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Jaakko Sääskilahti

Retail Banking in the Aftermath of the Financial Crisis

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Editors
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ABSTRACT

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This thesis considers the effects of the global financial crisis that started in 2008 on the retail banking environment and on banks' behavior during and in the aftermath of the crisis. The thesis consists of an introductory chapter and three empirical articles that use unique datasets on Finnish cooperative banks. The introductory chapter provides background and an overview of the thesis and considers the effects of the crisis on retail banking from an overall perspective. The empirical articles investigate the roles of a competitive environment, a low interest rate environment, and relationship banking during the crisis and in the post-crisis period.

The first article looks at whether the effects of the financial crisis on the volumes and prices of small-business loans depended on the pre-crisis local competitive environment. The second article explores the relationship between market interest rates and retail bank interest margins and its implications in the low interest rate environment that resulted from the financial crisis. The third article examines the association of bank relationship strength with the performance of small and medium-sized enterprises (SMEs) after the onset of the financial crisis.

Keywords: retail banking, financial crisis, bank competition, low interest rate environment, relationship banking

Author's address

Jaakko Sääskilahti
School of Business and Economics
University of Jyväskylä
jaakko.s.saaskilahti@student.jyu.fi

Supervisors

Professor Ari Hyytinen
School of Business and Economics
University of Jyväskylä

Professor Jaakko Pehkonen
School of Business and Economics
University of Jyväskylä

Reviewers

Dr. Esa Jokivuolle
Head of Research, Bank of Finland

Professor Panu Kalmi
University of Vaasa

Opponent

Professor Panu Kalmi
University of Vaasa

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LIST OF INCLUDED ARTICLES

I Jaakko Sääskilahti. 2016. Local bank competition and small business lending after the onset of the financial crisis. *Journal of Banking and Finance*, 69 (August), 37-51. doi:10.1016/j.jbankfin.2016.04.004

II Jaakko Sääskilahti. 2016. Retail bank interest margins in low interest rate environments. *Journal of Financial Services Research* (2016). doi:10.1007/s10693-016-0262-1

III Jaakko Sääskilahti. 2017. Relationship banking and the financial difficulties of SMEs in the aftermath of the crisis.

1 INTRODUCTION

This thesis investigates the consequences of the global economic crisis that began in 2007-2008 for retail banking and focuses particularly on the changes in the banking environment. The thesis consists of this introductory chapter and three research articles that examine retail banking in the aftermath of the crisis from various perspectives. The research articles are empirical and employ detailed micro-level datasets obtained from the OP Financial Group[1] in Finland.

The first article examines whether the effects of the financial crisis on the volumes and prices of small-business loans depended on the pre-crisis local competitive environment. The results indicate that the loan margins increased, and the volumes of new small-business loans decreased to a greater extent among the banks that operated in more competitive local markets before the crisis.

The second article examines the relationship between market interest rates and retail bank interest margins. The empirical analysis allows for nonlinearities in these relationships to account for the special effects of a low interest rate environment that stem from the zero lower bound for deposit rates. The results reveal that a positive relationship between the market interest rate and the interest rate spread between the stocks of loans and deposits is much stronger in a low interest rate environment than in a high interest rate environment, which exerts pressure on bank profitability when policy rates fall to low levels. The results also indicate that banks increase spreads on new loans to maintain a sufficient interest rate spread between new loans and deposits, which weakens the pass-through from policy rates to new loan rates in a low interest rate environment.

The third article examines the association of bank relationship strength with the performance of small and medium-sized enterprises (SMEs) after the onset of the financial crisis. The results reveal that bank relationship strength is

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1 This is the current name of the Group. There is also used the old name "OP-Pohjola Group" in the thesis if this name existed at the time of the research.

negatively associated with the probability that SMEs suffer from financial difficulties and, if those difficulties are faced, helps SMEs cope with them.

This introductory chapter provides a framework for the research articles and summarizes the main results and implications of the thesis. Section 1.2 first goes through the role of the banking sector in the various stages of the global economic crisis and describes key changes in banks' operational environments in the aftermath of the crisis. In the latter part of this section, the focus is specifically on retail banking aspects and the contributions of this thesis. Section 1.3 reviews previous research related to the topics and data of this thesis. The reviewed research areas are bank lending during crises, bank competition, bank interest margins, monetary policy and low interest environments, relationship banking, and research on the Finnish banking sector. Section 1.4 provides the institutional framework by analyzing the characteristics of European and Finnish banking sectors, including the Finnish OP Financial Group. The analyses are based on basic figures in retail banking, and the focus is on the effects of the crisis and the specific aspects of this thesis. Section 1.5 consists of the summaries of the research articles. Finally, Section 1.6 considers the main lessons and policy implications of the thesis.

1.1 Background

The banking sector has been a major figure in the various stages of the global economic crisis since the onset of the financial crisis in the US in mid-2007. First, banks had a significant role in the subprime mortgage crisis in the US in 2007–2008. An excessively increased loan supply and loosened lending standards are seen as key reasons for the lending boom and housing bubble, whose burst was a trigger for the financial crisis in the US (e.g., Brunnermeier, 2009; Dell'Ariccia et al., 2012; Mian and Sufi, 2010; Peydró and Maddaloni, 2011). The significance of a mortgage credit boom in the building up of financial fragility has been found to be a typical pattern in advanced economies in the past (Taylor et al., 2014).

Second, due to the interconnectedness of the global banking system, the US financial crisis spread around the world, especially after the collapse of Lehman Brothers in September 2008. A key contagion channel was the turmoil in money markets, including interbank markets, and wider wholesale funding markets, such as repo and commercial paper (Adams-Kane et al., 2015; de Haan et al., 2016). The increased use of wholesale funding had made banking systems vulnerable to disturbances in the money markets, and the most fragile banks were those that were highly dependent on short-term market-based funding (Bologna, 2015).[2] In addition, banks around the world suffered direct losses from US financial instruments, and many European banks were significantly

[2] The problems arising from an excessive reliance on wholesale funding have been a typical feature in previous banking crises (e.g., Balluck et al., 2016).

exposed to the US asset-backed commercial paper and subprime markets (Acharya and Schnabl, 2009; Shin, 2012).

Third, the banking sector has been at the center of the Eurozone crisis since the end of 2009. A key characteristic of this crisis has been the interconnectedness of sovereigns and banks (Baldwin and Giavazzi, 2015). The direction of causality has been both from sovereign debt problems to banks' difficulties and from banking crises to sovereign debt problems (Alsakka et al., 2014; Angelini et al., 2014; De Bruyckere et al., 2013; Singh et al., 2016). The most significant banking crises were in Cyprus, Iceland, Ireland, and Spain, and the lending boom and housing bubbles were the key reasons for the crises, particularly in Ireland and Spain.

The crisis has significantly affected the banking environment due to poor economic conditions and the policy responses to that as well as to banking sector vulnerabilities. As a result, the crisis has had many impacts on all banks regardless of their role in the origins or spread of the crisis. The key factors that have been shaping the banking environment since the onset of the financial crisis are new regulations, expansive/unconventional monetary policies, and weak real economies. Technological development also had an impact on the banking environment before the crisis, but it can be argued that the crisis has affected, to some extent, how this development has shaped the markets of financial services.

Bank regulation has tightened significantly in the aftermath of the financial crisis, and the final regulatory environment is not yet completely clear. An important new regulatory initiative is the global Basel III capital and liquidity standard. Another notable change is an increased focus on the systemic aspect of regulation, i.e., macroprudential regulation. Some of the tools of macroprudential regulation include capital requirements that are pro-cyclical and depend on the systemic importance of a bank and measures affecting loan eligibility, such as loan-to-value and debt-to-income ratios (Basel Committee on Banking Supervision [BCBS], 2016; Claessens et al., 2013). In Europe, the new regulatory framework is based on the Capital Requirements Regulation (CRR) and the Capital Requirements Directive (CRD IV), as well as the two pillars of an established banking union of the EU: the Single Supervisory Mechanism (SSM) and the Single Resolution Mechanism (SRM).[3] An overall assessment of the impacts of the large set of new regulatory tools on the banking sector is difficult. However, there are extensive reviews in which the benefits and costs of new regulations are assessed. The BCBS (2016) considered new capital and liquidity regulations and argued that a crucial benefit is the increased resilience of both individual banks and the whole financial system. The main drawbacks are increased bank funding costs and, thus, increased borrowing costs for customers, as well as reduced interbank lending and maturity transformation. The European Commission (EC) (2014) reviewed the implications of a wide array of regulatory reforms and highlighted that costs and benefits should not

[3] The new European banking regulatory environment is presented in more detail in Appendix 1.

be examined separately, and that costs to financial intermediaries do not necessarily mean costs to wider society.

Monetary policy reacted strongly to the financial crisis, and central banks around the world rapidly lowered policy rates following the lead of the US Federal Reserve. Since then, the policy rates and market interest rates have remained exceptionally low or have even become negative. This low interest rate environment and unconventional monetary policy tools, like quantitative easing (QE), have had many effects on banks, including—at a minimum— profitability, risk-taking, and customers' shifts to non-bank funding sources (e.g., Lambert and Ueda, 2014; Claeys and Darvas, 2015; Deutsche Bundesbank, 2014).

An economic downturn typically has harmful effects on banking systems even if banks are in good condition and do not play a key role in the origins of a crisis. Poor economic conditions and uncertain prospects can decrease loan demand, increase loan losses, and hamper banks' funding conditions (e.g., Puri et al., 2011; Le Leslé, 2012). It is evident that the financial crisis has considerably impacted banking environments around the world.

New technology and digitalization have had and will continue to have a large impact on the banking environment. The development of the fintech industry has allowed new competitors into banking markets (Barty and Ricketts, 2014). Although this is largely a natural evolution, it can be argued that the crisis has contributed the rise of alternative players in banking businesses due, for example, to the problems and increased regulation of traditional banks (Accenture, 2014; Nash and Beardsley, 2015).

The extent of the impacts of the changes in the banking environment can differ across bank business models (Ayadi et al., 2011). Calomiris and Nissim (2014) provide evidence of how various changes in the banking environment have affected certain parts of banking. They find that banks' market-to-book ratios have decreased significantly during the crisis, and this is related to a decreased value of intangibles, which is due to the changed regulatory environment, the decreased value of core deposits in a low interest rate environment, and the decreased value of customer relationships during poor economic conditions. All key changes in the banking environment have had significant implications for retail banking, on which this thesis focuses.

A retail bank can be seen as a traditional bank business model. The main characteristic of retail banks is that they provide loans mostly to private customers and small businesses and use retail deposits as their primary source of funding (see, e.g., Ayadi et al., 2011; EC, 2007; Roengpitya et al., 2014). However, there are no unambiguous definitions of various bank business models. A rough distinction can be set between commercial banks—that includes retail banks—and investment banks. A key difference between retail banks and other commercial banks is that the latter use more wholesale funding and are sometimes called wholesale banks (Ayadi et al., 2011; Roengpitya et al., 2014). Investment banks or capital market-oriented banks are active in trading activities and often highly dependent on short- term market-based funding (Ayadi et al., 2011; Roengpitya et al., 2014).

There is evidence that retail banking was the most successful business model after the onset of the financial crisis because, in particular, it was not as exposed to the disruptions in wholesale funding markets (Ayadi et al., 2011; Hannoun, 2015). Still, many of the changes in the banking environment in the aftermath of the crisis have fallen chiefly on retail banking. The second article of this thesis highlights how a low interest rate environment exerts pressure on bank profitability, particularly for retail banks (see, also, Hannoun, 2015). The first article suggests that local bank competition decreased right after the onset of the financial crisis, which might have somehow alleviated the pressure on profitability. However, a competitive environment typically tightens when the economic outlook improves, and on top of that, there has been an increase in new competitors in retail banking services in the wake of the crisis. The third article suggests that relationship banking, which is typical for retail banks, has played an important role in mitigating the negative effects of the crisis on SMEs, despite the challenging retail banking environment.

1.2 Previous research

This section reviews previous literature related to the topics of the articles of this thesis. The first subsection considers bank lending during crises, focusing on the recent global economic downturn, which provides a background for all the articles. The second subsection considers the literature on the measurements and outcomes of bank competition. The third and fourth subsections review bank interest margins and monetary policy literature related to the second article. A review of relationship banking literature in the fifth subsection provides the background for the third article. Finally, there is a review of the empirical research on the Finnish banking sector, as the empirical analyses of the research articles are based on the datasets obtained from the Finnish OP Financial Group. Each subsection presents the basic theoretical and empirical literature on a topic and further explores a topic in the context of crises.

1.2.1 Bank lending during crises

Bank lending varies significantly over time, especially between good and bad economic times. When examining the reasons for the changes in lending, it is essential to distinguish between demand- and supply-side effects (e.g., Peek and Rosengren, 1995; Puri et al., 2011a). Regarding bank-driven evolutions in lending during crises, a significant contraction in loan supply has often been called a "credit crunch" (Bernanke and Lown, 1991). If bank financing becomes more difficult during a crisis, this typically creates financial constraints, especially for SMEs, which often do not have other financing options (e.g., Carbo-Valverde et al., 2016). Alternatively, a large contraction in bank lending during crises can be due to decreased loan demand because of the poor economic outlook and fewer investment opportunities (e.g., Kahle and Stulz,

2013). In this review, the focus is on banks' lending behavior during crises, i.e., on the supply side of bank lending.

Theoretical banking literature provides several reasons for significant decreases in bank lending during crises. First, large loan losses and low earnings decrease bank capital, and "capital crunch" refers to the situation in which weakened capital adequacy causes banks to shrink their balance sheets and reduce lending (Peek and Rosengren, 1995). Second, funding structures can play a major role in lending cuts. If there are problems in money markets, this causes funding uncertainty for banks that are dependent on wholesale funding, and they can respond to that by decreasing lending (Ritz and Walther, 2015). Third, there are theories about how bank competition affects lending standards, and these suggest that lower competition leads to decreased loan availability during crises (Gorton and He, 2008; Ruckes, 2004). Lastly, banks' risk-taking can decrease in uncertain times, and the "flight-to-quality" phenomenon means that lending decreases the most for the riskier customers (Bernanke et al., 1996). However, an "evergreening" mechanism may have inverse effects. According to this mechanism, weak banks have incentives to delay the recognition of losses and to continue lending to weak or insolvent borrowers (Peek and Rosengren, 2005).

There is substantial empirical literature on the effects of various loan supply factors during crises. Many empirical studies observe that a decline in bank capital leads to a decreasing loan supply during crises (e.g., Hancock and Wilcox, 1998; Peek and Rosengren, 1995). Observations from the recent crisis indicated that banks' loan losses from the US mortgage-backed securities and European sovereign bonds decreased their loan supply (Popov and van Horen, 2013; Puri et al., 2011a; Santos, 2011). In addition, there is evidence showing that the effects of bank capital on lending can also come through risk-based capital regulation, as banks react to the increased capital charges that are due to increased credit risks (Behn et al., 2016). Empirical studies have also found that the funding structure affected lending behavior during the recent crisis. Many studies observed that banks with more vulnerable funding structures decreased their loan supplies more, where a vulnerable funding structure means a low share of core deposits and a correspondingly higher share of wholesale funding, as well as a greater dependence on foreign funding (Aiyar, 2012; Cornett et al., 2011; Dagher and Kazimov, 2015; Ivashina and Scharfstein, 2010; Iyer et al., 2014). Additionally, there is evidence that increased sovereign debt risk decreased the availability and increased the costs of bank funding in Italy, negatively affecting banks' loan supply (Albertazzi et al., 2014). There are fewer empirical studies on the effects of changes in competition and risk-taking on bank lending during crises. Regarding risk-taking, there is evidence that low-capitalized banks reduced lending more to riskier customers during the crisis (Albertazzi and Marchetti, 2010). Even if various theories suggest that changes in competition can explain changes in lending behavior between good and bad times, there is a gap in the empirical literature related to that.

Empirical studies also provide evidence about the consequences of decreased lending on the real economy during the recent crisis period. Financial constraints during the various stages of the global economic crisis have decreased investments, hindered valuable projects, weakened employment growth, and reduced revenues (Acharya et al., 2015; Campello et al., 2010; Duchin et al., 2010). Evidence indicates that the financial constraints caused by decreased bank lending fall predominantly on SMEs, which has adverse effects on the real economy (Klein, 2014). Tight lending standards have led to a shift from bank financing to capital market financing, but this is typically not possible for small firms (Becker and Ivashina, 2014). Also, some evidence suggests that a firm will have difficulties acquiring financing from a new bank if there is a reduction in loan supply at its current bank (Iyer et al., 2014).

