. Firm level controls include lagged ln(total assets), lagged ln(years of relation), lagged leverage (long term debt divided by total asset), and firm age. Loan level controls include ln(loan size), a dummy variable indicating whether the loan is secured, and the contracted maturity (in months).

In column 1, only the Diff-in-Diff interaction term is included. Internal rating fixed effects is added in column 2. Then I add firm level controls in column 3, and finally loan level controls in column 4. Standard errors are clustered at the loan-type level and included within the parentheses under the coefficients. All the coefficients are statistically significant at the 1% level. Economically, becoming a less profitable non-loan customer reduces on average the chance of receiving lenient treatment by 23 percentage points (58%=23/39.9) relative to the unaffected delinquent loans. Overall, I interpret these findings as evidence of how cross-selling-profit causally affect the bank's debt renegotiation decision.

4.4 Addressing concerns and robustness tests

Below I address some challenges over how we interpret the effect of higher capital charge on non-loan products on how the bank's incentives change on the lending side, and show that the results are robust.

4.4.1 Did the affected products become less profitable?

If the bank engaged in regulatory arbitrage, or failed to comply to the rules, the negative impact on credit supply and lenience in delinquency can not be tied to the drop in profitability of the non-loan relationships. To address this concern, I show with the bank's internal records that the affected products' profitability was negatively affected, using the following specification:

$$y_{p,t} = \beta \text{Affected}_p * \text{Post}_t + \gamma X_{p,t} + F_p + B_t + \epsilon_{p,t}, \tag{22}$$

where p is product and t is time (year-month). The dependent variables include both product profitability in SEK, and in ratio $\frac{\text{total profit}}{\text{total cost of capital}}$ for each product p at time t. F is product fixed effects, and B is time (year-month) fixed effects. Affected_p is absorbed by F, and Post_t is absorbed by B. The unit of observation is product-year-month. Post is a dummy equal to one after Basel II was adopted by the bank. Time (year-month) and product fixed effects F are also included. The coefficient of interest is reported in column 1 of Table A3. I find a negative and significant effect of 0.11 percent on affected products. Given that the average profitability is 0.5 percent (per month), this corresponds to a more than 20 percent drop in profitability for affected products.

4.4.2 Did the bank pass the losses to the affected borrowers?

If the loss of profit from non-loan products was passed on to customers through increasing the price of the loans instead, the overall profitability of the affected relationships might be unaffected. I compare the pricing of loans to affected and unaffected firms after the shock, and show that the affected firms did not receive more expensive loans. I test whether the bank passed the additional cost on to its borrowers; i.e., affected firms' existing loans did not become more

expensive compared with unaffected firms'. The econometric specification is as below:

$$\text{Spread}_{i,f} = \beta \text{Affected}_i * \text{Post}_t + \gamma_1 X_i + \gamma_2 Z_{f,year-1} + A_f + B_{j,t} + C_r + F_i + \epsilon_{i,f}, \tag{23}$$

where i is loan, $year$ is the year of loan issuance, t is the time (year-month) of loan issuance, r is internal rating category, j is industry, and f is firm. The purpose of this test is to study whether the bank internalized the cost of higher capital requirement or instead passed it on to the affected borrowers. Coefficients of interest are reported in Table 8. I test whether affected firms' loan spreads are increased by the shock, compared with those of the unaffected firms'. The dependent variable is loan spread, which is measured as the difference between the interest rate on the loan and the bank's internal estimate of the cost of the loan at each month. In columns 1 and 2, I conduct the analysis on a panel dataset of loans to affected and unaffected firms. The unit of observation is loan-year-month. A loan is affected if the firm is affected, and unaffected otherwise. Post is a dummy equal to one after Basel II was adopted at the bank. Controls at the firm level include age, leverage, size, and years of relationship. Whether the loan is secured (dummy variable) is included as a loan-level control. Industry by time (year-month), firm, internal rating, and loan fixed effects are also included. Affected_i is absorbed by firm fixed effects A, and Post_t is absorbed by time fixed effects B. Standard errors are presented in parentheses and clustered at the loan level.

In columns 3 and 4, I restrict the sample to the first observation of each loan. A loan is considered affected if the company is affected, and unaffected otherwise. Firm controls include age, leverage, size, and years of relationship. Industry by time (year-month), firm, and internal rating fixed effects are also included. Standard errors are clustered at the loan type level. None of the coefficients of interest are statistically significant, and therefore we conclude that we fail to reject that the bank passed the extra cost to affected borrowers.

4.4.3 Did the bank learn less from the affected relationships after the shock?

In order to disentangle the profit channel from the information channel, I show that the affected products did not become less informative compared with unaffected products. Since

the information channel was held fixed, then any change in the affected firms' credit supply is plausibly due to the change in the profit shock to non-loan products they bought. I measure information acquisition as (1) the time interval (in months) between two firm reviews by the bank, and (2) the likelihood of a change in internal rating from month to month. I follow the same econometric specification as the previous test, and report the coefficient of interest in Table 10. Again, statistically insignificant coefficients on all columns for both measures for information indicate that we fail to reject the hypothesis that the bank's information acquisition pattern changed due to the shock.

4.4.4 Did affected firms' credit deteriorate after the shock?

Another concern one might have is that certain unobservable shocks negatively affected the affected group rather than the unaffected group, and therefore lead us to find the reduction in credit supply to the affected group. To address this concern, I test whether affected group became downgraded after the Basel shock. OLS regression estimates are presented in Table 9. An insignificant coefficient indicates that affected firms did not deteriorate in any sense in terms of credit quality, from the bank's perspective.

4.4.5 Additional robustness checks

To make sure the finding is robust to using a different definition of treatment, in addition to defining whether a firm is negatively affected by the Basel II event using a dummy variable, I also use the intensity in terms of what fraction of a firm's pre-Basel II non-loan profit was negatively affected as an explanatory variable, instead of the dummy variable, and find similar results (Table A4).

To make sure that changes to the credit limit variable is truly reflecting the bank's supply rather than firms' demand for credit, I conduct another robustness check where I only include firms that had significant credit supply (from 0 to 50% relative to total pre-shock limit) before the shock in the tests. The results are similar as we identified above.[30]

[30] I would like to thank Hans Degryse for suggesting this test.

Overall, I interpret these results as strong support of the notion that profit generated from cross-sold non-loan products to borrowers—independent of informational synergies—affects bank credit allocation.

5 Related literature

This paper contributes to the understanding of relationship banking. Banking relationships are proven to be important in overcoming various frictions in the capital market (Brealey et al. 1977; Diamond 1984; Hoshi et al. 1990; Petersen 1999), and insure credit access in economic downturns (Beck et al. 2018; Bolton et al. 2016). Therefore, obtaining and maintaining a good relationship with bank(s) is of vital importance for firms (Petersen and Rajan 1994). While the benefits of a banking relationship for firms have been well identified (James 1987; Lummer and McConnell 1989; Hellmann et al. 2008; Bharath et al., 2011), we know relatively little about a bank's motivation to be engage in a relationship with its borrowers (Boot 2000). The consensus so far is that banks gain informational rents (Bharath et al. 2007; Schenone 2010; Hale and Santos 2009; Giannetti et al. 2017; Liberti and Petersen 2017), through repeated interaction with firms over time or multiple product exposure at the same time (Freixas and Rochet 2008; Srinivasan 2014). This paper contributes to this literature by documenting that the synergy generation is not limited to reduced information asymmetry, but also increasing rent to banks' engagement in the relationships through selling non-loan products.

This paper also contributes to the debate whether relationship with banks help during borrower distress. On the one hand, large strands of literature argue that relationships should benefit borrowers in distress, either because of information friction mitigation or implicit contracting incentives (Sharpe 1990; Diamond, 1991; Dinc 2000; Schäfer 2018).[31] On the other hand, increased likelihood of bankruptcy may also lead to a reduction of the benefits of relationship lending as the relationship bank sees little benefit in continuing relationship in future due to lower likelihood of business from the same borrower (Bharath et al., 2007; Li and Srinivasan,

[31]Similar intuition is also present in studies that document lenders' tendency to internalize negative spillover (Petersen and Rajan 1995; Giannetti et al. 2011; Favara and Giannetti 2017; Giannetti and Saidi 2018).

2017). My finding of lenience in delinquency is related to the first view. However, I also find the benefits of non-loan relationships are absent for firms that are close to bankruptcy, which agrees with the second view. The contribution to this literature comes from an overlooked measure for relationship with non-loan profits, and this brings more evidence to this debate.

In addition, by emphasizing the importance of banks' cross-selling incentive in a relationship, this paper contributes to the interpretation of other studies that uses geographical distance between bank and firm (Degryse and Ongena 2005; Hauswald and Marquez 2006; Agarwal and Hauswald 2010);[32] length of relationship (Ongena and Smith 2001); or whether the bank is a main bank (or intensity of lending) as proxies for relationship.[33] My findings document the importance of cross-selling activity as a main determinant of the strength of banking relationships, and contribute to the discussion of the sources of value in relationship banking.

The literature provides some evidence on how loan and non-loan products interact with each other through the information channel (Mester et al. 2006; Norden and Weber 2010; Agarwal et al. 2018). Much evidence has been provided on the interaction between commercial banking and investment banking business (Yasuda 2005; Ivashina and Kovner 2011; and Neuhann and Saidi 2018). We know little about how the products within commercial banking affect relationships despite its importance, because compared with investment banking services, the firewall is less likely in place for commercial banking services.[34]

The closest paper in the literature, Santikian (2014) documents that non-loan profit is associated with lower loan price for 2,981 loans drawn by 1,704 unique SMEs in a mid-sized U.S. bank. My paper differs in three dimensions. First, I look at the bank's credit supply, which is free from contamination of the borrowers' demand for credit as in this paper, and is of first-order economic importance. Second, I estimate the causal effect of the profit channel, which is an improvement in identification and the key innovation.[35] Third, I look at within-firm variation instead of cross-

[32]Previous literature assumes that a bank's ability to gather information decreases with its distance from the borrower, although geographical distance is considered to be less and less important with advances in modern communication technology.

[33]Srinivasan (2014) reviews theoretical and empirical literature on the relationship-banking field and raises concern over potential biases caused by employing existing proxies such as the length, scope, and intensity of the relationship.

[34]A few exceptions include Drucker and Puri (2005); Mester et al. (2006); Norden and Weber (2010); and Agarwal et al. (2018).

[35]Santikian (2014) states "In interpreting this result, we must be careful not to attribute the credit discount associated

sectional differences in cross-selling, which addresses the cross-firm omitted variable bias issues. The richness of the data, especially being able to observe the time-series of the relationship, in combination with the identification strategy, allows this paper to provide richer insights that the previous paper could not test. For example, I show that the credit discount result documented in Santikian (2014) is not only determined by competition environment faced by the bank, but also by the length of the relationship. The discount is only present in the beginning of the relationship, as the relationship intensifies and therefore switching cost increases, the effect is gone. Not incorporating the time-series variation could lead to a partial understanding of the relationship.

Lastly, while most of the focus on the Basel II Accord has been on the internal risk models implemented by large banks (Behn et al. 2014; Behn et al. 2016), the capital requirement on non-loan products I exploit in this paper is used for the first time in the literature. This contributes to the identification strategies of more studies to investigate how the capital requirement on non-loan products could affect lending, and could have real effects. For example, I find that affected firms experienced a 17% drop in investment relative to unaffected firms, after the shock (Table A2).

6 Conclusion

Using a unique and comprehensive dataset that contains firm-product-level information on all corporate customers of a large commercial bank for nearly a decade, this paper shows that a non-loan relationship increases credit supply, especially during recessions. It also makes a bank more likely to make concessions and offer support when borrowers are at distress. Speaking to concerns over conflicts of interest and evergreening of lending, I do not find increased default probability for these loans; rather, the bank learns more about the firms through providing certain services. In addition to documenting evidence on the information synergy in such relationships, I causally estimate the profit channel by exploiting an exogenous shock to some firms' non-loan profitability to the bank. I document a 10.5% (3.5 million SEK) drop in the credit supply, and 58% (23 pp) drop in the likelihood of receiving lenient treatment as a distressed borrower, due to

with the number of non-credit purchases exclusively to the profit channel of relationship benefits."

a 20% drop in profitability of the affected non-loan products.

This paper contributes to the literature by showing that cross-selling business not only mitigates information asymmetry problems in lending, but also provides banks with a long-term incentive to sustain its relationships with borrowers. Combining reduced information asymmetry and long-term interest, banks are more likely to support borrowers when times are tough, and to be more tolerant and willing to help when a firm is in distress. However, this also calls for more careful policy evaluations of potential trade-offs between conflicts of interest and the benefit of allowing financial intermediaries to multi-produce. The findings are not only informative of the banking industry, but also contributes to understanding the any large organization that is engaged in both lending and non-lending activities—for example the increasing presence of BigTech firms in the credit market (Philippon 2019, Stulz 2019), and how this change might affect credit allocation in the economy.

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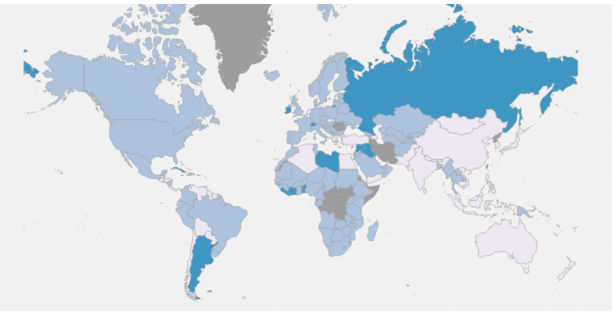
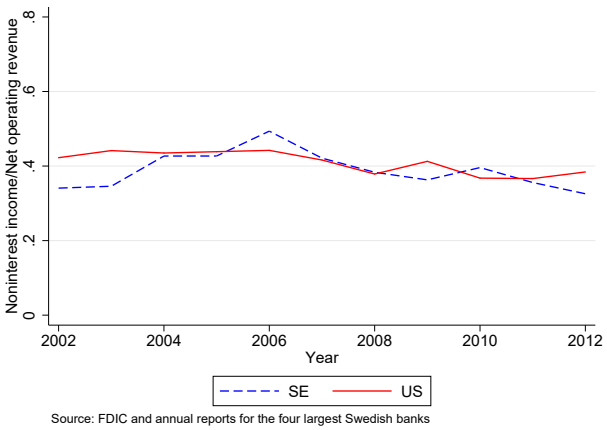
7 Figures

Figure 1: Non-interest income share by nation and over time

This figure shows the ratio of non-interest income divided by total income by geography and over time.
Panel (a) shows the ratio for 176 nations in 2017 (the most recent year when data are available). Data source is the Federal Reserve Bank of St. Louis. Gray areas are countries where data are not available. White areas are countries where the ratio is between 2.47% (minimum) and 28.63%. Light blue areas, which include the majority of countries (110 countries), stand for countries with a ratio between 28.63% and 54.79%. Dark blue areas are countries with a ratio between 54.79% and 80.95% (maximum). Darker color mean higher ratios.
Panel (b) shows the (quarterly) share of non-interest income of total operating income, for banks with asset size over 1 billion USD. The blue (dotted) line represents the weighted (by asset size) average of the four largest Swedish banks (Swedbank, Nordea, Handelsbanken, and SEB). I obtained the data from their annual reports. The red (solid) line represents large US banks, where data are obtained from the FDIC's historical banking data.