In sum, loan supply can decrease significantly during crises, which often has significant consequences on the real economy. A reduction in loan supply can be due to the problems of banks or due to banks' reactions to changes in the banking environment and the real economy. Previous literature provides ample proof that losses and vulnerable funding affect lending behavior during crises. However, empirical evidence on the role of changes in risk tolerance and competition in lending behavior during crises is scant, despite theoretical studies suggesting their importance.

1.2.2 Bank competition

Bank competition is one of the most researched areas in banking literature. In this section, the focus is on the theoretical and empirical literature on bank competition issues in the crisis context, as well as about some of the significant effects of bank competition on banks' behavior, their customers, and the real economy. A competitive banking environment can be shaped by competition between traditional banks and by competition from outside the traditional banking sector. In the existing bank competition literature, the emphasis is mainly on competition between traditional banks, but competition from outside the traditional banking sector—i.e., from the so-called shadow banking sector—has increasingly influenced the competitive environment of banking (see, e.g., Barty and Ricketts, 2014; Claessens and Laeven, 2004).

Theoretical literature on bank competition focuses largely on the effects of competition on loan availability and prices, as well as on risks and risk-taking. The market power hypothesis states that higher market power, or less competition, is related to lower loan availability, higher loan rates, and lower deposit rates (e.g., Carbó-Valverde et al., 2009). In contrast, the information hypothesis states that higher market power incentivizes banks to invest in relationship banking, which leads to greater loan availability (Petersen and Rajan, 1995).[4] Regarding the changes in competition over time, Ruckes (2004)

[4] However, the literature on relationship banking is not consistent on whether closer relationships improve loan availability (see Section 1.2.5).

theorizes that low screening activity increases competition and loosens credit standards in good times and vice versa in bad times.

The significant attention given to the relationship between bank competition and risk-taking reflects the fact that bank competition can have significant implications for financial stability (Allen and Gale, 2003). A variety of theoretical models suggest both positive (the competition-fragility or charter value paradigm) and negative (the competition-stability or risk-shifting paradigm) relationships. The competition-fragility view argues that higher market power leads to higher profits and, therefore, to higher charter value, and banks do not take too much risk in order to avoid bankruptcy and the loss of a valuable charter (see, Keeley, 1990). The competition-stability view argues that lower competition leads to higher loan prices, which increases borrowers' incentives toward moral hazards and risk-taking and, thus, the probability of their bankruptcy (Boyd and De Nicolo, 2005). In addition to these opposing views, there are theories implying a nonlinear relationship between bank competition and risks. These theories contend that it is possible to find an optimal level of competition; risk-taking increases, and loan quality worsens if competition increases or decreases from that level (Gomez and Ponce, 2013; Martinez-Miera and Repullo, 2010). On top of that, Berger et al. (2009) highlight that it is essential to distinguish between the risks of loans and banks. As an example, even if the risks of loans increase, this does not automatically increase the risks of banks due to hedging and/or an increase in bank capital.

There is also theoretical literature on the effects of competition on bank orientation. A theory by Boot and Thakor (2000) argues that an increase in interbank competition incentivizes relationship lending because it can better alleviate the pressure of price competition than transaction lending. Alternately, customers' propensity for switching banks can be greater in more competitive environments, which lessens the incentives to invest in relationship banking (Boot, 2000).

Empirical literature on bank competition employs various measures of the degree of competition. Competition measures can be divided into the traditional and new empirical methods of industrial organization (IO) literature. The traditional IO literature uses market structure measures, whereas new measures attempt to gauge market power more directly based on various margin measures (see, e.g., Beck et al., 2010; Carbo et al., 2009). Empirical literature highlights the challenges of measuring competition, and different measures often produce conflicting results for the degree of competition (Carbo et al., 2009; Claessens and Laeven, 2004). There can be also confusion regarding the differences among measures, and various measures are incorrectly used interchangeably (Lapteacru, 2014). A key issue is at which level competition is measured. Many papers argue that concentration measures do not work at the national level, but the situation can change if concentration is measured at the local level (Fernández de Guevara et al., 2005; Schaeck et al., 2009). Another dimension is that there can be separate markets for each banking product, and an appropriate approach is to use competition measures at the product level

(Corvoisier and Gropp, 2002; Martín et al., 2006). The measurement of the effects of competition can also be based on differences in competition regulation between markets or over time (Cornaggia et al., 2015; Rice and Strahan, 2010).

Empirical studies are largely consistent about the fact that fiercer bank competition decreases prices. Loan rates are found to be lower and deposit rates higher in more competitive or less concentrated markets (Berger and Hannan, 1989; De Graeve et al., 2007; Hannan, 1997; Mallet and Sen, 2001; Rice and Strahan, 2010). Instead, the evidence of the effects of competition or market power on loan availability is more mixed. Many studies find that aggressive competition eases the financial constraints that are measured based on things such as loan approval decisions, borrower discouragement, dependence on trade credit, and direct surveys (Carbo-Valverde et al., 2009; Chong et al., 2013; Leon, 2015). Petersen and Rajan (1995) support the information hypothesis, as they find that young firms get better financing, and interest rates are smoothed out more over the lifecycle in more concentrated markets.[5] An important observation is that the results of the relationship between bank competition and loan availability are quite sensitive to various competition and loan availability measures (e.g., Carbo et al., 2009).

Regarding the effects of bank competition on prices and loan availability, many studies reveal that fiercer competition from other banks or from capital markets improves and speeds up the transmission of monetary policy (Adams and Amel, 2011; Fungáčová et al., 2013; Gropp et al., 2007; Mojon, 2000; Neumark and Sharpe, 1992; van Leuvensteijn et al., 2013). As an exception, Olivero et al. (2011) observed that increasing competition weakens the bank lending channel, i.e., the transmission of monetary policy on loan supply.

Empirical studies support both the competition-fragility and competition-stability views. One set of studies find that fiercer competition increases risks. Evidence indicates that fiercer deposit competition causes higher funding costs and risk-taking, and that low market power leads to low capital levels (Craig and Dinger, 2013; Keeley, 1990). Other studies find that competition is a good thing for financial stability. The evidence shows that restrictions on competition lead to a more fragile banking system, a lower Herfindahl–Hirschman Index (HHI) is associated with a lower probability of bank failure (Z-score), and a more competitive banking system decreases the likelihood of a crisis (Beck et al., 2006; De Nicoló et al., 2006; Fiordelisi and Salvatore, 2014; Schaeck et al., 2009). There is also some empirical support for a nonlinear relationship between competition and risk. Some findings give support to the theories of a U-shaped relationship (Jiménez et al., 2013), but also opposite results are observed, indicating that both high and low competition levels enhance financial stability (Tabak et al., 2012). Finally, numerous studies highlight the importance of several dimensions in the relationship between bank competition and risks. The findings indicate that competition can differently affect the risk of a loan

[5] According to the information hypothesis, better loan availability in less competitive environments is based on higher incentives to relationship building, but Degryse and Ongena (2007) found that fiercer local competition can increase relationship banking.

portfolio and the risk of a bank or the risk of an individual bank and the stability of the whole banking system. Additionally, country-specific factors can significantly impact the relationship between bank competition and financial stability (Beck et al., 2013; Berger et al., 2009; Kick and Prieto, 2015).

Existing literature on the position of bank competition in crisis periods is surprisingly limited. Research on the relationship between bank competition and financial stability touches on the role of competition in the development of crises.[6] Instead, the relevance of competition and its changes during crises have received much less attention. The theory by Ruckes (2004) argues that price competition intensifies during boom periods and diminishes during bust periods, which leads to tighter lending standards in bad times. European Central Bank (ECB) lending surveys reveal that competition from other banks normally eases lending standards, but this effect was reversed between the third quarter of 2007 and the third quarter of 2009.[7] However, to my knowledge, there are no empirical studies that directly examine the change in bank competition during a crisis and its effects, for example, on loan availability and prices.

Overall, the existing literature finds many favorable effects of greater bank competition, in particular more efficient financial intermediation due to lower prices, better loan availability, and a more effective transmission of monetary policy. However, it can be argued that increasing bank competition is not as unambiguously positive as it is in most other industries (Berger et al., 2004; Claessens and Laeven, 2004). This argument is mainly based on the effects of bank competition on financial stability, where both theoretical and empirical literature suggests opposing and nonlinear effects. In spite of the abundance of literature on bank competition, there is limited consideration of the role of bank competition in lending behavior during crises compared to lending behavior in good times.

1.2.3 Bank interest margins

Bank interest margins—i.e., the difference between average interest revenue and average interest expenses—is an essential factor of bank profitability. The level of interest margins is also used to measure the efficiency of banking systems (Demirgüç-Kunt and Huizinga, 1999). There are many ways to define and measure interest margins or spreads (see, Brock and Rojas Suarez, 2000). A common definition is all interest revenues minus all interest expenses divided by interest-bearing assets or total assets, and this measure is typically called net interest margin. Regarding retail banking, another important measure is the difference between average loan rates and average deposit rates.

The most common theoretical framework for the determination of interest margins is the dealer model initially proposed by Ho and Saunders (1981). In

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6 Soedarmono et al. (2013) find that the effect of bank competition on stability in banking can be different in normal and crisis periods.

7 See https://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html.

this model, banks act as dealers of stochastically arriving loans and deposits. According to this initial model and its extensions or modifications, the key determinants of bank interest margins are market structure, interest rate risk, risk aversion, transaction size, operating costs, and credit risk and its interaction with interest rate risk (Angbazo, 1997; Entrop et al., 2015; Maudos and Fernández de Guevara, 2004). Another theoretical framework for the determination of interest margins is a firm-theoretical approach according to which banks set loan and deposit prices simultaneously. This alternative approach proposes largely the same determinants of interest margins as the dealership model. (Wong, 1997; Zarruk and Madura, 1992.)

Empirical literature on the determinants of interest margins uses both international and country-specific datasets, as well as various measures for interest margins. Empirical findings support the theories, as interest rate volatility, credit risk, market power, and operating costs have positive effects on interest margins (Amidu and Wolfe, 2013; Brock and Rojas Suarez, 2000; López-Espinosa et al., 2011; Maudos and Solís, 2009; Saunders and Schumacher, 2000). Empirical studies also establish many other significant determinants of interest margins, such as regulation, institutional characteristics, and other incomes/cross-selling (Angbazo, 1997; Brock and Rojas Suarez, 2000; Demirgüç-Kunt and Huizinga, 1999; Lepetit et al., 2008). Many studies find different effects of certain elements depending on bank- and country-specific factors (Demirgüç-Kunt and Huizinga, 1999). For example, the effect of interest rate volatility depends on the maturity structure of assets and liabilities (Entrop et al., 2015), or the effects of credit and interest rate risks differ across bank sizes (Angbazo, 1997).

Previous literature on the effects of the level of market interest rates and a crisis on bank interest margins is limited. Some studies take the market interest rate level into account as a potential determinant of bank interest margins and often find significant effects (e.g., Lepetit et al., 2008; Aliaga-Diaz and Olivero, 2011). Regarding the recent crisis, there is some evidence that the relationship between the level of market interest rates and net interest income, in particular from retail customer activities, have had a major role in bank profitability challenges (ECB, 2010, 2009a). However, surprisingly little attention has been given to the impact of a low interest rate environment on bank interest margins, and only negative interest rate policy has increased notice of the issue.

In sum, the previous literature provides many bank- and country-specific as well as macroeconomic determinants of bank interest margins that are a key part of the banking business. However, a consideration of the market interest rate level as a determinant of interest margins has been limited both in theoretical and empirical literature. The effects of the recent exceptional and prolonged low interest rate environment on bank interest margins and profitability seem to be significant, which encourages more attention to the relationship between market interest rates and bank interest margins and profitability, especially regarding a low interest rate environment.

1.2.4 Transmission mechanism of monetary policy and a low interest rate environment

The transmission mechanism of monetary policy refers to the processes through which monetary policy affects the economy and the price level, and it is one of the most researched topics in monetary economics (Borio and Zhu, 2012). Banks play a vital role in the various channels of the transmission mechanism and particularly in bank-based financial systems (ECB, 2008). This chapter provides a review of the theoretical and empirical literature on the transmission channels and considers how the low interest rate environment and unconventional monetary policy tools have affected these channels in the recent crisis and post-crisis period.

The first transmission channel is the credit channel, which can be further divided into the bank lending channel and the firm balance sheet channel (Bernanke and Gertler, 1995). The bank lending channel describes how monetary policy affects loan supply. The initial model by Bernanke and Blinder (1988) suggest that monetary policy affects the amount of reserves and, thus, the amount of deposits, which further affects loan supply. However, Disyatat (2011) argues that the bank lending channel does not work so much through the effects of monetary policy on the amount of deposits, but instead through the effects on banks' balance sheet strength and risk-taking. The firm balance sheet channel describes how monetary policy influences loan demand. The loan demand effects of higher market interest rates can be due to increased debt service, eroded cash flows, lowered collateral values, and the deterioration of firms' creditworthiness (Ascraft and Campello, 2007).

The second transmission channel is the interest rate channel. This channel describes the pass-through of policy rates to bank interest rates, which further affect real economic activity and inflation through consumption and investment decisions (ECB, 2008; Mojon, 2000). The interest rate channel can be explained using the cost of funds approach (De Bondt, 2002; Gigineishvili, 2011). The basic idea is that money market rates, which are affected by policy rates, are transmitted to loan and deposit rates through their effects on the marginal costs of funds and the opportunity costs of deposits.

The third transmission channel is the risk-taking channel. This channel denotes the effects of monetary policy on bank risk-taking, where the key mechanisms are search for yield behavior and the changes in valuations, incomes, and cash flows (Borio and Zhu, 2012). The model by Dell'Ariccia et al. (2014) describes how low interest rates can increase bank risk-taking, and how the magnitude of this effect depends on the banks' capital structures. The designation of the risk-taking channel is relatively recent compared to most of the other transmission channels, but it has received increased consideration in recent years. An essential reason for that is the prolonged low interest rate environment following the onset of the 2007–2008 crisis (Beck et al., 2014a).

Other identified transmission channels include the asset price and exchange rate channels. The asset price channel can be dealt with as a separate transmission channel but also as a part of a broad credit channel. It describes

the effects of monetary policy on the costs of capital, the net worth of households and enterprises, collateral values, and asset prices through the discount rate on cash flows (ECB, 2008; Gigineishvili, 2011; Hannoun, 2015). In addition, the portfolio balance channel can be described as a separate channel in the asset price channel. The portfolio balance channel describes the direct impact of the asset purchases of central banks on asset prices due to investors' rebalancing of their portfolios (Joyce et al., 2011). The exchange rate channel refers to the effects of monetary policy on exchange rates and, thus, export incomes (Agarwal et al., 2015; Hannoun, 2015).

There is a rich amount of literature on the transmission channels of monetary policy, and in this review of empirical studies, the focus is on the interest rate channel due to its relevance in the context of this thesis. The empirical results with both the bank- and country-level datasets indicate that the pass-through is more rapid and complete to mortgages, corporate loans, and term deposits than to consumer loans, current account deposits, and saving deposits (De Bondt, 2002; De Graeve et al., 2007; Gambacorta, 2008; Gropp et al., 2007; Sorensen and Werner, 2006). There is also evidence that the adjustments of loan and deposit rates to changes in market interest rates are interdependent (Rocha, 2012). Additionally, many empirical studies find asymmetric effects, which indicate that loan rates adjust more slowly and/or deposit rates adjust more rapidly when market interest rates increase and vice versa (Belke et al., 2013; De Graeve et al., 2007; Gropp et al., 2007; Kleimeier and Sander, 2006). Empirical literature identifies several factors affecting the differences in the pass-through and, therefore, in the efficiency of monetary policy transmission. The most important bank-specific aspects include capitalization, liquidity, liability structure, and various risk factors (De Graeve et al., 2007; Gambacorta, 2008; Gropp et al., 2007). Country- or market-specific elements include competition, the sophistication and structure of the financial system, and various macroeconomic factors (Cottarelli and Kourelis, 1994; De Graeve et al., 2007; Gigineishvili, 2011; Hannan and Berger, 1991; Neumark and Sharpe, 1992; van Leuvensteijn et al., 2013).

Regarding the other transmission channels, there is evidence that an increase (or decrease) in market interest rates decreases (or increases) loan supply, and that the effects are greater for banks with low capital and liquidity (Jiménez et al., 2012; Kashyap and Stein, 2000). The empirical support for the firm balance sheet channel suggests that the negative effects of contradictory monetary policy on loan growth are stronger in the areas where economic conditions are poor (Ascraft and Campello, 2007). The empirical evidence for the risk-taking channel indicates that low interest rates increase risk-taking, and this behavior applies particularly to low-capitalized banks (Delis and Kouretas, 2011; Jimenez et al., 2014).

Literature on the functioning of the transmission channels and on the effects of unconventional monetary policy tools during the recent crisis and low interest rate period is growing rapidly. There are several potential reasons why the interest rate channel does not operate effectively during crises and low

interest environments. Increases in the funding costs of banks and the risks of borrowers, along with an uncertain economic outlook, can weaken the interest rate pass-through during crises (Gambacorta et al., 2014; Illes and Lombardi, 2013; Ritz and Walther, 2015). In a low interest rate environment, the zero lower bound for deposit rates is a relevant constraint on the interest rate pass-through (Darracq-Paries et al., 2014; Illes et al., 2015). Brunnermeier and Koby (2017) present a theory of "the reversal interest rate" which means that below this rate the positive effects of accommodative monetary policy on lending reverse. This is due to the adverse effects of very low interest rates on bank profitability.

The empirical findings indicate that the repricing of the risks of banks and borrowers explains the weak interest rate pass-through, and that the weakening of the interest rate channel was greater in stressed countries, possibly due to increased funding costs following increased sovereign bond yields (Darracq-Paries et al., 2014; Gambacorta et al., 2014; Holton and Rodriguez d'Acri, 2015; Illes and Lombardi, 2013). There is also evidence of structural reasons for the weakened pass-through during the crisis, like weaker competition and the higher costs of adjusting interest rates and restoring bank capital positions (Hristov et al., 2014). Another set of empirical studies consider the interest rate channel in a low interest rate environment and the effects of unconventional monetary policy. The results show that whereas the first decrease in policy rates after the collapse of Lehman Brothers transmitted to retail rates relatively well, the decrease in policy rates to a very low level did not transmit well to retail rates (Apergis and Christou, 2015; Darracq-Paries et al., 2014; ECB, 2013, 2009b). Cloyne et al. (2015) argue that QE could in practice improve the functioning of the interest rate channel through its effects on long-term interest rates, but their empirical analysis does not find a significant effect. An interesting finding is that if the effects of increased risks and the lower bound for deposits rates on bank funding costs are taken into account, banks' pricing behavior has not been changed substantially (Illes et al., 2015). Finally, there is confirmation that that the weakening of the interest rate pass-through has been more significant for small loans (Holton and Rodriguez d'Acri, 2015).

The evidence on the larger role of the bank lending channel in banks with low capital and liquidity implicates that monetary stimuli should be particularly effective during crises when banks' balance sheets are weak (Jiménez et al., 2012). Literature on the bank lending channel during the recent crisis focuses on the effects of QE. Various arguments about the effects of QE partly reflect differing views how the bank lending channel works. On the one hand, it can be argued based on the traditional bank lending channel that QE increases reserves and deposits, which leads to an increased loan supply directly or indirectly (Butt et al., 2014; Joyce and Spaltro, 2014). On the other hand, it can be argued that the effects of QE on the bank supply are limited because the availability of bank reserves is not the main constraint of bank lending (Borio and Disyatat, 2009). Empirical findings give support to the small, favorable effects of QE on lending, and the effects are more pronounced in

small banks and less significant in low-capitalized banks (Bowman et al., 2015; Joyce and Spaltro, 2014).

There is also some literature on the importance of the risk-taking channel when interest rates are low during a crisis. It is argued that low interest rates can encourage banks to roll over loans to poor firms in order to avoid write-downs, but this can increase risks in the long term (e.g., Lambert and Ueda, 2014). Limited empirical evidence suggests that the risk-taking channel is not so strong during weak economic conditions (Dell'Ariccia et al., 2013).

In summary, the transmission mechanism of monetary policy is a widely researched topic, and the recent crisis and exceptional monetary policy have put new issues on the agenda. The transmission of monetary policy through banks includes several channels, and the crisis and low interest rate environment have affected the functioning of these channels and their relative importance. The risk-taking channel has received more attention in the low interest rate environment, and there are studies considering the effect of QE on the bank lending channel. There is strong evidence that the interest rate channel has weakened during the recent crisis period. However, the focus has been—to a surprisingly large extent—on the effects of risk factors on the functioning of the interest rate channel, and the role of the zero lower bound for deposit rates has attracted more attention only very recently.

1.2.5 Relationship banking

Relationship banking can be defined in many ways, but key characteristics include the use of soft information and multiple interactions (Boot, 2000). A central purpose for the long-term and close relationships between banks and customers is to alleviate the problems of asymmetric information (Boot, 2000). Because asymmetric information is a key characteristic of loan markets, borrower-lender relationships can be seen as one of the reasons for the existence and specialness of banks (Degryse et al., 2009). Another type of bank orientation is transaction banking, which means focusing on particular transactions instead of aiming at information-based relationships with customers (Boot and Thakor, 2000).

The informational advantage of relationship banking is based on the collection of soft information**.** One of the banks' main tasks is the production of information about their borrowers, and the basic division is between hard and soft information (e.g., Diamond, 1984). Hard information refers to quantitative information, like balance sheet and income information (e.g., Berger and Udell, 2006). Soft information refers to qualitative information via personal interactions (e.g., Rajan, 1992). Asymmetric and imperfect information are inherently present in the case of opaque firms, about which a limited amount of reliable quantitative information is available. This feature applies particularly to SMEs and, consequently, relationship banking is particularly relevant in SME lending markets (Baas and Schrooten, 2006; Berger and Udell, 1998; Rajan, 1992). Stein (2002) argues that large banks tend to avoid SME lending because that relies heavily on soft information.

Theoretical literature on the effects of bank relationships on the terms and availability of loans provides arguments for both favorable and unfavorable results. Better loan availability can come through the information advantage, which enables flexible financial decisions and facilitates debt renegotiations (Rajan, 1992). If a firm has performed well in a long relationship, a bank can provide loans with lower interest rates and looser collateral requirements (Boot and Thakor, 1994). There are several arguments on why loan prices can be higher in relationship banking. The gathering of soft information can cause higher costs that lead to higher loan rates (Baas and Schrooten, 2006; Bolton et al., 2013). The information advantage of an incumbent bank over its competitors can enable the use of monopoly power (Sharpe, 1990; von Thadden, 2004). Banks can have incentives to attract customers with low prices, which can be compensated for later on in a long relationship (Kim et al., 2003; Sharpe, 1990).[8] Therefore, relationship banking is a key reason for the significance of switching costs in lending markets (Barone et al., 2011; Kim et al., 2003).

There are theoretical arguments for both a positive and negative relationship between risks and relationship banking. The potential reasons for higher risks in relationship banking are related to soft-budget constraint and the possibility of extracting extra rents. Soft-budget constraint means that banks can be unwilling to reject new lending to their non-performing relationship customers, due to, e.g., sunk costs, and this can weaken firms' incentives to avoid problems (Boot, 2000; Dewatripont and Maskin, 1995). Higher interest rates for locked-in customers can cause inefficient and riskier investment decisions (Fiordelisi et al., 2014). The arguments for lower risks are associated with the repeated lending and lower asymmetric information of relationship banking. Firms can have incentives to avoid risks and conduct only efficient investments in order to ensure the continuity of lending in the bank relationship (Rajan, 1992; Von Thadden, 1995). Lower asymmetric information enables more efficient monitoring, which decreases the probability of firms facing financial distress (Fiordelisi et al., 2014). In addition, there are two main arguments about why relationship banking can have favorable effects on firms in distress. First, a close and/or long bank relationship can facilitate the separation of fundamentally good and bad firms and simplify assessments of the future outlook of distressed firms (Hoshi et al., 1990; Longhofer and Santos, 2000). Second, a strong relationship can mitigate free-rider problems in debt renegotiations (Hoshi et al., 1990).

Empirical literature uses several approaches and measures in the investigation of the effects relationship banking. One approach is to divide banks into relationship and transactional banks based on, for example, primary/non-primary bank separation or survey information (Bartoli et al., 2013; Ono et al., 2014). The more common approach is to use several variables that are assumed to measure the strength of the relationship. First, relationship

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8 The terms "hold-up costs" and "lock-in effects" are used to describe the possibility of charging higher prices in a close and long relationship due to the informational advantage (Boot, 2000).

length is a widely used measure, and it is based on the idea that a bank can collect customers' private (soft) information over time, which gives it an informational advantage (e.g., Berger and Udell, 1995; Degryse and Cayseele, 2000; Fiordelisi et al., 2014). Second, the scope of the bank-firm relationship is measured by the existence of various services, such as transaction services and deposit accounts, that provide information about customers (e.g., Degryse and Cayseele, 2000; Norden and Weber, 2010; Santikian, 2014). Third, the ability to collect soft information is also measured by a bank's organizational structure and various distance variables (e.g., Agarwal and Hauswald, 2010; Berger and Udell, 2002; Bolton et al., 2013a; Cotugno et al., 2013). Finally, the number of bank relationships as a relationship measure is based on the premise that having exclusive or fewer bank relationships makes them stronger (e.g., Brunner and Krahnen, 2008; Castelli et al., 2012; Elsas, 2005).

An important part of the empirical literature on relationship banking examines the effects of relationship banking on the prices, other terms, and availability of loans. Most of the studies show that a strong relationship decreases the cost of credit, and several different measures are used for relationship strength (e.g., Berger and Udell, 1995; Bharath et al., 2011; D'Auria et al., 1999). However, some studies find that loan rates are higher in longer relationships, which provides support for the lock-in effect (Brick and Palia, 2007; Degryse and Cayseele, 2000). Regarding other loan terms, empirical studies find that collateral requirements are looser and loans larger in longer bank relationships (Berger and Udell, 1995; Bharath et al., 2011). Empirical evidence supports the positive effects of relationship banking on loan availability that are measured by, e.g., credit rationing and the use of alternative financing (Bartoli et al., 2013; Petersen and Rajan, 1994). An important empirical finding is that the effects of relationship banking on loan terms and availability are positive, particularly for opaque firms (Bharath et al., 2011; Kirschenmann, 2016). Some studies reveal that while a close relationship improves loan availability, it increases loan prices (Agarwal and Hauswald, 2010; Weinstein and Yafeh, 1998).

Empirical studies on the association between relationship banking and risks largely indicate that relationship banking mitigates risks. There is evidence that a strong or prior relationship decreases the riskiness of customers (Foglia et al., 1998; Puri et al., 2011b). Other studies find that the use of soft information in relationship banking increases the accuracy of default prediction and, thus, improves credit risk management (Agarwal and Hauswald, 2010; Chang et al., 2014; Chen et al., 2015). However, there is evidence to support the theoretical arguments that propose higher risks in relationship banking (Jiménez and Saurina, 2004).

Empirical literature on the role of a bank relationship in firm distress can be divided into two parts. One set of studies examines how a bank relationship affects the future performance of distressed firms. Evidence indicates that a strong or prior relationship with a bank has a positive effect on the probability of recovery and the business development of a distressed or defaulted firm

(Hoshi et al., 1990; Höwer, 2016; Rosenfeld, 2014; Shimizu, 2012). Another set of studies examines the issues in which relationship banking plays a role when a firm is in distress. There is evidence that debt restructurings or firm reorganizations are more successful and efficient in stronger bank relationships (Brunner and Krahnen, 2008; Chen et al., 2015). In addition, there is evidence of liquidity support for relationship customers that are distressed (Elsas and Krahnen, 1998).

Relationship banking can have a specific role in crises. As uncertainty and agency problems between lenders and borrowers typically increase in bad times, soft information can be even more valuable than in normal times (see, e.g., Alexandre et al., 2014). There is limited theoretical literature on the role of relationship banking during crises. The model by Bolton et al. (2013) proposes that relationship banks provide more favorable loan terms than transaction banks during crises. According to this model, the higher operating costs of relationship banking are covered by higher interest rates in normal times. On the contrary, it can be argued that the hold-up costs are particularly high during crisis times, and an information advantage enables banks to charge comparatively higher interest rates than in normal times (Santos and Winton, 2008).

Empirical literature considers the role of relationship banking in crisis times from various perspectives. There is a lot of corroboration that relationship lending mitigates the negative effects of crises on loan supply (Cotugno et al., 2013; Deyoung et al., 2015; Jiangli et al., 2004; Puri et al., 2011a). Beck et al. (2014b) discover that the positive effects of relationship banking on loan availability are greatest for small and opaque firms and in regions with more severe economic downturns. Several studies also find that the loan terms of relationship customers are better than those of other customers during crises (Alexandre et al., 2014; Bolton et al., 2013; Gambacorta and Mistrulli, 2014). However, some studies have shown that, during crises, banks charge higher prices from the customers that have no other funding possibilities, but they do not charge higher prices from these customers during expansion phases (Mattes et al., 2013; Santos and Winton, 2008).

Evidence of the association between relationship banking and risks during crises indicates that there are relatively fewer defaults among customers with close relationships to banks or in banks that focus on relationship banking (Bolton et al., 2013a; Fiordelisi et al., 2014; Ono et al., 2014). There is also evidence that, during the recent crisis, the overall performance of the firms with established bank relationships was better than the performance of other firms (Dewally and Shao, 2014).

In sum, a substantial amount of theoretical and empirical literature describes a number of advantages and disadvantages to relationship banking. The effects of relationship banking on loan availability and risks are key topics in this literature, but there are opposing arguments and empirical evidence on these outcomes. However, the existing literature is more united on the favorable effects of relationship banking in crisis times. Empirical studies on crisis times focus mostly on the effects of relationship banking on loan

availability and the realization of risks. There is much less attention given to the role of relationship banking in the overall performance and survival of bank customers during crisis periods.

1.2.6 Research on the Finnish banking sector

This section provides a review of the literature on the Finnish banking sector, as all three articles of this thesis use the data on Finnish cooperative banks. My emphasis is on the banking literature on crises and the same topics that are considered in the previous sections. There is much literature about the Finnish banking crisis of the 1990s that was one of the most severe financial crises in advanced economies in the post-war period (Honkapohja, 2014). Otherwise, empirical literature with Finnish banking data is not extensive.

Literature on the Finnish banking crisis in the 1990s aligns with literature on the recent global crisis with regard to the major causes and banks' behavior before and in response to the crises. There are arguments that financial market deregulation in the 1980s triggered increased bank competition and risk-taking, which led to loose credit standards and strong credit growth (Honkapohja, 2014; Koskenkylä and Vesala, 1994; Nyberg and Vihriälä, 1993). Non-deposit funding increased before the crisis, and this included the use of foreign debt and short-term money market funding (Koskenkylä and Vesala, 1994; Vihriälä, 1999). Empirical studies do not find clear signs of a credit crunch—a large decrease in loan supply— even if bank lending declined significantly during the crisis (Herrala, 2009; Honkapohja, 2014). Instead, empirical findings suggest that poor borrower quality and decreased loan demand were more important contributors to weak growth or even a decline in lending (Vihriälä, 1996). However, even if there is no strong evidence of a credit crunch, it is argued that bank lending policy was tighter and more careful during the crisis than before and after the crisis (Herrala, 2009; Koskenkylä and Vesala, 1994; Vihriälä, 1996). There is also evidence that the higher credit growth of a bank before the crisis was associated with a larger amount of non-performing loans during the crisis (Vihriälä, 1999).

There is limited literature that examines the recent global financial crisis in the Finnish banking sector and/or with Finnish banking data. Some empirical evidence indicates that the conditions of SME financing have been relatively good even if the global crisis tightened these in Finland, especially right after the onset in September 2008 (Pylkkönen and Savolainen, 2013). At the same time, an uncertain economic outlook and weakened global demand have decreased loan demand (Pylkkönen and Savolainen, 2013).