(a) Non-interest income share by country



(b) Non-interest income share over time

Figure 2: Pre-trends in credit supply

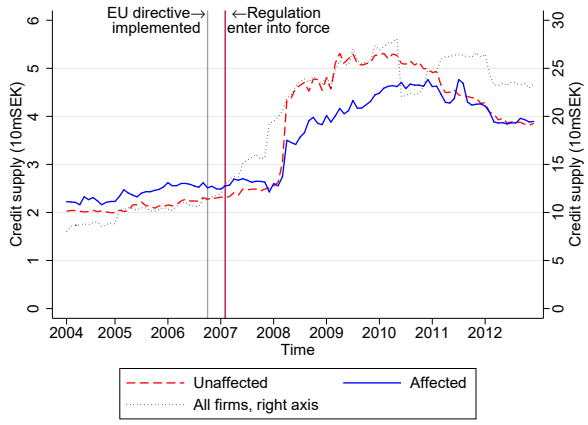
This figure lends support to the parallel trend assumption for the main test .

Panel (a) lends support to the parallel growth assumption for the difference between affected and unaffected borrowers for the main outcome - internal credit limit measure. The average credit limit for all limited liability borrowers at the bank level is also plotted in black dot (right y-axis). The dark grey vertical line marks the time when EU directive was implemented. The red vertical line marks the time Sweden started its implementation of the Basel II rules regarding certain non-loan products (leasing, factoring, and trade related documentation products).

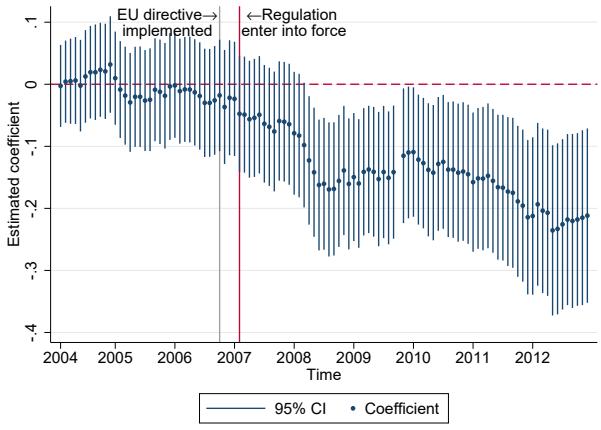
Panel (b) lends support to the parallel growth assumption for the difference between affected and unaffected borrowers for the main outcome - internal credit limit measure. The panel depicts estimates of the β_t coefficients (dot in navy color) and their 95% confidence intervals (vertical line in navy color) from the following model:

$$\text{Credit supply}_{f,t} = \text{Affected}_f * \sum_{t=2004m1}^{t=2012m12} \beta_t D_t + \gamma X_{f,year-1} + A_f + B_{j,t} + D_r + \epsilon_{f,t}$$

The dark grey vertical line marks the time when EU directive was implemented. The red vertical line marks the time Sweden started its implementation of the Basel II rules regarding certain non-loan products (leasing, factoring, and trade related documentation products). The dependent variable is credit supply, measured as ln(internal credit limit). The controls include lagged ln(total assets), ln(years of relation), leverage, and firm age. Time (year-month), firm, internal rating and industry fixed effects are also included. Standard errors are clustered at the firm level.



(a) Average credit supply



(b) Estimated coefficients

8 Tables

Table 1: Summary statistics for the whole sample

The table presents the summary statistics of the whole sample. Firm-by-month-level variables are presented in panel A, and firm-by-year-level characteristics in panel B. Panel C reports loan characteristics. Panel D reports loan spreads (measured as the difference between loan interest rates and the bank's internal recorded funding rates). Panel E reports the profit margins of about 80 loan products. Panel F reports the profit margins of about 130 non-loan products. All variables are winsorized at the 1st and 99th percentage levels.

	Mean	Std	P25	P50	P75	No.
Panel A *firm-by-month level*						
Internal credit limit (mSEK)	32.795	83.225	2.603	5.481	17.196	665,968
Utilized amount (mSEK)	13.659	31.208	1.160	2.968	8.768	665,968
Distance to ceiling (mSEK)	10.759	33.647	0.152	0.861	3.718	665,968
Internal rating (1(bad)-21(good))	12.416	2.985	11.000	12.000	14.000	665,968
Rating change=1	0.076	0.265	0.000	0.000	0.000	665,968
Months between two reviews on borrower	17.250	17.303	6.000	12.000	23.000	20,088
Panel B *firm-by-year level*						
Non loan profits (kSEK)	47.417	97.182	0.000	13.818	46.075	55,709
No. of non-loan products	1.909	1.589	1.000	2.000	3.000	55,709
Leverage	0.335	0.276	0.091	0.284	0.536	55,709
Total assets (mSEK)	260.448	1292.170	5.289	12.482	43.526	55,709
Sales (mSEK)	115.484	485.962	3.434	12.605	44.164	55,709
No. of employees	34.952	124.531	2.000	7.000	20.000	55,709
Sales growth	0.160	0.727	-0.054	0.040	0.174	55,709
Age	21.884	18.517	9.000	17.000	28.000	55,709
Years of relationship	6.021	4.963	2.083	5.250	8.917	55,709
Panel C *loan level*						
Default (0/1)	0.0230	0.1498	0.0000	0.0000	0.0000	167,164
Contracted maturity (month)	42.7614	46.7111	4.0000	6.9167	100.0000	167,164
Collateralized loan (0/1)	0.3500	0.4770	0.0000	0.0000	1.0000	167,164
Loan size (mSEK)	6.7981	16.5000	0.1993	0.5890	3.0289	167,164
Panel D *loan-by-month level*						
Spread (pp)	2.0113	3.8727	0.4100	1.5100	3.4900	17,892,843
Panel E *loan-type level*						
Profit per SEK and month - loan	0.001	0.001	0.000	0.001	0.001	5,843
Panel F *product-type level*						
Profit per SEK and month	0.169	1.798	-0.000	0.001	0.003	7,226

Table 2: Summary statistics for the difference-in-differences test

This table presents summary statistics for key variables in the Diff-in-Diff analyses just before Basel II implementation in December 2006. Spread is measured as the difference between charged interest rate and the reference rate. A loan is secured if there is collateral posted against the exposure. All variables are winsorized at the 1st and 99th percentage levels. I follow Imbens and Rubin (2015) and calculate the normalized differences as

$$\bar{X}_1 - \bar{X}_0 / \sqrt{(S_1^2 + S_0^2)/2},$$

where $i = 1$ refers to the affected group, and $i = 0$ the unaffected group. $\bar{X}_i$ is the mean, and S_i^2 the standard deviation of matching variable X. Imbens and Rubin (2015) suggests that an absolute value below 0.3 of the normalized differences is a reasonable threshold to identify substantial differences between two groups. A t-statistic might suggest that two groups are significantly different even though the actual difference is small if the sample is large enough. The paper also notes that it may be large in absolute value simply because the sample is large and, as a result, small differences between the two sample means are statistically significant even if they are substantively small, Large values for the normalized differences, in contrast, indicate that the average covariate values in the two groups are substantially different.