There are various studies considering the specific topics of this thesis with Finnish data. Bank competition with Finnish data has been studied to some extent, but not in recent times (Kauko et al., 2016). The Finnish banking markets are very concentrated but, at the same time, low loan prices suggest relatively fierce competition, particularly in mortgage lending (Kauko, 2005; Putkuri, 2010). Vesala (1995) extensively investigated competition in the Finnish banking markets before and during the banking crisis in the 1980s and 1990s. His results

indicate that intense competition before the crisis was one of the reasons for excessive risk-taking; high concentration was associated with fierce competition, and competition decreased significantly during the crisis. To my knowledge, there are no empirical studies on the determinants of bank interest margins with Finnish data. There are some studies examining the functioning of the interest rate channel in Finland. The key conclusions are that the interest rate pass-through is fast and complete to loan rates but far from complete to deposit rates (Kauko, 2005; Putkuri, 2010). Relationship banking is studied from various perspectives. Research signals that a strong or prior bank relationship is related to better loan availability and lower loan prices (Mörttinen, 1999; Niskanen and Niskanen, 1999; Peltoniemi, 2004; Peltoniemi and Vieru, 2013). Other empirical studies find that a long relationship is particularly useful for high-risk firms and has a positive effect on a bank's risk-adjusted profitability (Fredriksson and Moro, 2014; Peltoniemi, 2007).

There are some empirical studies that use data on the same Finnish cooperative banks as in this thesis for various research questions. Hyytinen and Toivanen (2004) investigate whether the banks use their branch network to invest in monitoring and/or market power and how this affects loan interest rates and credit losses. Jones et al. (2012) study the effects of general and firm-specific workplace training on worker outcomes and organizational performance. Jones and Kalmi (2015) analyze the relationship between membership and the performance of cooperative banks. Kauko (2009) examines how the characteristics of managers affect cost efficiency in banking by using the data on all Finnish saving and cooperative banks.[9]

In sum, the Finnish banking crisis in the 1990s resulted in a number of banking studies, but since then, research on the Finnish banking sector or with Finnish banking data has been more limited. Finnish data is largely missing from the research focusing on banking during the recent financial crisis. Existing literature suggests that competition is relatively fierce, and the interest rate pass-through to loan rates is fast and complete. In addition, relationship banking seems to play an important role in and substantially affect loan availability.

1.3 Institutional framework

This section presents the institutional framework for the research articles of this thesis that use data on the OP Financial Group cooperative banks. The Group consist of some 180 independent member cooperative banks that own their central organization, OP Cooperative and its subsidiaries.[10] The retail banking activities are operated mainly through local member banks, and the Group is a

[9] In addition to the cooperative banks of the OP Financial Group, there are the cooperative banks of a smaller cooperative banking group (the POP Bank Group) in Finland.

[10] The chart of the structure of the OP Financial Group is presented in Appendix 2.

market leader in loans and deposits in Finland; the market shares in Finland were 35.1% and 36.5% at the end of 2015 (Finance Finland [FFI], 2016).[11]

The first subsection describes the Finnish and European banking systems and their overall evolution before and after the onset of the financial crisis. The second subsection focuses on the evolution of retail banking activities in Finland, in Finnish cooperative banks, and in the euro area before and after the financial crisis. The third subsection considers the competitive environments of the European and Finnish banking sectors and the development of loan and deposit prices before and after the financial crisis. The fourth subsection compares the balance sheet structures of the whole euro area banking sector, the whole Finnish banking sector, and the Finnish cooperative banks. In addition, this subsection illustrates the evolution of bank interest margins in the Finnish banks in total and in Finnish cooperative banks.[12] The fifth subsection concludes with a summary.

1.3.1 Overview of the European and Finnish banking systems and the effects of the financial crisis

The banking sector plays a significant role in the European financial system. The total assets of banks relative to GDP are notably higher than in other advanced economies, and this is due to the rapid growth of the European banking system since 1990 (Langfield and Pagano, 2015). A large portion of the banking sector reflects both a significant amount of domestic bank lending and an expansion of banks to various business lines (especially trading) and foreign lending (Pagano et al., 2014). A key characteristic of the European banking sector is the significance of the universal bank business model that combines retail and investment banking activities (see, e.g., Liikanen, 2012). Another characteristic is that there are approximately 4,000 local cooperative banks in Europe (Liikanen, 2012). These cooperative banks typically focus on retail banking (Groeneveld, 2016). The European bank-based financial system is particularly relevant for SMEs that are highly dependent on bank financing (e.g., Aiyar et al., 2015).

The relative sizes of the banking sectors in European countries vary notably, and the size of the Finnish banking sector relative to GDP is close to the average of the euro area (see ECB, 2014). Banks are the primary source of debt funding for over 60% of Finnish firms, and this share is the highest among SMEs (Bank of Finland, 2015). Other important funding sources are finance houses, commercial papers and bonds (mostly for large firms), and Finnvera, which is a specialized financing company owned by the Finnish state (Bank of Finland, 2015).

The Finnish banking sector is relatively concentrated, as three banks/banking groups manage a significant share of the retail banking markets.

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11 The evolution of the market shares of loans and deposits for the OP Financial Group in the aftermath of the financial crisis is presented in Appendix 3.

12 There is no data on bank interest margins for Europe or the euro area.

The combined market share of OP Financial Group, Nordea Bank Finland, and Danske Bank Finland was more than 70% in both the loan and deposit markets between 2008 and 2015. Other relevant banks or banking groups are the Handelsbanken Group, Aktia Bank plc, the Savings Bank Group, the POP Bank Group, S-Bank, Ålandsbanken Abp, and Hypo (FFI, 2016). The Finnish banks focus mainly on retail banking, and net interest income is the most important income source for all the banks (FFI, 2016). The largest banks, in particular, also provide the other typical services of universal banks. Most of the banks are commercial banks, but cooperative banks (OP Financial Group and POP Bank Group) play a large role due to the significant market share of the OP Financial Group. Savings banks have a minor role in the Finnish banking system.

Relationship banking has been an important feature of the Finnish retail banking markets. Peltoniemi (2004) reviews the development of the Finnish financial markets and considers the role of relationship banking in various stages of this development. He proposes that before the liberalization of the financial markets in the 1980s, the main motivation for the establishment of bank-firm relationships was to improve loan availability. After the liberalization in the 1990s, an increased focus on risk management and the prices and terms of loans became the main reasons for close bank-borrower relationships. Nätti and Lähteenmäki (2016) study the development of market orientation in Finnish retail banking. They suggest that customer loyalty has diminished significantly since the beginning of 2000, and the main reason for that is the development of online banking. On the other hand, they argue that local banking still has an important function. The OP Financial Group cooperative banks operate in local banking markets where relationship lending is typically central (see, e.g., Hasan et al., 2014).

The financial crisis has significantly affected the development of the European banking system. There was rapid growth in the size of the European banking sector before the crisis (Pagano et al., 2014). The reasons for this increased size and leverage were an increased role of banks in financial intermediation, a significant increase in trading activities, and financial innovations (Ayadi et al., 2011). The size of the European banking sector decreased after 2008, and this change has been more significant for large banks (Pagano et al., 2014). However, the size of the Finnish banking sector increased during the crisis. Figure 1 depicts the evolution of the total assets of the Monetary Financial Institutions (MFIs) in the euro area and in Finland. The figure shows that the growth of the Finnish banking sector has been higher than in the whole euro area, especially after the onset of the financial crisis in 2008. Significant changes in the assets of the Finnish MFIs between 2010 and 2013 mainly reflect the balance sheet arrangements of the Nordic banks between their subsidiaries.[13] Another potential reason for the temporary high asset

[13] In particular, Nordea Bank AB centralized its derivatives position to its Finnish subsidiary. On the other hand, the Finnish bank tax may have caused transfers of balance sheet items in the opposite direction.

growth after 2010 is that the Finnish banking sector was a safe haven during the European sovereign debt crisis.

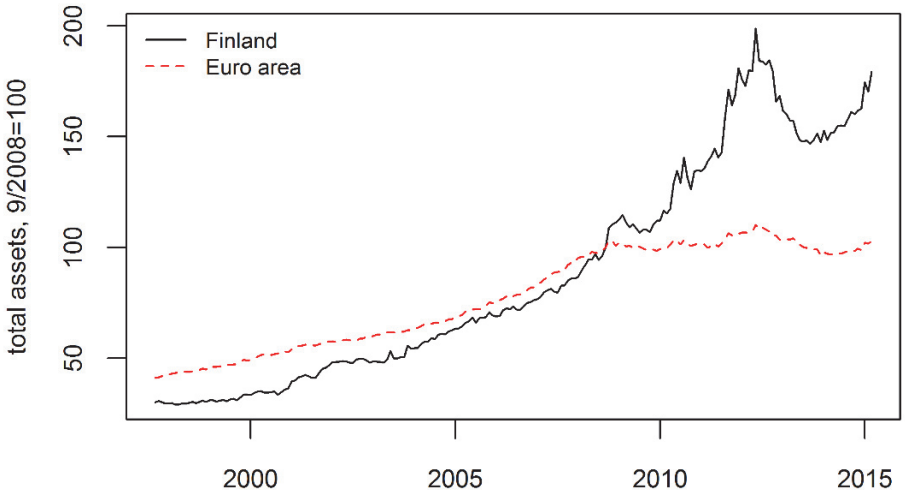


FIGURE 1 Total assets of MFIs. Source: ECB MFI statistics.

The stalled growth in the assets of the euro area MFIs reflects the many problems that the European banking sector has faced during the various stages of the global economic crisis, as well as the necessary deleveraging in some business areas and banking sectors. After 2007, a considerable number of European countries have experienced banking crises, which has meant significant losses and financial distresses in the banking systems and ensuing policy interventions (Laeven and Valencia, 2013). The major factors behind the fragility and decreased profitability of the banking systems have been large credit losses, the interconnectedness between banks and sovereigns, the dependence on wholesale funding, and high leverage (De Bruyckere et al., 2013; Le Leslé, 2012; Pagano et al., 2014). However, Finland has not experienced a banking crisis during the global economic crisis. The good performance of the Finnish banking sector is revealed in the evolution of non-performing loans (NPL), illustrated in Figure 2. The share of NPLs is much lower in the Finnish banks than in the EU on average, and the difference has increased during the crisis period. Overall, there are large differences in the NPLs among EU countries (EC, 2015).

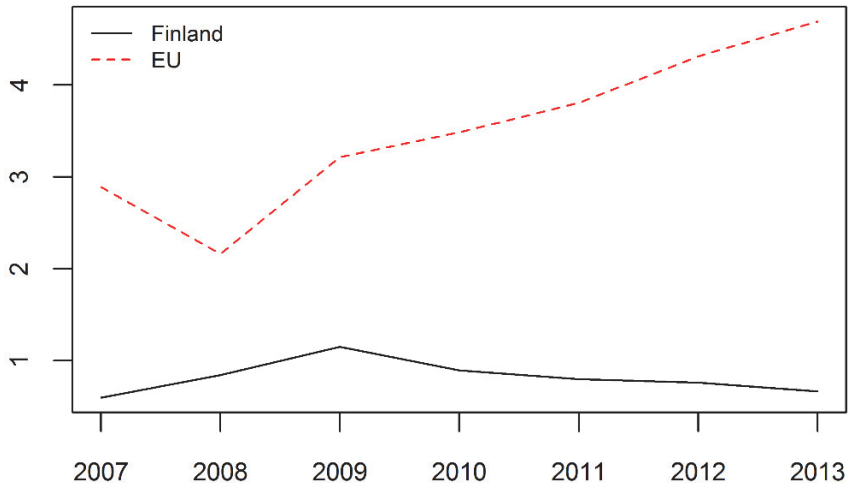


FIGURE 2 Gross total doubtful and non-performing loans [% of total debt instruments and total loans and advances]. Source: ECB consolidated banking data.

Retail banks generally weathered the crisis better than other banks, as they have been more stable, have needed less government support, and have lent more (Ayadi et al., 2011).[14] Nevertheless, the funding conditions of SMEs have tightened in particular due to banks' problems. There has been a large shift from bank finance to direct finance in capital markets during the crisis, but this option is often only possible for larger firms (e.g., Liikanen, 2012).

1.3.2 Evolution of loans and deposits before and after the crisis

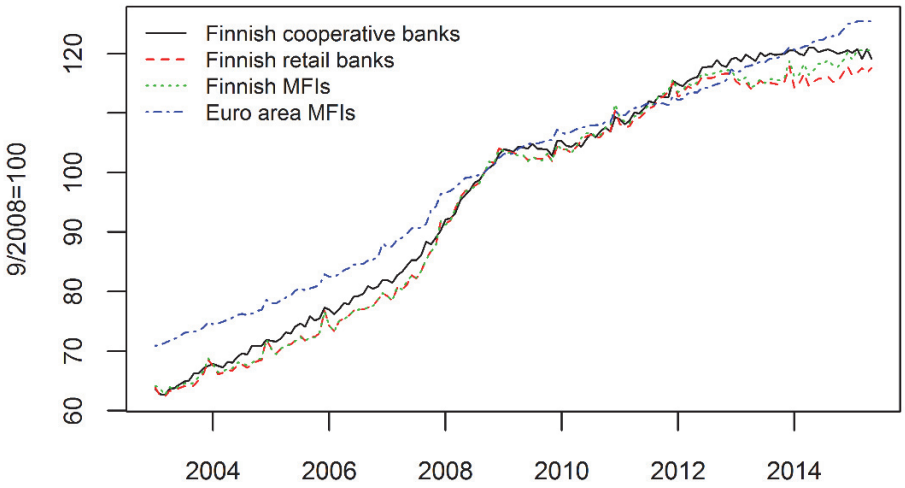
Figure 3 depicts the time series of loan and deposit volumes of households and non-financial corporations in the MFIs of the euro area and Finland, as well as in all retail banks and in the Finnish cooperative banks.[15] Panel A of Figure 3 illustrates that the evolution of deposits was rather similar in all groups after the onset of the crisis in 2008, whereas the growth of deposits was somewhat higher in Finland than in the euro area before the crisis. Panel B of Figure 3 illustrates that, after the onset of the crisis, the evolution of loans differed considerably between the euro area and Finland, as well as between all retail banks and the cooperative banks in Finland. The outstanding loans grew

14 There is also evidence that cooperative banks have succeeded on average more than other kind of bank during the crisis (Ferri et al., 2014).

15 I employ the same statistics for all the MFIs' deposits and loans in Finland and the euro area (ECB MFI statistics) and the same statistics for deposits and loans in all Finnish retail banks and in the cooperative banks in Finland (Bank of Finland statistics). Regarding the latter, the Finnish cooperative banks also include other cooperative banks than those of the OP Financial Group, but their share is minor. In 2014, the market share of the OP Group in loans was 34.2%, whereas the market share of the other cooperative banks (POP Bank Group) was 1.8% (see https://www.fkl.fi/en/material/publications/Pages/Banks.aspx).

steadily in Finland during the crisis, but in the euro area, the growth of outstanding loans stalled after the onset of the crisis. In Finland, the loan growth was higher in cooperative banks than in all retail banks after 2008. Consequently, the market share of the OP Financial Group in total loans increased from 32.0% to 34.2% between 2008 and 2014.

Panel A. Deposits from euro area non-financial corporations and households



Panel B. Loans to euro area non-financial corporations and households

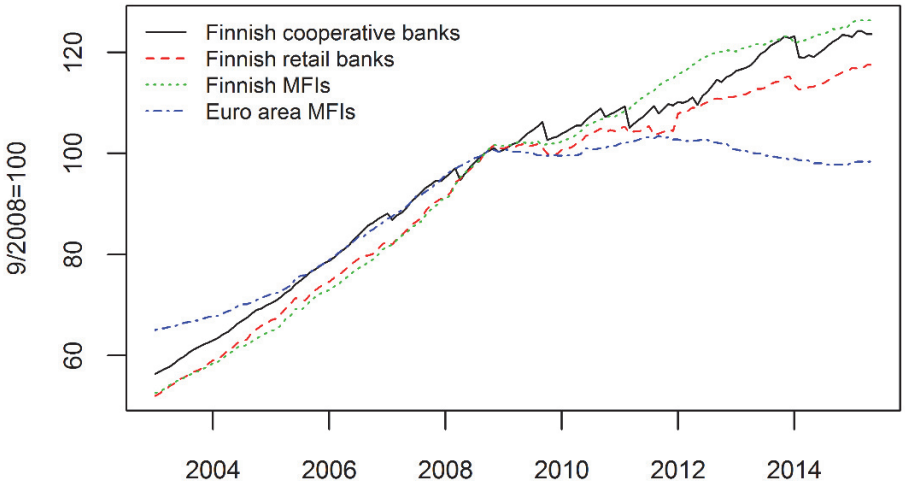


FIGURE 3 The evolution of deposit and loan volumes in the euro area and in Finland. Sources: ECB MFI statistics, Bank of Finland.

Figure 4 illustrates the evolution of business lending. It depicts the indices of the 12-month moving averages of new loan volumes below and above 1 million in Finland and the euro area. In addition, the figure depicts the moving

averages of all new business loans of the cooperative banks of the OP Financial Group that can be assumed to be mostly below 1 million in size. This is because OP Corporate Bank plc, which is one of the subsidiaries of the central organization of the Group, manages its large-business loans. Before the crisis, the growth of new loans was higher in large loans than in small loans both in Finland and in the euro area. The growth of new loans at the OP Financial Group cooperative banks was somewhat higher than that of small loans in Finland and the euro area. The figure also shows that the volumes of new business loans began to decrease before the final onset of the global financial crisis in September 2008. After that, the decrease of new loans continued in most of the groups to the end of the data period in March 2013. A notable exception is that the growth of new loans increased significantly in the cooperative banks of the OP Financial Group after 2009.

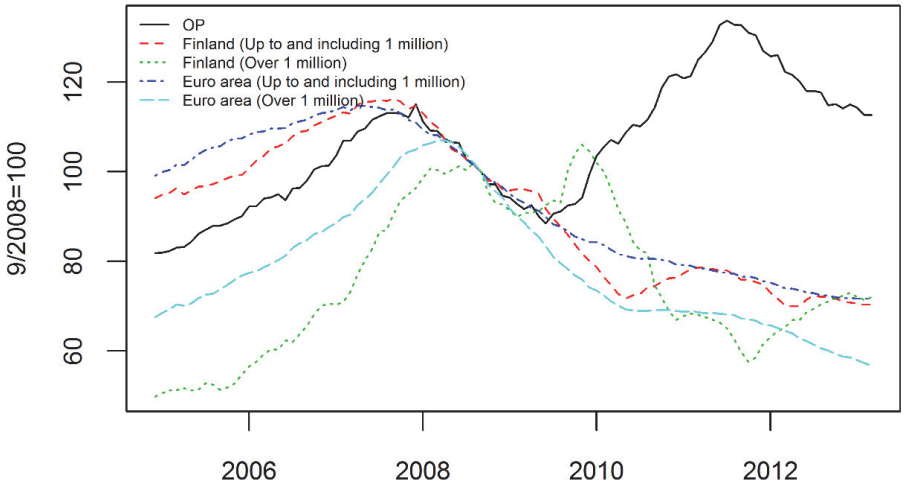


FIGURE 4 The volumes of new business loans in the euro area, Finland, and the cooperative banks of the OP Financial Group. Sources: ECB MFI statistics, OP Financial Group.

The financing conditions of firms in the euro area can also be assessed based on the euro area bank lending survey and the survey on the access to finance of enterprises. [16] There are also national surveys on financing conditions in Finland.[17] These surveys imply that lending standards tightened, and rationing increased significantly during the crisis. Loan availability has been better in

16 Euro area bank lending survey: https://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html; survey on the access to finance of enterprises: https://www.ecb.europa.eu/stats/money/surveys/sme/html/index.en.html.

17 Yritysrahoituskyselyt (in Finnish), see http://www.suomenpankki.fi/fi/julkaisut/selvitykset_ja_raportit/rahoituskyselyt/pages/default.aspx.

Finland than in the euro area on average throughout the crisis, but the surveys do show some tightening in lending standards in Finland during the crisis, particularly for small firms.

1.3.3 Competitive environment and loan and deposit prices

The EC's 2015 European Financial Stability and Integration Review provides a comprehensive assessment of the competitive environment of the European banking sector and its recent development (EC, 2015). It describes that concentration, measured by concentration ratios (CR) and the HHI, increased from 1997 to 2013, and that the crisis had only a small impact on this development. There are big differences in the concentration of banking sectors between countries: Germany, France, and Italy are among the least concentrated, and Greece, Finland, and the Netherlands are among the most concentrated (see also, ECB, 2016). The review also considers the development of other measures of bank competition. The Lerner index and Boone indicator suggest somewhat opposing developments of competition, especially after the onset of the crisis. The Lerner index values were high—indicating low competition—before the crisis but decreased significantly in 2011. Instead, the evolution of the Boone indicator suggests tightened competition in the run-up to the crisis and decreasing competition after 2007. The evolution of bank competition can also be considered based on the ECB lending surveys that ask the euro area banks directly about bank competition conditions. These surveys indicate increasing competition before the crisis, a clear decline in competition after the onset of the crisis, a short-lived resurgence in competition before the sovereign debt crisis that again decreased the pressure of competition, and increasing competition from 2014 onwards. An interesting observation from these surveys is that they show that competitive pressure from market-based financing grew after the crisis.

Kauko (2007) examines the development of bank competition in Finland before the crisis in the period from 1990 to 2006 and find evidence for increasing competition, but the results are not statistically significant. To my knowledge, there is no comprehensive comparison of bank competition in Finland relative to other countries. The Finnish banking sector is highly concentrated compared to the other European countries, but this does not necessarily indicate loose competition. Loan and deposit rates are one way to compare competitive conditions. Kauko (2007) describes how there were arguments in favor of tightened competitive environments based on lowered loan margins in Finland. However, he argues that the level of loan prices is an incomplete measure of competition due to other affecting factors like the riskiness of loans. Deposit prices, in turn, can depend significantly, for instance, on the funding conditions of banks in different countries. Nevertheless, the comparison of loan and deposit prices in Finland and in the euro area shed some light on the bank competition in Finland relative to the euro area on average.

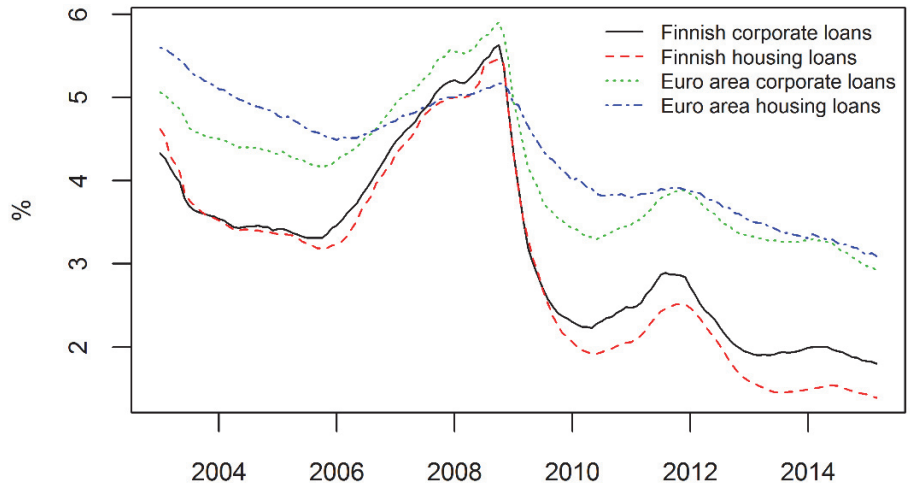
Figure 5 depicts the evolution of loan and deposit rates in the euro area and Finland. Panel A of Figure 5 illustrates that the interest rates on both

corporate and housing loans were lower in Finland than in the euro area on average most of the time between 2003 and 2015, and that the differences increased after the start of the financial crisis. The variation in loan rates has been greater in Finland, which mainly reflects the significant share of short-term and variable rate loans in Finland.[18] Over time, the level of loan rates has been much lower in Finland than in the euro area on average, which suggests that competition in Finnish lending markets has been relatively fierce. In addition, the difference in the average loan rates between Finland and the euro area increased after the onset of the financial crisis. This evolution reflects the relatively good condition of the Finnish banking sector and economy during the various stages of the global economic crisis. Panel B of Figure 5 illustrates that the average interest rates on current account deposits have been very similar in Finland and the euro area over time. The average interest rates on term deposits differ somewhat, and these deposit rates were lower in Finland than in the euro area, particularly after the onset of the crisis.

Figure 6 focuses on the interest rates of new business loans. The figure shows the evolution of the average loan rates separately for small and large loans in Finland and the euro area, as well as for all new business loans in the OP Financial Group cooperative banks. A fundamental observation is that the difference of the average loan rates for small and large loans rose after the onset of the crisis, particularly in the euro area on average. In addition, the interest rates on new loans have been significantly lower in Finland and the OP Financial Group than in the euro area during the crisis, whereas the differences were much smaller before the crisis. The figure suggests relatively unfavorable financing conditions for SMEs during the crisis, but not so much in Finland than in the euro area on average.

18 See e.g., Paries et al., 2014, p. 9.

Panel A. Interest rates on outstanding loans



Panel B. Interest rates on deposits

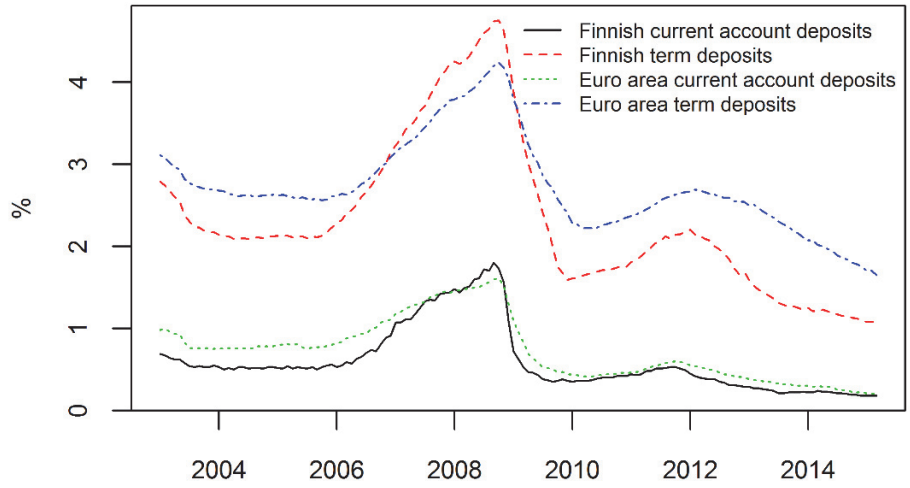


FIGURE 5 Loan and deposit rates in the euro area and Finland. Source: ECB MFI statistics.

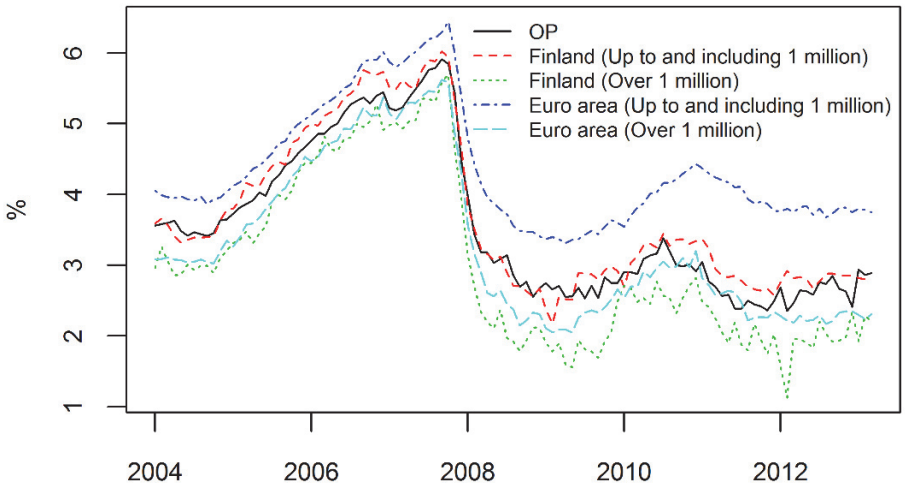
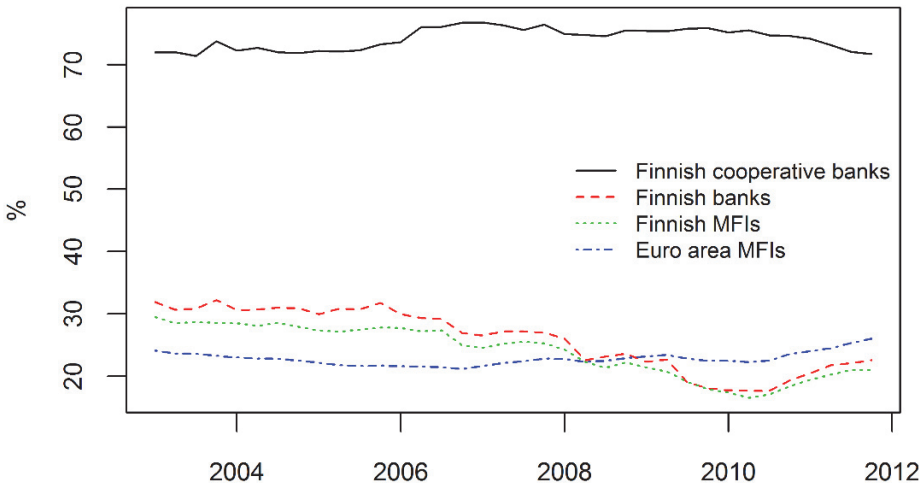


FIGURE 6 Interest rates on new business loans. Sources: ECB MFI statistics, OP Financial Group

Figure 7 presents the shares of deposits and loans on the banks' balance sheets. The figure illustrates the importance of the traditional financial intermediation and the differences of the funding structures in banks. I employ the ECB MFI statistics to provide the comparable figures for the euro area and Finland, and Bank of Finland statistics provide the comparable figures for all Finnish banks and Finnish cooperative banks. Panel A of Figure 7 shows that the share of deposits in total liabilities was approximately between 20% and 30% in the whole banking sector of Finland and the euro area between 2003 and 2013. In Finnish cooperative banks, the share of deposits was approximately 70% during that period. Panel B of Figure 7 shows largely similar patterns in the shares of loans, where the shares were approximately 30% to 40% in the whole banking sector of Finland and the euro area and approximately 80% in Finnish cooperative banks. These figures highlight the focus of Finnish cooperative banks on retail banking. In addition, the figures show that the shares of both loans and deposits have decreased in the whole Finnish banking sector after the financial crisis. However, this reflects a significant growth in the balance sheets of the banking sector instead of a weak development in the amount of loans and deposits (see Figures 1 and 3).

Panel A. The share of deposits in total liabilities



Panel B. The share of loans in total assets

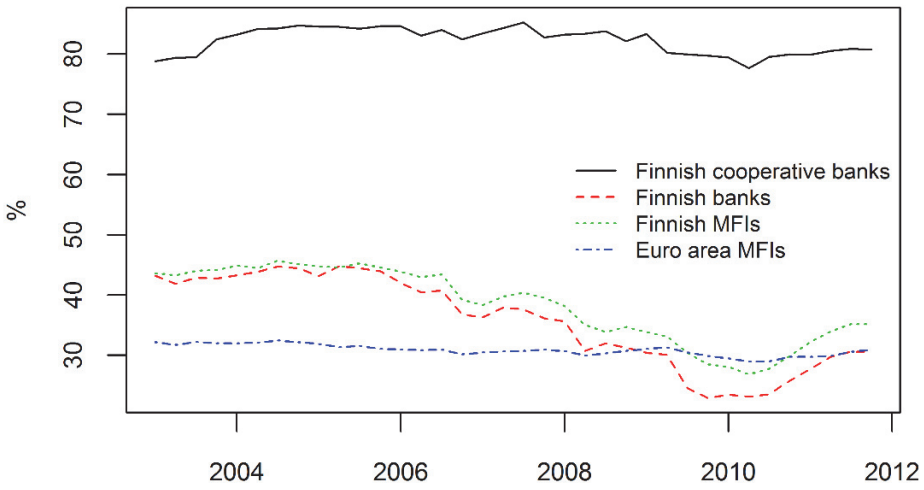


FIGURE 7 The shares of loans and deposit in total assets and liabilities. Sources: ECB MFI statistics, Bank of Finland.