	Affected				Unaffected				Difference	Normalized
	Mean	S.D.	p50	No.	Mean	S.D.	p50	No.	in mean	difference
Panel A *loan level*										
Loan spread	1.37	1.13	1.30	1,142	1.85	1.71	1.17	8,478	0.48***	-0.01
Panel B *firm level*										
Internal credit limit (mSEK)	41.62	4.00	182.29	910	34.37	3.60	171.97	4,031	-7.25	0.04
Internal rating (1(bad)-21(good))	12.43	12.00	2.99	910	12.21	12.00	2.97	4,031	-0.22*	0.07
Distance to ceiling (mSEK)	16.78	0.65	105.26	910	16.33	0.59	118.21	4,031	-0.45	0.00
Total assets (mSEK)	189.51	11.46	991.33	910	217.23	10.70	1189.04	4,031	27.72	-0.03
Years of relationship (borrowing)	4.76	4.63	4.48	910	5.74	5.50	4.30	4,031	0.98***	-0.22
Months between two firm reviews	37	32	27	291	35	29	26	1,185	-2	0.06
Age	20	16	17	910	22	17	18	4,031	2***	-0.14
Total non-current debt/Total asset	0.24	0.19	0.23	910	0.25	0.22	0.21	4,031	0.01	-0.03
Total debt/Total asset	0.65	0.68	0.22	910	0.66	0.68	0.20	4,031	0.01	-0.06
No. of non-loan products	3	2	1	910	3	2	2	4,031	0	-0.05

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Non-loan relationship and *credit supply*

The purpose of this table is to show that both non-loan profit and number of non-loan products purchased in a given relationship strongly predict the internal borrowing limit that borrowers are assigned. The table presents results from the following specification:

$$\text{Credit supply}_{f,t} = \beta \text{Non-loan relation}_{f,\text{year}-1} + \gamma X_{f,\text{year}-1} + A_f + B_{j,t} + C_r + \epsilon_{f,t}.$$

The dependent variable is the natural logarithm of the internal credit limit assigned to each customer at each month. Non-loan relation is measured in two ways. In columns 1 and 2, it is measured as the natural logarithm of total non-loan profits generated from a customer from the previous year. In columns 3 and 4, it is measured as the total number of non-loan products purchased by the firm in the previous year. In columns 5 and 6, both measures are included. Firm (A), year-month by industry (B), and internal rating (C) fixed effects are included throughout the tests to remove any factors that are nonvariant in each specific dimension that might instead cause the differences we capture. Standard errors are clustered at the firm level and presented in parentheses under the coefficients.

	Dependent variable: ln(credit limit)					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(NL. profit)	0.027***	0.028***			0.016***	0.017***
	(0.002)	(0.002)			(0.002)	(0.002)
No. of products			0.084***	0.085***	0.064***	0.065***
			(0.006)	(0.006)	(0.006)	(0.006)
Age	0.004	0.004	0.004	0.005	0.005	0.005
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Leverage	0.553***	0.607***	0.559***	0.612***	0.560***	0.615***
	(0.036)	(0.037)	(0.036)	(0.036)	(0.036)	(0.036)
ln(years of relationship)	-0.090***	-0.081***	-0.095***	-0.085***	-0.100***	-0.090***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
ln(total assets)	0.461***	0.448***	0.456***	0.443***	0.451***	0.438***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
ln(loan profit)	0.113***	0.116***	0.112***	0.115***	0.112***	0.114***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Industry-Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Internal rating FE	No	Yes	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.909	0.910	0.909	0.910	0.910	0.910
No of obs	665,968	665,968	665,968	665,968	665,968	665,968

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Non-loan relationship and *credit supply* in recessions

The purpose of this table is to show that even both non-loan profit and number of non-loan products purchased in a given relationship strongly predict the internal borrowing limit that borrowers are assigned in normal times, only the former predicts higher borrowing limit in recessions. The table presents results from the following specification:

$$\text{Credit supply}_{f,t} = \beta_1 \text{Non-loan relation}_{f,\text{year}-1} + \beta_2 \text{Non-loan relation}_{f,\text{year}-1} * \text{Recession dummy}_t + \gamma X_{f,\text{year}-1} + A_f + B_{j,t} + C_r + \epsilon_{f,t}.$$

The dependent variable is the natural logarithm of the internal credit limit assigned to each customer at each month. Non-loan relation is measured in two ways. In columns 1 and 2, it is measured as the natural logarithm of total non-loan profits generated from a customer from the previous year. In columns 3 and 4, it is measured as the total number of non-loan products purchased by the firm in the previous year. In columns 5 and 6, both measures are included. Recession is a dummy variable that equals one if real GDP growth has been negative for two consecutive quarters, which corresponds to periods from 2008Q3 to 2009Q1 (the Great Recession), and 2012Q3 to 2012Q4 (European debt crisis). Firm (A), year-month (B), and internal rating (C) fixed effects are included in the tests to remove any factors that are nonvariant in each specific dimension that might instead cause the differences we capture. Standard errors are clustered at the firm level and presented in parentheses under the coefficients.

	Dependent variable: ln(credit limit)					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(NL. profit)	0.026***	0.027***			0.015***	0.016***
	(0.002)	(0.002)			(0.002)	(0.002)
Recession x ln(NL. profit)	0.005***	0.005***			0.007***	0.006***
	(0.001)	(0.001)			(0.002)	(0.002)
No. of products			0.083***	0.084***	0.065***	0.066***
			(0.006)	(0.006)	(0.006)	(0.006)
Recession x No. of products			0.007**	0.007**	-0.005	-0.004
			(0.003)	(0.003)	(0.004)	(0.004)
Age	0.002	0.002	0.002	0.003	0.003	0.003
	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Leverage	0.552***	0.606***	0.558***	0.611***	0.559***	0.613***
	(0.036)	(0.037)	(0.036)	(0.036)	(0.036)	(0.036)
ln(years of relationship)	-0.101***	-0.091***	-0.106***	-0.096***	-0.111***	-0.101***
	(0.019)	(0.019)	(0.018)	(0.018)	(0.018)	(0.018)
ln(total assets)	0.462***	0.448***	0.457***	0.444***	0.452***	0.438***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
ln(loan profit)	0.113***	0.116***	0.112***	0.115***	0.112***	0.114***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Industry-Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Internal rating FE	No	Yes	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.909	0.909	0.909	0.909	0.909	0.910
No of obs	665,968	665,968	665,968	665,968	665,968	665,968

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Non-loan relationship and the bank's *lenient* treatment conditional on delinquency

The purpose of this table is to show that both non-loan profit and number of non-loan products purchased in a given relationship strongly predict the likelihood of a delinquent loan getting leniency from the bank. Although both measures are statistically significant on their own, only profit stands out when putting both regressors together. The table reports coefficients from OLS regressions of bank's lenient treatment toward delinquent loans (a dummy variable that equals one if interest payment is paused or waived, and zero otherwise) on firms' non-loan relationship measures, while controlling for a series of control variables and fixed effects. Non-loan relation is measured in two ways. In columns 1 and 2, it is measured as the natural logarithm of total non-loan profits generated from a customer from the previous year. In columns 3 and 4, it is measured as the total number of non-loan products purchased by the firm in the previous year. In columns 5 and 6, both measures are included. Standard errors are clustered at the firm level and included within the parentheses under the coefficients. The specification is as below.

$$\text{Lenient}_{i,f} = \beta \text{Non-loan relation}_{f,\text{year}-1} + \gamma_1 X_{f,\text{year}-1} + \gamma_2 Z_i + B_{j,t} + C_r + E_p + \epsilon_{i,f},$$

	Dependent variable: Lenient=1					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(NL. profit)	0.021***	0.015***			0.020***	0.013***
	(0.004)	(0.004)			(0.005)	(0.005)
No. of products			0.019**	0.020**	0.003	0.009
			(0.009)	(0.008)	(0.010)	(0.009)
ln(loan profit)	-0.003	-0.002	-0.000	-0.001	-0.003	-0.003
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
ln(years of relationship)	-0.055**	-0.067***	-0.042*	-0.058**	-0.055**	-0.066***
	(0.024)	(0.023)	(0.025)	(0.023)	(0.024)	(0.023)
Leverage	0.155**	0.098	0.144**	0.090	0.157**	0.101*
	(0.063)	(0.059)	(0.063)	(0.059)	(0.063)	(0.059)
Age	-0.001	0.000	-0.001	0.000	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Secured loan	-0.052	-0.018	-0.038	-0.009	-0.051	-0.017
	(0.042)	(0.038)	(0.042)	(0.038)	(0.042)	(0.038)
Contracted maturity	0.000	-0.000	-0.000	-0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln(loan size)	0.003	0.003	0.002	0.003	0.003	0.003
	(0.011)	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)
Default time x industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Loan type FE	Yes	Yes	Yes	Yes	Yes	Yes
Internal rating FE	No	Yes	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.511	0.577	0.503	0.574	0.511	0.577
No of obs	2,081	2,081	2,081	2,081	2,081	2,081

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Main table—Shock to non-loan products' profitability and *credit supply*

The purpose of this table is to test whether the bank decreased affected firms internal borrowing limit relative to unaffected firms, due to decreased non-loan profit they are able to generate from the affected firms. The table tests the following model:

$$\text{Credit supply}_{f,t} = \beta \text{Affected}_f * \text{Post}_t + \gamma X_{f,\text{year}-1} + A_f + B_{j,t} + D_r + \epsilon_{f,t}.$$

A firm is considered affected if it purchased affected product(s) before the shock, and unaffected if it purchased unaffected product(s). Post is a dummy equal to one after Basel II implementation by the bank. The dependent variable is credit supply, which is measured as ln(internal credit supply). Controls include lagged ln(total assets), ln(loan profit), ln(years of relation), leverage, and firm age. Time (year-month), firm, internal rating, and industry fixed effects are also included. Standard errors are clustered at the firm level and included within the parentheses under the coefficients.

	Dependent variable: ln(credit limit)					
	(1)	(2)	(3)	(4)	(5)	(6)
Affected x Post	-0.185***	-0.184***	-0.118***	-0.146***	-0.144***	-0.105***
	(0.036)	(0.036)	(0.030)	(0.037)	(0.037)	(0.032)
Age			0.033			0.022
			(0.038)			(0.037)
Leverage			0.388***			0.383***
			(0.062)			(0.061)
ln(yrs of relationship)			-0.054*			-0.060*
			(0.032)			(0.032)
ln(total assets)			0.496***			0.493***
			(0.025)			(0.025)
ln(loan profit)			0.184***			0.183***
			(0.010)			(0.010)
Year-Month FE	Yes	Yes	Yes	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Internal Rating FE	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
Industry x Year-Month FE	No	No	No	Yes	Yes	Yes
Adj. R2	0.865	0.866	0.885	0.867	0.867	0.886
No of obs	321,131	321,131	321,131	321,131	321,131	321,131

Table 7: Main table—Shock to non-loan products' profitability and *lenience in delinquency*

The purpose of this table is to test whether the bank are less likely to be lenient to affected firms relative to unaffected firms conditional on both being delinquent on their loan repayments, due to decreased non-loan profit they are able to generate from the affected firms. The table tests the following model:

$$\text{Lenient}_{i,f} = \beta_1 \text{Affected}_i * Post_t + \gamma_1 X_{f,\text{year}-1} + \gamma_2 Z_i + B_{j,t} + C_r + E_p + \epsilon_{i,f},$$

A loan is considered affected if the firm is affected, and unaffected otherwise. Post is a dummy equal to one after Basel II implementation by the bank in February 2007. The dependent variable is a dummy which equals one if the bank pauses or waives interest payments for the delinquent loan. Firm level controls include lagged ln(total assets), ln(loan profit), lagged ln(years of relation), lagged leverage (long term debt divided by total asset), and firm age. Loan level controls include Ln(loan size), whether the loan is secured, and the contracted maturity (in months). Standard errors are clustered at the loan type level and included within the parentheses under the coefficients.

	Dependent variable: lenient=1			
	(1)	(2)	(3)	(4)
Affected x Post	-0.143**	-0.230***	-0.215***	-0.226***
	(0.065)	(0.057)	(0.059)	(0.061)
Affected	0.020	0.057	0.037	0.020
	(0.039)	(0.054)	(0.052)	(0.047)
Age			-0.000	-0.000
			(0.002)	(0.002)
Leverage			0.040	0.012
			(0.086)	(0.088)
ln(yrs of relationship)			-0.044**	-0.039**
			(0.016)	(0.014)
ln(total assets)			-0.021	-0.042**
			(0.013)	(0.016)
Secured loan				-0.013
				(0.048)
ln(loan size)				0.052**
				(0.019)
Contracted maturity				0.001**
				(0.001)
Loan type FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Default time FE	Yes	Yes	Yes	Yes
Internal rating FE	No	Yes	Yes	Yes
Firm level controls	No	No	Yes	Yes
Loan level controls	No	No	No	Yes
Adj. R2	0.279	0.311	0.315	0.328
No of obs	810	810	810	810

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Shock to non-loan products' profitability and *loan spread*

The purpose of this table is to test whether the bank internalized the cost of higher capital requirement, or passed it on to the affected borrowers. The table tests the following model:

$$\text{Spread}_{i,f} = \beta \text{Affected}_i * \text{Post}_t + \gamma_1 X_i + \gamma_2 Z_{f,year-1} + A_f + B_{j,t} + C_r + F_i + \epsilon_{i,f}.$$

I test whether affected firms' loan spreads are increased by the shock, compared with those of the unaffected firms'. The dependent variable is loan spread, which is measured as the difference between the interest rate on the loan, and the bank's internal estimate of the cost of the loan. I restrict the sample to the first observation of each loan. A loan is considered affected if the company is affected, and unaffected otherwise. Firm controls include age, leverage, size, and years of relationship. Loan level controls include a dummy variable indicating whether the loan is secured, and ln(loan size). Standard errors are clustered at the loan type level and included within the parentheses under the coefficients.