Figure 8 presents the evolution of interest rate margins—the difference between the average loan rate and the average deposit rate—in all Finnish (deposit) banks and in Finnish cooperative banks. The figure illustrates that bank interest rate margins have decreased significantly after the onset of the financial crisis, which is due to the loose monetary policy and extremely low interest rates. The evolution of the interest rate margins has been similar in Finnish cooperative banks and all banks in Finland, especially during the crisis. The figure indicates the significant pressure of the low interest rate environment on the profitability of traditional financial intermediation. There are no similar statistics for bank

interest rate margins in the whole euro area. The evolution of the loan and deposit rates presented in Figure 5 suggests that the average interest rate margins of the euro area have decreased in the low interest rate environment but not as much as in Finland. One important reason for that is the predominance of variable rate loans in Finland.[19] In any case, the low interest rate environment has caused profitability pressure, especially for the traditional retail banks whose main business is to grant loans and collect deposits (see also, e.g., FFI, 2014; Hannoun, 2015).

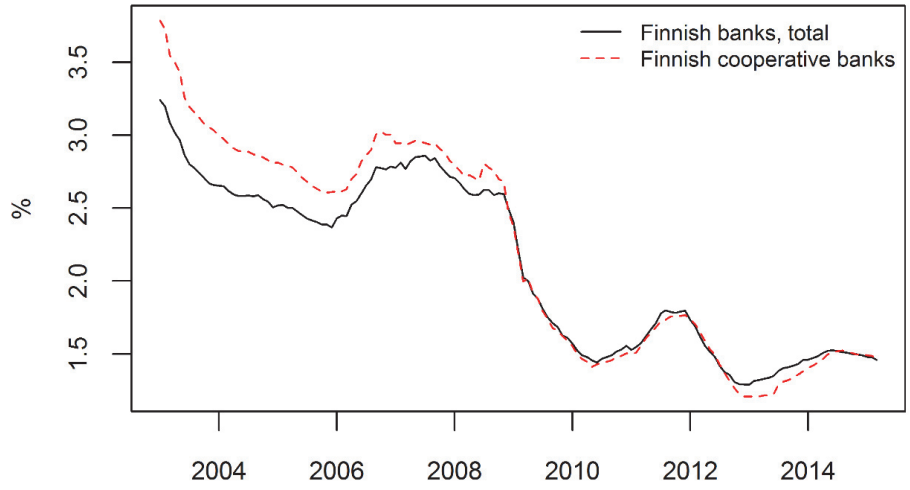


FIGURE 8 Bank interest margins in Finland. Source: Bank of Finland.

1.3.4 Summary

Banks play an important role in the European financial system. The Finnish banking system is an integral part of the euro area banking system. Both the Finnish and euro area banking systems include a wide variety of banks. Universal banks are typical both in Finland and in the euro area, but at the same time, the relatively small cooperative and savings banks focusing on retail banking play a large role.

The datasets of my research articles consist of the information on the cooperative banks of the Finnish OP Financial Group. These cooperative banks are traditional retail banks that focus on traditional financial intermediation and where relationship banking is typical. They operate in local banking markets in the entire area of Finland. Even if the Finnish banking sector is highly

[19] The ECB, 2010) shows that the effects of market interest rates on interest margins differ between the euro area countries where floating rate loans are dominant (Ireland, Greece, Spain, Italy, Austria, Portugal, and Finland) and where fixed rate loans are dominant (Belgium, Germany, France, and the Netherlands).

concentrated, the average loan and deposit prices in Finland compared to those of the whole euro area suggest relatively fierce competition.

The figures in this section indicate that the Finnish banking sector has performed relatively well after the onset of the financial crisis. Both the total size of the banking sector and the amounts of loans and deposits have grown more in Finland than in the whole euro area. In Finland, cooperative banks have increased their market shares in loan markets. The amount of non-performing loans has also been at a much lower level in the Finnish banks than in the whole euro area. These characteristics are taken into account in the research questions and the interpretations of the results of the empirical articles. The focus is on the changes in the banking environment that were mainly due to exogenous shocks to the Finnish banking sector.

The figures of this section also support a common concern about the particular funding problems of SMEs during the crisis. The average interest rates on small-business loans have not decreased as much as those of large-business loans when market interest rates have fallen to very low levels. In addition, the evolution of the amount of new loans has been better for large loans. However, the business lending activity of the OP Financial Group cooperative banks, which focus on SMEs in business lending, has been relatively high during the crisis.

1.4 Summaries of the research articles

1.4.1 Local bank competition and small-business lending after the onset of the financial crisis

In this article, I examine whether and how the effects of the financial crisis on small business lending depended on local competitive environments. In the previous literature, changes in loan supply during crises have been explained by bank balance sheet factors (e.g., Bernanke and Lown, 1991; Jimenez et al., 2012b). Studies concerning the availability and costs of bank loans during the recent crisis focus particularly on the role of the bank funding structure (Ivashina and Scharfstein, 2010; Cornett et al., 2011) and examine the effects of loan losses (Puri et al., 2011; Santos, 2011) and more indirect factors, such as changes in risk tolerance (Albertazzi and Marchetti, 2010). I contribute to this literature by examining whether the market structures of and pre-crisis competition among local banks were also relevant factors for explaining heterogeneous changes in the volumes and prices of small business loans after the onset of the financial crisis. Different competitive environments can explain heterogeneous changes in loan volumes and prices during crises, because changes in competition during crises (see Ruckes, 2004) and characteristics relevant to lending during the crisis—such as risk-taking, relationship banking, and the funding structure—can depend on the pre-crisis competitive

environment (see Keeley, 1990; Boyd and Nicolo, 2005; Petersen and Rajan, 1995; Graig and Dinger, 2013).

I employ unique data on the local cooperative banks of the Finnish OP Financial Group that contain monthly information on the volumes and the average margins of new small-business loans during the period from 2004 through 2010. I also have data on local economic characteristics and the number of bank branches that are combined for each local banking market. In my auxiliary analysis, I also use the loan-specific data that are available for the crisis period, i.e., after September 2008. Because the accurate measurement of bank competition is very challenging, I use two measures. My first measure is the HHI. This index is a market structure measure based on the number of branches of various banks in the main operating area of each cooperative bank. My second measure is the Lerner index. It refers to the gap between prices and marginal costs and is a more direct competition measure that is widely used in the banking literature (e.g., Carbo et al., 2009).

My results indicate that the competitiveness of local banking markets influences how lending transforms in response to a crisis. First, I find that after the onset of the financial crisis, the volumes of new small-business loans decreased more in the more competitive local markets. Second, I find that the margins of new business loans increased to a greater extent in more competitive local markets. The loan margins were lower in more competitive banking markets before the crisis, in line with previous studies (e.g., Hannan, 1997). However, this difference diminished significantly during the crisis. Auxiliary analyses suggest that the greater impacts of the crisis in more competitive markets are likely attributable to the degree of competition that was leveled off between the more and less competitive markets throughout the crisis. I also find that the banks operating in the more competitive environments are more dependent on market-based funding. This may have been an indirect effect of the competitive environment. The results based on loan-specific data exclude the view that changes in small-business credit risks or banks' risk-taking would explain greater increases in loan margins in the more competitive local markets.

Overall, my results suggest that differences in competitive environments can induce heterogeneous changes in lending conditions between normal and crisis periods. This finding is relevant for the purposes of bank regulation and supervision, because the control of excessive procyclicality in lending remains a critical concern. Moreover, the results suggest that the heterogeneous effects of crises on local economies transmitted through local banks (see Gozzi and Goetz, 2010) can also depend on local competitive environments.

1.4.2 Retail bank interest margins in low interest rate environments

In this article, I examine the relationship between market interest rates and retail bank interest margins and its implications for bank profitability and the interest rate channel of monetary policy in a low interest rate environment. There is well-established literature on the determinants of bank interest margins, but literature with a focus on the role of market interest rate levels is limited

limited (e.g., Angbazo, 1997; Ho and Saunders, 1981; Lepetit et al., 2008; Maudos and Fernández de Guevara, 2004; Saunders and Schumacher, 2000). I contribute to this literature by empirically examining the effects of market interest rates on bank interest margins using detailed bank-specific data. The data period includes a low interest rate environment that can have specific effects due to the zero lower bound for deposit rates.[20] I take this into account by allowing for nonlinearities in the relationship between market interest rates and bank interest margins (see, Borio et al., 2015).

I employ a detailed dataset of Finnish local retail banks covering the period between January 2005 and March 2014. This period witnessed significant changes in the ECB policy rates and market interest rates and, consequently, experienced a shift to a low interest rate environment. I utilize two different bank interest margin measures that are the interest rate spread between the stocks of loans and deposits and the interest rate spread between new loans and deposits. The interest rate spread between the stocks of loans and deposits reflects past pricing decisions and contract types and is a key determinant of retail bank profitability. The interest rate spread between new loans and deposits reflects current pricing behavior.

My results indicate that there is a strong positive relationship between market interest rate levels and interest rate spreads, which are mainly attributable to rigid interest rates on current account deposits. The results of nonlinear smooth transition regressions (STR) reveal the interesting effects of a low interest rate environment. The positive relationship between the market interest rate (the 3-month Euribor) and the interest rate spread between the stocks of loans and deposits is significantly stronger in a low interest rate environment. This result is due to the combination of mechanically changing interest rates on variable rate loans and the increasing rigidity of interest rates on core deposits in a low interest rate environment. However, the positive relationship between the market interest rate and the interest rate spread between new loans and deposits disappears and even becomes negative in a low interest rate environment. This result is due to significant increases in the spreads on new loans reflecting banks' pricing reactions to maintain a sufficient interest rate spread between new loans and deposits in a low interest rate environment.

Overall, my results suggest that the level of market interest rates is an important determinant of bank interest margins and, thus, the profitability of retail banking. In a low interest rate environment, the pressure on bank profitability increases due to the zero lower bound for deposit rates. In this situation, banks can maintain a sufficient interest rate spread between new loans and deposits by increasing the spreads on new loans. An important

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20 The zero lower bound for deposit rates is not absolute, but the basic obstacle, at least for large negative rates, is a guaranteed zero nominal interest rate for paper currency (see, e.g., Agarwal and Kimball, 2015). In practice, the zero lower bound for retail deposits has been a relevant restriction, and negative rates have been rare exceptions.

implication of increasing loan spreads is that the pass-through from policy rates to new loan rates weakens.

1.4.3 Relationship banking and the financial difficulties of SMEs in the aftermath of the crisis

In this article, I examine the association of bank relationship strength with the performance of SMEs after the onset of the financial crisis in 2008. Previous literature finds many benefits of relationship banking in times of crisis, such as the better availability and terms of loans (e.g., Alexandre et al., 2014; Cotugno et al., 2013; Jiangli et al., 2004). I contribute to this literature by examining the effects of relationship banking on the occurrence of/survival from the financial difficulties of SMEs during the five-year period after the onset of the 2008 financial crisis. Some previous studies examine the effects of relationship banking on firms' defaults during the recent financial crisis, but they do not focus exclusively on SMEs (Bolton et al., 2013a; Fiordelisi et al., 2014). To my knowledge, there are no studies that focus on the role of relationship banking in firms' survival from financial distress during economy-wide periods, but previous studies consider the issue in the case of firms' idiosyncratic shocks (e.g., Hoshi et al., 1990; Rosenfeld, 2014).

I use proprietary data on the SME customers of the Finnish OP Financial Group local cooperative banks. The dataset consists of complete credit file information on all firm customers of the cooperative banks, and I exclude the largest firms (an annual turnover of over 50 million euros) to focus purely on SMEs. My analysis is based on the follow-up of the pool of SMEs that were customers of the cooperative banks in August 2008, i.e., just before the onset of the global financial crisis. I measure relationship strength by relationship length and the existence of a checking account. In the first analysis, I examine the effect of relationship strength on the probability of financial difficulties in the two years after the onset of the crisis in 2008. Recognition of the financial difficulties is based on credit rating information, and I use two measures for that. The first measure is a default condition, which indicates that a firm has serious payment defaults, is under debt restructuring, or is bankrupted. The second measure is a less severe distress condition that is defined by a downgrade to a weak credit rating category. In the second analysis, I examine the effects of relationship strength on the probability of alternative outcomes for those SMEs that faced financial difficulties during this two-year crisis period. The four possible outcomes are bankruptcy, recovery from default/improvement in the credit rating, still defaulted/distressed, and exit from the data without the indication of bankruptcy.

My results reveal that relationship strength is negatively associated with the probability of financial difficulties and positively associated with the probability of a favorable outcome for the distressed SMEs. First, I find that a longer relationship and the existence of a checking account are negatively associated with both the probability of default and the probability of experiencing less severe distress during the two years following the onset of the

crisis. Second, I find that relationship length has a positive connection with the probability of recovery from default and improvement in credit rating, and a negative relationship with the probability of bankruptcy over three years after the identification of financial difficulties.

Overall, my results provide additional evidence of the benefits of relationship banking in crisis periods (see, e.g., Beck et al., 2014b; Dewally and Shao, 2014). The findings suggest that relationship lending can improve the quality of lending and facilitate SMEs' survival throughout temporarily worse economic conditions.

1.5 Implications of the thesis

The three articles of this thesis consider the effects of the financial crisis and the ensuing global recession on the retail banking environment, as well as banks' behavior during this crisis period. In this section, I provide the main implications of the thesis from both banks' and public policy perspectives. I also take a slightly broader perspective on the topics of the articles regarding the outlook of retail banking. Finally, I suggest some directions for future research.

1.5.1 Business implications

The findings of the articles have implications for bank profitability during the financial crisis and/or in the operating environment in the aftermath of the crisis. The results suggest that the decreased pressure of competition might have alleviated profitability concerns during the crisis, but the low interest rate environment due to expansionary monetary policy has been detrimental to the profitability of retail banks. The results also indicate that banks have been willing to help their long-term SME customers over difficult times. This may have been done at the expense of the short-term profitability of these customers based on the long-term profitability perspective. The evolutions of a competitive environment, market interest rates, and the role of relationship banking are essential issues regarding the profitability of retail banking in the future.

The first article highlights the relevance of bank competition for the lending behavior of retail banks. In particular, the results suggest that the differences in bank competition between (local) markets and over business cycles result in significant differences in loan prices. As the level of loan prices is an essential element of the profitability of retail banking, the development of a competitive environment is important for banks. The legacy of the crisis and the technological development in the financial system can have significant effects on the future competitive environment of retail banking because of increased competition from outside the traditional banking sector. The increasing roles of shadow banking and technological development have significantly transformed financial intermediation since even before the crisis,

but the crisis has likely affected these trends.[21] New technology and digitalization have generated and enabled the entry of new competitors into banking activities (Barty and Ricketts, 2014). Some shadow banking activities, like securitization, contracted after the onset of the crisis. However, the tougher bank regulations following the recent crisis have helped the rise of shadow banking (Nash and Beardsley, 2015).

The second article finds that a low interest rate environment exerts significant pressure on the interest rate spread between loans and deposits and, thus, on the profitability of the traditional intermediation activities of banks. The main reason for that is the zero lower bound for deposit rates. Hence, an advantage of the low funding costs of retail banks due to low deposit rates, particularly regarding current account deposits, diminishes or disappears in a low interest rate environment. The key ways for banks to maintain profitability are increasing loan margins and other revenues, as well as reducing costs. My article considers the pricing of new loans and finds significantly increased spreads. There are also indications that the share of other income sources has risen during the crisis and in the recent low interest rate environment (e.g., Liikanen, 2012).[22] Regarding the future, an interesting question is whether the traditional intermediation activities are again more profitable business for retail banks when market interest rates rise to a higher level. There are a couple of potential reasons for increased competition for deposit funding, which can mitigate the advantage of low deposit funding costs in higher interest rate environments. It has been desirable to increase the share of deposit funding because of the vulnerability of non-deposit funding observed during the crisis (Le Leslé, 2012). Moreover, technological development has made bank switches much easier.