	Dependent variable: new loan spread			
	(1)	(2)	(3)	(4)
Affected x Post	0.073	0.051	0.073	0.049
	(0.050)	(0.047)	(0.052)	(0.048)
Age		0.005		0.015
		(0.013)		(0.013)
Leverage		-0.015		-0.005
		(0.064)		(0.064)
ln(yrs of relationship)		0.039		0.028
		(0.034)		(0.034)
ln(total assets)		-0.154***		-0.151***
		(0.028)		(0.028)
ln(loan profit)		0.080***		0.078***
		(0.009)		(0.009)
Secured loan		-0.072***		-0.067***
		(0.017)		(0.017)
ln(loan size)		-0.125***		-0.125***
		(0.007)		(0.007)
Contracted maturity		0.001***		0.001***
		(0.000)		(0.000)
Firm FE	Yes	Yes	Yes	Yes
Year-Month x loan type FE	Yes	Yes	Yes	Yes
Internal rating FE	No	Yes	No	Yes
Industry x Year-Month FE	No	No	Yes	Yes
Controls	No	Yes	No	Yes
Adj. R2	0.761	0.776	0.766	0.780
No of obs	43,885	43,885	43,763	43,763

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Shock to non-loan products' profitability and *firm rating*

The purpose of this table is to test whether the credit qualities of the affected firms were also affected by the Basel shock. Credit quality is measured as the internal rating that the bank assigns the firms, reflecting the expected default probability for each class. Firm level control variables include ln(total assets), ln(loan profit), firm age, leverage, ln(years since the first relationship) (all lagged by one year). Standard errors are included in parentheses and clustered at firm level. Year-month, and firm fixed effects are included in column 1. Industry by year-month, and firm fixed effects are included in column 2.

	Dependent variable: internal rating	
	(1)	(2)
Affected x Post	-0.026	0.006
	(0.084)	(0.086)
Age	-0.065	-0.073
	(0.052)	(0.047)
Leverage	-0.122	-0.121
	(0.077)	(0.076)
ln(yrs of relationship)	-0.449***	-0.413***
	(0.063)	(0.063)
ln(total assets)	0.626***	0.600***
	(0.050)	(0.049)
ln(loan profit)	-0.238***	-0.253***
	(0.019)	(0.019)
Year-Month FE	Yes	No
Industry x Year-Month FE	No	Yes
Firm FE	Yes	Yes
Controls	Yes	Yes
Adj. R2	0.675	0.679
No of obs	481,606	481,606

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Shock to non-loan products' profitability and *information acquisition*

The purpose of this table is to test whether the learning about the affected firms were affected by the Basel shock. Firm level control variables include ln(total assets), ln(loan profit), firm age, leverage, ln(years since the first relationship) (all lagged by one year). Standard errors are included in parentheses and clustered at firm level. In column 1 to 4, the dependent variable is measured as the time (months) between two reviews on the firm. In column 5 to 6, the dependent variable is the likelihood of a change in internal rating. Year-month, and firm fixed effects are included throughout in both column 1, 2, and 5. Firm, industry by time fixed effects are included in column 3, 4, and 6. In column 2 and 4, internal rating fixed effect is also included.

	Time (months) between two reviews on the firm				*Rating change=1*	
	(1)	(2)	(3)	(4)	(5)	(6)
Affected x Post	-1.535	-1.727	-0.619	-0.747	0.007	0.004
	(1.595)	(1.526)	(1.058)	(1.100)	(0.006)	(0.006)
ln(loan profit)	0.550**	0.616***	0.490**	0.587***	0.006***	0.007***
	(0.264)	(0.229)	(0.199)	(0.182)	(0.001)	(0.001)
ln(total assets)	-1.575	-1.573	-1.757*	-1.840*	0.005*	0.006**
	(1.102)	(1.127)	(1.060)	(1.080)	(0.003)	(0.003)
Age	1.449	1.356	1.441*	1.382*	-0.002	-0.001
	(0.920)	(0.910)	(0.796)	(0.753)	(0.003)	(0.003)
Leverage	-0.010	-1.247	-0.014	-1.099	-0.001	-0.000
	(0.025)	(1.535)	(0.024)	(1.386)	(0.001)	(0.001)
ln(yrs of relationship)	1.147	1.186	0.821	0.806	0.008*	0.006
	(0.908)	(0.927)	(0.888)	(0.901)	(0.004)	(0.005)
Year-Month FE	Yes	Yes	No	No	Yes	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Internal Rating FE	No	Yes	Yes	Yes	No	No
Industry x Year-Month FE	No	No	Yes	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.588	0.588	0.595	0.595	0.007	0.008
No of obs	652,858	652,858	652,858	652,858	410,336	410,336

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A Appendices

A.1 Products offered at the bank

Without revealing the identity of the bank, I will describe as much in detail as possible the non-loan products that are offered by the bank to its corporate customers. In total, there are nearly 200 unique and finely defined products over the sample period, with some very close to each other in terms of purpose. I first exclude all products that are similar to a loan, and then classify the remaining products into seven categories based on their functionalities. Below is a brief description of the products. In terms of the dynamics, even though cards and accounts contribute to more than half of non-loan profits, their significance has been decreasing over the years.

Cards and accounts The most common product is cards and accounts, which are usually bundled together. A firm cannot have a card product from this bank without setting up an account, which is a common practice in the card business. A certain number of credit or debit cards are usually offered for free to the corporate customer when they set up an account, and they can purchase more cards for their business use if they wish. The cards are for business use only, and the drawn amounts are recorded as operating expenses in their accounting reports. Foreign currency exchange, payroll management, automatic payment services etc., are also included in this category, since they are usually bundled within the account service.

Trade-related documentation Extensive documentation is required in trading, especially cross-border trade. For example, to mitigate risks such as fraud, documents issued from credit-worthy banks are needed for importers to collect their goods from the harbor. Two important documentation products in this paper are letter of guarantee and documentary collection. A letter of guarantee is a type of contract issued by a bank on behalf of a customer who has entered a contract to purchase goods from a supplier. A bank usually only issues such a statement when there is enough cash in the firm's account. A documentary collection is a trade transaction in which exporters allow their bank to act as a collection agent for payment of shipped goods to the

buyer. The risk in such a product usually lies with the exporter or importer.

Merchant acquiring service Merchant acquiring service allows the bank to process credit and debit card payments on behalf of a merchant. This is a valuable product for banks. Historically, price discrimination was used so that a bank could increase the market share of their card business. In recent years, banks can no longer do that; instead, they make sure that the information generated by their systems can only be accessed by themselves.

Leasing A common contract by which the bank leases certain property to its borrowers, for a specified period of time, in exchange for a periodic payment. Since the ownership of the property lies with the bank, it is therefore different from a loan contract.

Factoring Factoring is a financing solution which allows a firm to sell its accounts receivables or invoices to its bank, usually at a large discount. Alternatively, a firm could borrow against its receivables. There are two types of broadly defined factoring: recourse and non-recourse factoring. In recourse factoring, the firm must buy back any invoices that the bank is unable to collec payment on. While in non-recourse factoring, the ownership of the debt—together with its credit risk—is transferred to the bank (the factor).

Sales solution To increase sales for the borrower, the bank offers financial solutions to their customers. One common example is leasing contracts. Many heavy-duty vehicles and car dealerships offer ready-made lease contracts to their customers that are actually supported by the bank. The dealer pays for the service, and gets to decide on the terms of the contract. Ownership of the property lies with the borrowing firm. In some cases, the end customer has the opportunity to purchase the residual value from the borrowing firm.

Similar to the leasing to customer service, the borrowing firm can also choose to offer its customers financing solutions that break down the payments for items they purchase on several occasions. The contract is drafted between the borrowing firm and its customers, and the firm has the option to set the terms of the contract. The firm retains the ownership of the product

until full payment is made by the end customer.

Negotiable instrument A negotiable instrument is a document that guarantees payment of a specific amount of money, either on demand or at a set time, with the payer usually named on the document. This is a common and important instrument for payment settlement between firms.

A.2 Additional tables and figures

Table A1: Summary statistics for the **Lenient** test

The table presents summary statistics for the variables included in Table 5.

	Mean	Std	P25	P50	P75	No.
Panel A *loan level*						
Lenient (0/1)	0.399	0.490	0.000	0.000	1.000	2,081
Secured loan	0.181	0.385	0.000	0.000	0.000	2,081
Contracted maturity	33.348	44.198	3.000	5.000	100.000	2,081
Loan size (in kSEK)	1247.263	2558.292	164.717	248.254	1082.025	2,081
Panel B *firm-by-month level*						
Internal credit limit (mSEK)	73.496	345.285	3.671	9.823	31.668	1,438
Utilized amount (mSEK)	22.535	70.432	2.222	5.673	18.779	1,438
Distance to ceiling (mSEK)	31.032	213.008	0.256	1.568	7.479	1,438
Internal rating	10.468	4.178	8.000	11.000	14.000	1,438
Panel C *firm-by-year level*						
Non loan profits (kSEK)	76.604	311.862	0.398	2.930	19.268	1,051
No. of non-loan products	3.040	1.992	2.000	3.000	4.000	1,051
Leverage	0.301	0.276	0.043	0.250	0.478	1,051
Total assets (mSEK)	417.133	2307.942	6.123	18.220	97.329	1,051
Sales (kSEK)	348.943	1106.617	5.266	25.299	165.593	1,051
No. of employees	112.636	306.362	3.000	17.000	72.000	1,051
Sales growth	0.103	0.667	-0.101	0.025	0.167	1,051
Age	23.155	20.741	9.000	17.000	29.000	1,051
Years of relationship	8.463	2.162	6.583	8.167	10.250	1,051

Figure A1: Parallel trend test for investment

This figure lends support to the parallel trend assumption for the Diff-in-Diff test as below:

$$\ln(\text{Investment})_{f,t} = \beta \text{Affected}_f * \text{Post} + \gamma X_{f,t-1} + A_f + B_{j,t} + \epsilon_{f,t}, \tag{A24}$$

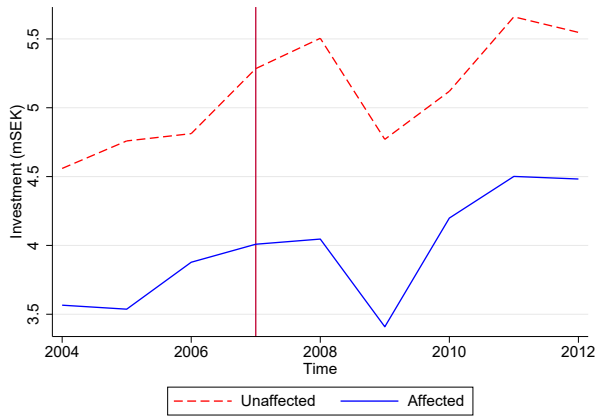
where f is firm, t is year, and j is industry. Post is 1 after 2007, and 0 before. The dependent variable is ln(investment). Investment is calculated as the increase in fixed assets, while taking into account depreciation and amortization. The controls include lagged ln(total assets), leverage, and firm age. Time (year-month), firm, internal rating (yearly average) and industry fixed effects are also included.

Panel (a) shows the average level of investment from 2002 to 2016, for affected (in blue) and unaffected (in red) firms respectively.

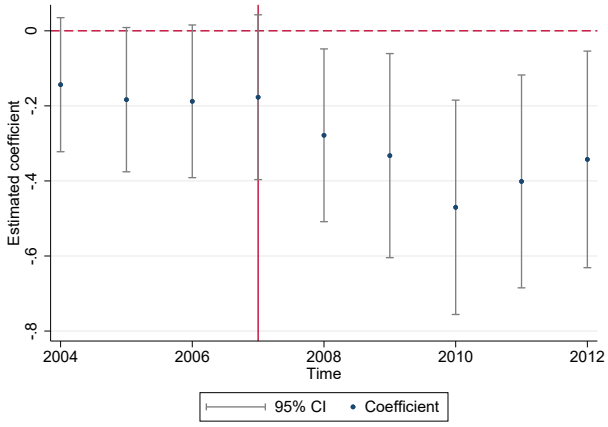
Panel (b) depicts estimates of the β_t coefficients and their 95% confidence intervals from the following model:

$$\ln(\text{Investment})_{f,t} = \text{Affected}_f * \sum_{t=2004}^{t=2012} \beta_t D_t + \gamma X_{f,t-1} + A_f + B_{j,t} + \epsilon_{f,t}, \tag{A25}$$

where f is firm, t is year, and j is industry. The dependent variable is ln(investment). Investment is calculated as the increase in fixed assets, while taking into account depreciation and amortization. The controls include lagged ln(total assets), leverage, and firm age. Time (year-month), firm, internal rating (yearly average) and industry fixed effects are also included.



(a) Average investment level for both groups



(b) Estimated coefficients

Table A2: Decreased credit supply and *investment*

This table reports the OLS coefficients for the Diff-in-Diff test specified in equation (A24). Standard errors are clustered at the firm level.

	Dependent variable: ln(Investment)			
	(1)	(2)	(3)	(4)
Affected x Post	-0.225***	-0.203***	-0.179**	-0.167**
	(0.077)	(0.075)	(0.077)	(0.075)
Leverage		0.402***		0.311**
		(0.152)		(0.149)
Age		-0.051*		-0.044
		(0.029)		(0.031)
ln(total assets)		0.473***		0.452***
		(0.049)		(0.049)
Firm FE	Yes	Yes	Yes	No
Year FE	Yes	Yes	No	No
Industry x Year-Month FE	No	No	Yes	Yes
Internal rating FE	No	Yes	No	Yes
Controls	No	Yes	No	Yes
Adj. R2	0.653	0.661	0.657	0.665
No of obs	33,050	33,050	33,050	33,050

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3: The effect of higher credit conversion ratio on non-loan products' *profitability*

The purpose of this table is to test whether the bank experienced a profit loss in the affected non-loan products due to the implementation of Basel II rules. The specification is defined as in equation (22). The unit of observation is product-year-month. The dependent variable in column 1 and 2 is total net product profit. The dependent variable in column 3 and 4 is product profitability margin, which is measured as $\frac{\text{total profit}}{\text{total cost of capital}}$. Standard errors are clustered at the product level and included within the parentheses under the coefficients.

Dependent variable:	Profit (mSEK)		Profit margin	
	(1)	(2)	(3)	(4)
Affected x Post	0.190	-0.582*	-0.001***	-0.001***
	(1.152)	(0.330)	(0.000)	(0.000)
Volume (mSEK)		0.001***		-0.000
		(0.000)		(0.000)
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes
Adj. R2	0.650	0.944	0.593	0.598
No of obs	2,402	2,402	2,402	2,402

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4: Shock to non-loan products' profitability and *credit supply*

The purpose of this table is to test whether results in Table 6 is robust to using treatment intensity instead of a dummy variable "Affected" in the Diff-in-Diff regression. The table tests the following model:

$$\text{Credit supply}_{f,t} = \beta \text{Intensity}_f * \text{Post}_t + \gamma X_{f,\text{year}-1} + A_f + B_{j,t} + D_r + \epsilon_{f,t}.$$

Intensity is measured as the ratio of affected profit by total non-loan profit in the year before the regulatory shock. Post is a dummy equal to one after Basel II implementation by the bank. The rest of the specification is identical to that of Table 6. The dependent variable is credit supply, which is measured as ln(internal credit supply). Controls in column 1 include lagged ln(total assets), ln(loan profit), ln(years of relation), leverage, and firm age. Time (year-month), firm, internal rating, and industry fixed effects are also included. Standard errors are clustered at the firm level and included within the parentheses under the coefficients.