The third article suggests the importance of relationship banking during crises. The results indicate that (local) retail banks want to maintain customer relationships with their (key) SME customers and are willing to support them through the economy-wide crisis. However, technological development and new competitors have increased the role of transaction-based financing (Boot, 2014). Regarding the future of relationship banking, a relevant question is whether there are such advantages to relationship banking that it is profitable for banks to invest in costly information gathering, e.g., through a local presence (see also, Boot and Thakor, 2000). The crisis has, on the one hand, made the operating environment of traditional retail banks more difficult and, thus, for its part, weakened the state of relationship banking. On the other hand, many studies have shown the particular importance of relationship banking during the recent crisis. Relationship banking typically has been seen to be the most relevant in SME financing (Hasan et al., 2014; Stein, 2002). In the discussion on the future of the banking industry, a common view is that SME

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21 Shadow banks and non-banks refer to bank-like systems—activities and institutions outside the traditional banking system—but there are various definitions due to the complexity of the issue (Adrian and Ashcraft, 2012; Claessens and Ratnovski, 2014).

22 See also Lepetit et al. (2008), who found that decreased profitability through fierce competition led to the diversification of banks into new activities.

markets can be relatively difficult to disrupt because SMEs often want overall solutions for their financial and payment services (Barty and Ricketts, 2014).

1.5.2 Public policy implications

The results of this thesis have implications for the conduct of macroprudential and monetary policy. The main goal of macroprudential policy is to preserve financial stability. The results suggest that a competitive environment, a low interest rate environment, and relationship banking can affect bank profitability and/or the procyclical lending that are key determinants of financial stability. The results also have implications for the functioning and the potentially heterogeneous effects of monetary policy in a low interest rate environment.

The results of the first article suggest that competition can be a relevant factor for the pro-cyclical lending that has received increased attention on the regulatory agenda in the aftermath of the financial crisis. A central goal of macroprudential regulation is to prevent excessive pro-cyclicality in lending practices, but competition issues have not been widely discussed in this context. In addition, the competitive environment of traditional banks is changing significantly due to digitalization and new players (see, e.g., Barty and Ricketts, 2014). It is essential that this new competitive environment of financial services is understood well enough in order to avoid excesses in lending and to guarantee the fair regulatory treatment of different players.

The findings of the second article have three important public policy implications. First, a low interest rate environment puts significant pressure on retail bank profitability, which may be a threat to financial stability because weak profitability hampers the building of capital buffers and can increase banks' risk-taking (see, e.g., Borio and Zhu, 2012; ECB, 2015a; Jimenez et al., 2014). Second, the zero lower bound for deposit rates deteriorates the functioning of the traditional interest rate channel of monetary policy well before policy rates hit zero. Third, an impaired interest rate channel in a low interest rate environment can induce the heterogeneous effects of expansionary monetary policy on small and large firms. This is because small firms are typically very bank-dependent, whereas large firms can obtain funding directly from capital markets.

The results of the third article suggest that relationship banking has alleviated the negative effects of the recent crisis on SMEs. Thus, the results support existing evidence and arguments about the favorable role of relationship banking in crises (Beck et al., 2014b; Bolton et al., 2013a; Cotugno et al., 2013). Regarding the concern about excessive procyclicality in the financial system, relationship banking can smooth lending through the cycle (see, e.g., Boot, 2000; Deyoung et al., 2015). However, technological development and new competitors can diminish the role of relationship banking and more generally relationship-oriented activities. Bolton et al. (2013) propose that aggressive competition by transaction banks can undermine access to relationship banking. Boot (2014) argues that technological development and

the proliferation of financial markets have created a transaction-oriented financial landscape that is fundamentally unstable.

1.5.3 Implications for future research

The results and business and public policy implications of the articles raise several suggestions for future research. Generally, there have been significant changes in retail banking and its operating environment in the aftermath of the crisis, and much research is needed to assess the future development of retail banking and its effects on the functioning and stability of the financial system.

Regarding the first article, the effect of changes in competition on the heterogeneous responses of banks to crises has received little attention. More generally, competition can be a significant factor in procyclical lending, and additional research is needed to take this appropriately into account in bank regulation and supervision. If the procyclical effect of competition is observed, an additional interesting question is whether competition is too fierce in good times or too loose in bad times, or both. There is also need for additional, at least empirical, research about the mechanisms that cause changes in competition between good and crisis times.

The second article provides evidence that a low interest rate environment can exert substantial pressure on the profitability of the traditional intermediation activities of banks. Possible avenues for future research are to examine in detail the banks' various reactions to that and their implications for the functioning of the financial services markets. One interesting research topic would be to examine the relationship between bank characteristics and the effects of a low interest environment on profitability. Regarding the impaired interest rate channel of monetary policy in the low interest rate environment, future research could examine the importance of the zero lower bound for deposit rates relative to other factors that have been found to weaken the pass-through during the recent crisis, such as increased risks and weaker competition. One more interesting topic for future research would be to examine the potentially heterogeneous effects of expansionary monetary policy on small and large firms. This examination could be built on the finding of this article that the profitability of retail banking sets boundaries for the transmission of lower policy rates to retail loan rates.

The results of the third article suggest the favorable effects of a strong bank relationship on the survival of SMEs in crisis periods. An interesting question and a possible avenue for future research is whether the better short-term survival of SMEs with a strong long-term relationship leads to better long-term outcomes. More generally, it seems that the concept of relationship banking will be increasingly challenged in the future, and much research is needed understand the consequences of that for retail banking and the whole financial system.

REFERENCES

Accenture. 2014. The Rise of Fintech: New York ' s Opportunity For Tech Leadership.

Acharya, V.V. & Schnabl, P. 2010. Do Global Banks Spread Global Imbalances ? The Case of Asset-Backed Commercial Paper During the Financial Crisis of 2007 – 09. IMF Economic Review 58 (1), 37-73.

Acharya, V. V, Eisert, T., Eufinger, C. & Hirsch, C. 2016. Real Effects of the Sovereign Debt Crisis in Europe: Evidence from Syndicated Loans. Working paper. Available at SSRN: https://ssrn.com/abstract=2612855.

Adams-Kane, J., Jia, Y. & Lim, J. J. 2015. Global transmission channels for international bank lending in the 2007-09 financial crisis. Journal of International Money and Finance 56, 97–113.

Adams, R. M. & Amel, D. F. 2011. Market structure and the pass-through of the federal funds rate. Journal of Banking & Finance 35 (5), 1087–1096.

Adrian, T. & Ashcraft, A. B. 2012. Shadow banking: a review of the literature. Federal Reserve Bank of New York Staff Reports No. 580.

Agarwal, R. & Kimball, M. 2015. Breaking Through the Zero Lower Bound. IMF Working Paper 15/224.

Agarwal, S. & Hauswald, R. 2010. Distance and Private Information in Lending. Review of Financial Studies 23 (7), 2757–2788.

Agarwal, S., Mahoney, N. & Stroebel, J. 2015. Do Banks Pass Through Credit Expansions ? The Marginal Profitability of Consumer Lending During the Great Recession. NBER Working Paper No. 21567.

Aiyar, S. 2012. From Financial Crisis to Great Recession: The Role of Globalized Banks. American Economic Review 102 (3), 225–230.

Aiyar, S., Al-Eyd, A., Barkbu, B. & Jobst, A. A. 2015. Revitalizing Securitization for Small and Medium-Sized Enterprises in Europe. IMF Staff Discussion Note 15/07.

Albertazzi, U. & Marchetti, D. J. 2010. Credit Crunch, Flight to Quality and Evergreening : An Analysis of Bank-Firm Relationships After Lehman. Mimeo. Bank of Italy.

Albertazzi, U., Ropele, T., Sene, G. & Signoretti, F. M. 2014. The impact of the sovereign debt crisis on the activity of Italian banks. Journal of Banking & Finance 46, 387–402.

Alexandre, H., Bouaiss, K. & Refait-Alexandre, C. 2014. Banking Relationships and Syndicated Loans during the 2008 Financial Crisis. Journal of Financial Services Research 46 (1), 99–113.

Allen, F. & Gale, D. 2003. Competition and Financial Stability. Journal of Money, Credit & Banking 36 (3), 453–480.

Alsakka, R., ap Gwilym, O. & Vu, T. N. 2014. The sovereign-bank rating channel and rating agencies' downgrades during the European debt crisis. Journal of International Money and Finance 49, 235–257.

Amidu, M. & Wolfe, S. 2013. The impact of market power and funding strategy on bank-interest margins. The European Journal of Finance 19 (9), 888–908.

Angbazo, L. 1997. Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking. Journal of Banking & Finance 21 (1), 55–87.

Angelini, P., Grande, G. & Panetta, F. 2014. The negative feedback loop between banks and sovereigns. Bank of Italy Occassional Papers No. 213.

Apergis, N. & Christou, C. 2015. The behaviour of the bank lending channel when interest rates approach the zero lower bound: Evidence from quantile regressions. Economic Modelling 49, 296–307.

Ascraft, A. B. & Campello, M. 2007. Firm balance sheets and monetary policy transmission. Journal of Monetary Economics 54, 1515–1528.

Ayadi, R., Arbak, E. & Groen, W. P. De. 2011. Business Models in European Banking: A pre- and post- crisis screening. Center for European Policy Studies. Available at SSRN: https://ssrn.com/abstract=1945779.

Baas, T. & Schrooten, M. 2006. Relationship Banking and SMEs: A Theoretical Analysis. Small Business Economics 27 (2–3), 127–137.

Baldwin, R. & Giavazzi, F. 2015. The Eurozone Crisis: A Consensus View of the Causes and a Few Possible Solutions. VoxEU eBook. Available at: http://voxeu.org/content/eurozone-crisis-consensus-view-causes-and-few-possible-solutions.

Balluck, B. K., Galiay, A., Ferrara, G. & Hoggarth, G. 2016. The small bank failures of the early 1990s : another story of boom and bust. Bank of England Quarterly Bulletin 2016 Q1.

Bank of Finland 2015. Business Financing Survey 2015 (Yritysrahoituskysely 2015) (*Available in Finnish*).

Barone, G., Felici, R. & Pagnini, M. 2011. Switching costs in local credit markets. International Journal of Industrial Organization 29 (February), 694–704.

Bartoli, F., Ferri, G., Murro, P. & Rotondi, Z. 2013. SME financing and the choice of lending technology in Italy: Complementarity or substitutability? Journal of Banking & Finance 37 (12), 5476–5485.

Barty, J. & Ricketts, T. 2014. Promoting competition in the UK banking industry. BBA Competition Report. Available at: https://www.bba.org.uk/news/reports/promoting-competition-in-the-uk-banking-industry/#.WSqwVOsT7IV.

Basel Committee on Banking Supervision. 2016. Literature Review on Integration of Regulatory Capital and Liquidity. Basel Committee on Banking Supervision Working Paper No. 30.

Beck, T., Colciago, A. & Pfajfar, D. 2014. The role of financial intermediaries in monetary policy transmission. Journal of Economic Dynamics and Control 43, 1–11.

Beck, T., Coyle, D., Dewatripoint, M., Freixas, X. & Seabright, P. 2010. Bailing out the Banks: Reconciling Stability and Competition. Centre for Economic Policy Research.

Beck, T., Degryse, H., De Haas, R., & Van Horen, N. 2014. When Arm ' s Length Is Too Far. Relationship Banking over the Business Cycle. BOFIT Discussion Papers 14/2014.

Beck, T., Demirgüç-Kunt, A. & Levine, R. 2006. Bank concentration, competition, and crises: First results. Journal of Banking and Finance 30 (5), 1581–1603.

Beck, T., Jonghe, O. De & Schepens, G. 2013. Bank competition and stability : Cross-country heterogeneity. Journal of Financial Intermediation 22 (2), 218–244.

Becker, B. & Ivashina, V. 2014. Cyclicality of credit supply: Firm level evidence. Journal of Monetary Economics 62 (1), 76–93.

Behn, M., Haselmann, R. & Wachtel, P. 2016. Pro-Cyclical Capital Regulation and Lending. The Journal of Finance 71 (2), 919–956.

Belke, A., Beckmann, J. & Verheyen, F. 2013. Interest rate pass-through in the EMU – New evidence from nonlinear cointegration techniques for fully harmonized data. Journal of International Money and Finance 37, 1–24.

Berger, A. N., Demirgüç-Kunt, A., Levine, R. & Haubrich, J. G. 2004. Bank Concentration and Competition: An Evolution in the Making. Journal of Money, Credit & Banking 36 (3), 433–451.

Berger, A. N. & Hannan, H. 1989. The Price-Concentration Relationship in Banking. The Review of Economics and Statistics 71 (2), 291–299.

Berger, A. N., Klapper, L. F. & Turk-Ariss, R. 2009. Bank Competition and Financial Stability. Journal of Financial Services Research 35 (2), 99–118.

Berger, A. N. & Udell, G. F. 1995. Relationship Lending and Lines of Credit in Small Firm Finance. The Journal of Business 68 (3), 351–381.

Berger, A. N. & Udell, G. F. 1998. The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. Journal of Banking & Finance 22 (6–8), 613–673.

Berger, A. N. & Udell, G. F. 2002. Small business credit availability and relationship lending: The importance of bank organisational structure. Economic Journal 112, 32–53.

Berger, A. N. & Udell, G. F. 2006. A more complete conceptual framework for SME finance. Journal of Banking and Finance 30 (11), 2945–2966.

Bernanke, B. S. & Blinder, A. S. 1988. Credit, Money , and Aggregate Demand. The American Economic Review 78 (2), 435–439.

Bernanke, B. S. & Gertler, M. 1995. Inside the Black Box : The Credit Channel of Monetary Policy Transmission. The Journal of Economic Perspectives 9 (4), 27–48.

Bernanke, B. S., Gertler, M. & Gilchrist, S. 1996. The financial accelerator and the flight to quality. The Review of Economics and Statistics 78 (1), 1–15.

Bernanke, B. S. & Lown, C. S. 1991. The Credit Crunch. Brookings Papers on Economic Activity 1991 (2), 205–247.

Bharath, S. T., Dahiya, S., Saunders, A. & Srinivasan, A. 2011. Lending relationships and loan contract terms. Review of Financial Studies 24 (4), 1141–1203.

Bologna, P. 2015. Structural Funding and Bank Failures: Does Basel 3 Net Stable Funding Ratio Target the Right Problem? Journal of Financial Services Research 47, 81–113.

Bolton, P., Freixas, X., Gambacorta, L. & Mistrulli, P. E. 2013. Relationship and Transaction Lending in a Crisis. BIS Working Papers No. 417.

Boot, A. W. A. 2000. Relationship Banking: What Do We Know? Journal of Financial Intermediation 9 (1), 7–25.

Boot, A. W. A. 2014. Financial Sector in Flux. Journal of Money, Credit and Banking 46 (1).

Boot, A. W. A. & Thakor, A. V. 1994. Moral Hazard and Secured Lending in an Infinitely Repeated Credit Market Game. International Economic Review 35 (4), 899–920.

Boot, A. W. A. & Thakor, A. V. 2000. Can Relationship Banking Survive Competition? The Journal of Finance 55 (2), 679–713.

Borio, C. & Disyatat, P. 2009. Unconventional monetary policies: an appraisal. BIS Working Papers No. 292.

Borio, C., Gambacorta, L. & Hofmann, B. 2015. The influence of monetary policy on bank profitability. BIS Working Papers No. 514.

Borio, C. & Zhu, H. 2012. Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism? Journal of Financial Stability 8 (4), 236–251.

Bowman, D., Cai, F., Davies, S. & Kamin, S. 2015. Quantitative Easing and Bank Lending: Evidence from Japan. Journal of International Money and Finance 57, 15–30.

Boyd, J. H. & De Nicolo, G. 2005. The Theory of Bank Risk Taking and Competition Revisited. The Journal of Finance 60 (3), 1329–1343.

Brick, I. E. & Palia, D. 2007. Evidence of jointness in the terms of relationship lending. Journal of Financial Intermediation 16, 452–476.

Brock, P. L. & Rojas Suarez, L. 2000. Understanding the behavior of bank spreads in Latin America. Journal of Development Economics 63 (1), 113–134.

Brunner, A. & Krahnen, J. P. 2008. Multiple Lenders and Corporate Distress: Evidence on Debt Restructuring. The Review of Economic Studies 75 (2), 415–442.

Brunnermeier, M. K. 2009. Deciphering the Liquidity and Credit Crunch 2007–2008. Journal of Economic Perspectives, 23 (1), 77–100.

Brunnermeier, M. K. & Koby, Y. 2017. The "Reversal Interest Rate": An Effective Lower Bound on Monetary Policy. Working Paper.