	Dependent variable: ln(credit limit)			
	(1)	(2)	(3)	(4)
Intensity x Post	-0.131***	-0.062***	-0.097***	-0.056***
	(0.031)	(0.018)	(0.026)	(0.019)
Age		0.031		0.020
		(0.044)		(0.042)
Leverage		0.299***		0.293***
		(0.068)		(0.067)
ln(yrs of relationship)		-0.039		-0.046
		(0.034)		(0.034)
ln(total assets)		0.487***		0.483***
		(0.027)		(0.027)
ln(loan profit)		0.187***		0.187***
		(0.011)		(0.011)
Year-Month FE	Yes	Yes	No	No
Firm FE	Yes	Yes	Yes	Yes
Industry x Year-Month FE	No	No	Yes	Yes
Internal Rating FE	No	Yes	No	Yes
Controls	No	Yes	No	Yes
Adj. R2	0.850	0.871	0.851	0.872
No of obs	278,712	278,712	278,712	278,712

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Evidence on the *information* channel

The purpose of this table is to show some indicative evidence of the information channel, i.e. evidence that the bank is able to gather information from the borrower through offering non-loan products. The table tests the following model:

$$y_{f,t} = \sum_{p \in \Phi} \beta I_p * Post_t + X_{f,year-1} + A_f + B_{j,t} + C_r + \epsilon_{i,t}.$$

Dependent variable is the length of time (number of months) between two consecutive reviews of the firm. Control variables at the firm level are all lagged by one year, and include loan profit, age, size (as measured by ln(total asset)), and ln(years of relationship). In column 1 and 2, changed firms initially had only loans and then started cross-buying *cards and accounts*, *trade-related documentation*, *merchant acquiring service*, *leasing*, *factoring*, *sales solutions*, and *negotiable instruments*, respectively, as indicated by a dummy variable. Unchanged firms are those that remained borrowers throughout the sample period. Post is a dummy equal to one after an Changed firm has picked up the product. Standard errors are clustered at firm level and included within the parentheses under the coefficients. Column 3 and 4 have the same specification, except that changed firms initially bought *cards and accounts*, *trade-related documentation*, *merchant acquiring service*, *leasing*, *factoring*, *sales solutions*, and *negotiable instruments*, respectively, as indicated by a dummy variable, and later dropped the product and become sole borrowers. Unchanged firms are those that remained borrowers throughout the sample period. Post is a dummy equal to one after an Changed firm has picked up the product. Standard errors are clustered at firm level and included within the parentheses under the coefficients.

	Dependent variable: months between two firm reviews			
	Buyers		Droppers	
	(1)	(2)	(3)	(4)
Post=1 x Accounts and cards=1	-0.068	-0.246	0.178	0.155
	(0.734)	(0.808)	(1.004)	(0.960)
Post=1 x Trade documentation=1	-1.547	-1.929	1.553	1.304
	(1.801)	(1.915)	(1.416)	(1.375)
Post=1 x Merchant acquiring=1	6.029***	6.041***	-2.389	-2.665
	(2.207)	(2.217)	(2.697)	(2.920)
Post=1 x Leasing=1	3.186*	3.719**	-3.849**	-3.786**
	(1.642)	(1.737)	(1.750)	(1.766)
Post=1 x Factoring=1	9.595**	12.057***	1.265	2.069
	(4.034)	(4.258)	(1.614)	(1.774)
Post=1 x Sales solution=1	0.226	1.375	0.880	1.138
	(1.473)	(1.525)	(1.522)	(1.506)
Post=1 x Negotiable instrument=1	0.327	1.627	0.812	1.291
	(1.570)	(2.987)	(2.519)	(2.488)
ln(loan profit)	-0.786**	-0.758*	0.729	0.789
	(0.382)	(0.404)	(0.555)	(0.551)
ln(total assets)	-0.729	-1.126	-0.605	-0.750
	(1.040)	(1.298)	(1.275)	(1.250)
Age	1.277	1.121	1.240	1.224
	(0.793)	(0.767)	(1.584)	(1.559)
Leverage	6.800***	7.000***	-2.635	-2.017
	(2.282)	(2.463)	(2.374)	(2.336)
ln(yrs of relation)	6.333**	7.030**	7.041**	7.323**
	(2.633)	(2.953)	(3.336)	(3.289)
Industry-Year-Month FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Internal rating FE	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes
Adj. R2	0.843	0.846	0.843	0.845
No of obs	30,969	30,969	29,063	29,063

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Non-loan relationship and *delinquency* probability

The purpose of this table is to test whether non-loan relationships predict higher delinquency of the relationship loans. The table reports coefficients of regressing delinquency outcome, which equals one if the interest payment is late for 90 or more days, and zero otherwise, regressed on measures of non-loan relations. Non-loan relation is measured in two ways. In columns 1 and 2, it is measured as the natural logarithm of total non-loan profits generated from a customer from the previous year. In columns 3 and 4, it is measured as the total number of non-loan products purchased by the firm in the previous year. In columns 5 and 6, both measures are included. Dummy variables indicating what type of non-loan products are included in column 7 and 8. Issuance time (year-month) by industry (B), loan type (E), and internal rating (C) fixed effects are included throughout the tests to remove any factors that are nonvariant in each specific dimension that might instead cause the differences we capture. Standard errors are clustered at the firm level and included within the parentheses under the coefficients. The empirical specification is as below:

$$\text{Default}_{i,f} = \beta\text{Non-loan relation}_{f,\text{year}-1} + \gamma_1 X_{f,\text{year}-1} + \gamma_2 Z_{i,f} + B_{j,t} + C_r + E_p + \epsilon_{i,f},$$

	Dependent variable: Default=1							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(NL. profit)	0.001**	0.000			-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)			(0.000)	(0.000)	(0.000)	(0.000)
No. of products			0.004***	0.002**	0.004***	0.003**	0.002	0.001
			(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Accounts and cards=1							-0.002	0.001
							(0.004)	(0.004)
Trade documentation=1							-0.003	-0.001
							(0.004)	(0.004)
Merchant acquiring=1							0.010	0.009
							(0.017)	(0.018)
Leasing=1							0.001	0.002
							(0.003)	(0.003)
Factoring=1							0.030***	0.016
							(0.010)	(0.011)
Sales solution=1							0.010	0.007
							(0.006)	(0.005)
Negotiable instrument=1							-0.004	0.000
							(0.006)	(0.005)
ln(loan profit)	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.000	-0.000
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
ln(yrs of relation)	-0.008***	-0.008***	-0.009***	-0.008***	-0.009***	-0.008***	-0.008***	-0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Leverage	0.037***	0.018**	0.040***	0.021***	0.040***	0.021***	0.040***	0.022***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Age	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ln(total assets)	-0.003***	-0.001	-0.004***	-0.002**	-0.004***	-0.002**	-0.004***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Secured loan	-0.014***	-0.008**	-0.014***	-0.008***	-0.014***	-0.008***	-0.014***	-0.008**
	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
ln(loan size)	0.001	0.003***	0.002*	0.003***	0.002*	0.003***	0.002**	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Contracted maturity	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year-month x industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Internal rating FE	No	Yes	No	Yes	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R2	0.025	0.098	0.026	0.098	0.026	0.098	0.029	0.099
No of obs	43,612	43,612	43,612	43,612	43,612	43,612	43,612	43,612

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$