Butt, N., Churm, R. & Mcmahon, M. 2014. QE and the bank lending channel in the United Kingdom. Bank of England Working Paper No. 511.

Calomiris, C. W. & Nissim, D. 2014. Crisis-related shifts in the market valuation of banking activities. Journal of Financial Intermediation 23 (3), 400–435.

Campello, M., Graham, J. R. & Harvey, C. R. 2010. The Real Effects of Financial Constraints: Evidence from a Financial Crisis. Journal of Financial Economics 97 (3), 470–487.

Carbo-Valverde, S., Rodriguez-Fernandez, F. & Udell, G. F. 2009. Bank Market Power and SME Financing Constraints. Review of Finance 13 (2), 309–340.

Carbo-Valverde, S., Rodríguez Fernández, F. & Udell, G. F. 2016. Trade Credit, the Financial Crisis, and SME Access to Finance. Journal of Money, Credit & Banking 48 (1), 113–143.

Carbo, S., Humphrey, D., Maudos, J. & Molyneux, P. 2009. Cross-country comparisons of competition and pricing power in European banking. Journal of International Money and Finance 28 (1), 115–134.

Castelli, A., Dwyer, G. P. & Hasan, I. 2012. Bank relationships and firms' financial performance: The Italian experience. European Financial Management 18 (1), 28–67.

Chang, C., Liao, G., Yu, X. & Ni, Z. 2014. Information from Relationship Lending: Evidence from Loan Defaults in China. Journal of Money, Credit and Banking 46 (6), 1225–1258.

Chen, Y., Huang, R. J., Tsai, J. & Tzeng, L. Y. 2015. Soft Information and Small Business Lending. Journal of Financial Services Research 47, 115–133.

Chong, T. T. L., Lu, L. & Ongena, S. 2013. Does banking competition alleviate or worsen credit constraints faced by small- and medium-sized enterprises? Evidence from China. Journal of Banking and Finance 37 (9), 3412–3424.

Claessens, S., Ghosh, S. R. & Mihet, R. 2013. Macro-prudential policies to mitigate financial system vulnerabilities. Journal of International Money and Finance 39(January), 153–185.

Claessens, S. & Laeven, L. 2004. What Drives Bank Competition ? Some International Evidence. Journal of Money, Credit & Banking 36 (3), 563–583.

Claessens, S. & Ratnovski, L. 2014. What is Shadow Banking? IMF Working Papers 14/25.

Cloyne, J., Thomas, R., Tuckett, A. & Wills, S. 2015. A sectoral framework for analysing money, credit and unconventional monetary policy policy. Bank of England Staff Working Paper No. 556.

Cornaggia, J., Mao, Y., Tian, X. & Wolfe, B. 2015. Does banking competition affect innovation? Journal of Financial Economics 115 (1), 189–209.

Cornett, M. M., McNutt, J. J., Strahan, P. E. & Tehranian, H. 2011. Liquidity risk management and credit supply in the financial crisis. Journal of Financial Economics 101 (2), 297–312.

Corvoisier, S. & Gropp, R. 2002. Bank concentration and retail interest rates. Journal of Banking and Finance 26 (11), 2155–2189.

Cottarelli, C. & Kourelis, A. 1994. Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy. IMF Staff Papers 41 (4), 587–623.

Cotugno, M., Monferrà, S. & Sampagnaro, G. 2013. Relationship lending, hierarchical distance and credit tightening: Evidence from the financial crisis. Journal of Banking & Finance 37 (5), 1372–1385.

Craig, B. R. & Dinger, V. 2013. Deposit market competition, wholesale funding, and bank risk. Journal of Banking and Finance 37 (9), 3605–3622.

D'Auria, C., Foglia, A. & Reedtz, P. M. 1999. Bank Interest Rates and Credit Relationships in Italy. Journal of Banking & Finance 23, 1067–1093.

Dagher, J. & Kazimov, K. 2015. Banks liability structure and mortgage lending during the financial crisis. Journal of Financial Economics 116 (3), 565–582.

Darracq-Paries, M., Moccero, D. N., Krylova, E. & Marchini, C. 2014. The Retail Bank Interest Rate Pass-Through: The Case of the Euro Area During the Financial and Sovereign Debt Crisis. ECB Occasional Paper Series No. 155.

De Bondt, G. 2002. Retail bank interest rate pass-through: New evidence at the euro area level. ECB Working Paper No. 136.

De Bruyckere, V., Gerhardt, M., Schepens, G. & Vander Vennet, R. 2013. Bank/sovereign risk spillovers in the European debt crisis. Journal of Banking & Finance 37 (12), 4793–4809.

De Graeve, F., De Jonghe, O. & Vennet, R. Vander. 2007. Competition, transmission and bank pricing policies: Evidence from Belgian loan and deposit markets. Journal of Banking & Finance 31 (1), 259–278.

de Haan, L., Vermeulen, P. & van den End, J. W. 2016. Lenders on the storm of wholesale funding shocks: Saved by the central bank? ECB Working Paper Series No. 1884.

De Nicoló, G., Jalal, A. M. & Boyd, J. H. 2006. Bank Risk-Taking and Competition Revisited: New Theory and New Evidence. IMF Working Papers 06/297.

Degryse, H. & Cayseele, P. Van. 2000. Relationship lending within a bank-based system: Evidence from European small business data. Journal of Financial Intermediation 9, 90–109.

Degryse, H., Kim, M. & Ongena, S. 2009. Microeconometrics of Banking: Methods, Applications, and Results. Oxford University Press.

Degryse, H. & Ongena, S. 2007. The impact of competition on bank orientation. Journal of Financial Intermediation 16, 399–424.

Delis, M. D. & Kouretas, G. P. 2011. Interest rates and bank risk-taking. Journal of Banking & Finance 35 (4), 840–855.

Dell'Ariccia, G., Igan, D. & Laeven, L. 2012. Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market. Journal of Money, Credit & Banking 44 (2–3), 367–384.

Dell'Ariccia, G., Laeven, L. & Marquez, R. 2014. Real interest rates, leverage, and bank risk-taking. Journal of Economic Theory 149, 65–99.

Dell'Ariccia, G., Laeven, L. & Suarez, G. 2013. Bank Leverage and Monetary Policy's Risk-Taking Channel: Evidence from the United States. IMF Working Papers 13/143.

Demirgüç-Kunt, A. & Huizinga, H. 1999. Determinants of commercial bank interest margins and profitability: some international evidence. The World Bank Economic Review 13 (2), 379–408.

Dewally, M. & Shao, Y. 2014. Liquidity crisis, relationship lending and corporate finance. Journal of Banking & Finance 39 (1), 223–239.

Dewatripont, M. & Maskin, E. 1995. Credit and Efficiency in Centralized and Decentralized Economies. The Review of Economic Studies 62 (4), 541–555.

Deyoung, R., Gron, A., Torna, G. & Winton, A. 2015. Risk Overhang and Loan Portfolio Decisions: The Supply of Small Business Loans Before and During the Financial Crisis. The Journal of Finance 70 (6), 2451–2488.

Diamond, D. W. 1984. Financial Intermediation and Delegated Monitoring. The Review of Economic Studies 51 (3), 393–414.

Disyatat, P. 2011. The bank lending channel revisited. Journal of Money, Credit and Banking 43 (4), 711–734.

Duchin, R., Ozbas, O. & Sensoy, B. A. 2010. Costly external finance, corporate investment, and the subprime mortgage credit crisis. Journal of Financial Economics 97 (3), 418–435.

European Commission. 2007. Report on the retail banking sector inquiry. Commission Staff Working Document.

European Commission. 2014. Economic Review of the Financial Regulation Agenda. Commission Staff Working Document No. 158.

European Commission. 2015. European Financial Stability and Integration Review. Commission Staff Working Document No. 98.

European Central Bank. 2008. The role of banks in the monetary policy transmission in the new EU member states. ECB Monthly Bulletin August 2008, 85-98.

European Central Bank. 2009a. Elasticity of banks' interest income vis-a-vis recent changes in short-term market rates. ECB Financial Stability Review June 2009, 95-101.

European Central Bank. 2009b. Recent Developments in the Retail Bank Interest Rate Pass-Through in the Euro Area. ECB Monthly Bulletin August 2008, 93–105.

European Central Bank. 2010. Sensitivity of euro area banks' interest income to changes in short-term market rates. ECB Financial Stability Review December 2010, 77-79.

European Central Bank. 2013. Assessing the retail bank interest rate pass-through in the euro area at time of financial fragmentation. ECB Monthly Bulletin August 2013, 75–91.

European Central Bank. 2015. Bank profitability challenges in euro area banks: the role of cyclical and structural factors. ECB Financial Stability Review May 2015, 134–145.

European Central Bank. 2016. Report on financial structures 2016.

Elsas, R. 2005. Empirical determinants of relationship lending. Journal of Financial Intermediation 14 (1), 32–57.

Elsas, R. & Krahnen, J. P. 1998. Is relationship lending special? Evidence from credit-file data in Germany. Journal of Banking & Finance 22 (10-11), 1283–1316.

Entrop, O., Memmel, C., Ruprecht, B. & Wilkens, M. 2015. Determinants of Bank Interest Margins: Impact of Maturity Transformation. Journal of Banking & Finance 54, 1–19.

Fernández de Guevara, J., Maudos, J. & Perez, F. 2005. Market Power in European Banking Sectors. Journal of Financial Services Research 27 (2), 109–137.

Ferri, G., Kalmi, P. & Kerola, E. 2014. Organizational Structure and Exposure to Crisis among European Banks : Evidence from Rating Changes. Journal of Entrepreneurial and Organizational Diversity 3 (1), 35–55.

Federation of Finnish Financial Services. 2014. Finnish banking in 2013.

Federation of Finnish Financial Services. 2016. Finnish banking in 2015.

Fiordelisi, F., Monferra, S. & Sampagnaro, G. 2014. Relationship Lending and Credit Quality. Journal of Financial Services Research 46 (3), 295–315.

Fiordelisi, F. & Salvatore, D. 2014. Competition and financial stability in European cooperative banks. Journal of International Money and Finance 45, 1–16.

Foglia, A., Laviola, S. & Marullo Reedtz, P. 1998. Multiple banking relationships and the fragility of corporate borrowers. Journal of Banking & Finance 22 (10–11), 1441–1456.

Fredriksson, A. & Moro, A. 2014. Bank–SMEs relationships and banks' risk-adjusted profitability. Journal of Banking & Finance 41, 67–77.

Fungáčová, Z., Solanko, L. & Weill, L. 2013. Does competition influence the bank lending channel in the euro area? Journal of Banking & Finance 49, 356–366.

Gambacorta, L. 2008. How do banks set interest rates? European Economic Review 52(5), 792–819.

Gambacorta, L., Illes, A. & Lombardi, M. 2014. Has the transmission of policy rates to lending rates been impaired by the Global Financial Crisis? BIS Working Papers No. 477.

Gambacorta, L. & Mistrulli, P. E. 2014. Bank Heterogeneity and Interest Rate Setting: What Lessons Have We Learned since Lehman Brothers? Journal of Money, Credit and Banking 46 (4), 753–778.

Gigineishvili, N. 2011. Determinants of Interest Rate Pass-Through: Do Macroeconomic Conditions and Financial Market Structure Matter? IMF Working Papers 11/176.

Gomez, F. & Ponce, J. 2013. Bank Competition and Loan Quality. Journal of Financial Services Research 46 (3), 215-233.

Gorton, G. B. & He, P. 2008. Bank Credit Cycles. Review of Economic Studies 75(4), 1181–1214.

Groeneveld, H. 2016. A Snapshot of European Co-operative Banking. Available at: https://www.tias.edu/docs/default-source/Kennisartikelen/a-snapshot-of-european-co-operative-banking---hans-groeneveld.pdf?sfvrsn=2.

Gropp, R., Kok Sørensen, C. & Lichtenberger, J. 2007. The dynamics of bank spreads and financial structure. ECB Working Paper Series No. 714.

Hancock, D. & Wilcox, J. A. 1998. The "credit crunch" and the availability of credit to small business. Journal of Banking & Finance 22 (6–8), 983–1014.

Hannan, T. & Berger, A. 1991. The rigidity of prices: Evidence from the banking industry. The American Economic Review 81 (4), 938–945.

Hannan, T. H. 1997. Market Share Inequality, the Number of Competitors, and the HHI: An Examination of Bank Pricing. Review of Industrial Organization 12 (1), 23–35.

Hannoun, H. 2015. Ultra-low or negative interest rates : what they mean for financial stability and growth. Speech at the Eurofi High-Level Seminar, Riga, 22 April 2015.

Hasan, I., Jackowicz, K. & Kowalewski, O. 2014. Bank ownership structure, SME lending and local credit markets. Bank of Finland Research Discussion Papers 22/2014.

Herrala, R. 2009. Credit Crunch? An Empirical Test of Cyclical Credit Policy. Bank of Finland Research Discussion Papers 10/2009.

Ho, T. S. Y. & Saunders, A. 1981. The Determinants of Bank Interest Margins : Theory and Empirical Evidence. The Journal of Financial and Quantitative Analysis 16 (4), 581–600.

Holton, S. & Rodriguez d'Acri, C. 2015. Jagged cliffs and stumbling blocks: interest rate pass-through fragmentation during the euro area crisis. ECB Working Paper Series No. 1850.

Honkapohja, S. 2014. Financial crises: Lessons from the Nordic experience. Journal of Financial Stability 13, 193–201.

Hoshi, T., Kashyap, A. K. & Scharfstein, D. 1990. The Role of Banks in Reducing the Costs of Financial Distress in Japan. Journal of Financial Economics 27 (1), 67–88.

Hristov, N., Hülsewig, O. & Wollmershäuser, T. 2014. The interest rate pass-through in the Euro area during the global financial crisis. Journal of Banking & Finance 48, 104–119.

Hyytinen, A. & Toivanen, O. 2004. Monitoring and market power in credit markets. International Journal of Industrial Organization 22 (2), 269–288.

Höwer, D. 2016. The role of bank relationships when firms are financially distressed. Journal of Banking & Finance 65, 59–75.

Illes, A. & Lombardi, M. 2013. Interest rate pass-through since the financial crisis. BIS Quarterly Review September 2013, 57–66.

Illes, A., Lombardi, M. & Mizen, P. 2015. Why did bank lending rates diverge from policy rates after the financial crisis? BIS Working Papers No. 486.

Ivashina, V. & Scharfstein, D. 2010. Bank lending during the financial crisis of 2008. Journal of Financial Economics 97 (3), 319–338.

Iyer, R., Peydro, J.-L., Da-Rocha-Lopes, S. & Schoar, A. 2014. Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007-2009 Crisis. Review of Financial Studies 27 (1), 347–372.

Jiangli, W., Unal, H. & Yom, C. 2004. Relationship lending, accounting disclosure, and credit availability during the Asian financial crisis. Journal of Money, Credit and Banking 40 (1), 25–35.

Jiménez, G., Lopez, J. A. & Saurina, J. 2013. How does competition affect bank risk-taking? Journal of Financial Stability 9 (2), 185–195.

Jiménez, G., Ongena, S., Peydró, J.-L. & Saurina, J. 2012. Credit supply and monetary policy: Identifying the bank balance-sheet channel with loan applications. American Economic Review 102 (5), 2301–2326.

Jimenez, G., Ongena, S., Peydro, J. & Saurina, J. 2014. Hazardous Times for Monetary Policy: What do Twenty-three Million Bank Loans Say About the Effect of Monetary Policy on Credit Risk-Taking? Econometrica 82 (2), 463–505.

Jiménez, G. & Saurina, J. 2004. Collateral, type of lender and relationship banking as determinants of credit risk. Journal of Banking and Finance 28 (9), 2191–2212.

Jones, D. & Kalmi, P. 2015. Membership and Performance in Finnish Financial Cooperatives: A New View of Cooperatives? Review of Social Economy 73 (3), 283-309.

Jones, D., Kalmi, P. & Kauhanen, A. 2012. The Effects of General and Firm-Specific Training on Wages and Performance: Evidence from Banking. Oxford Economic Papers 61 (1), 151–175.

Joyce, M. A. S., Lasaosa, A., Stevens, I. & Tong, M. 2011. The Financial Market Impact of Quantitative Easing in the United Kingdom. International Journal of Central Banking September 2011, 113–161.

Joyce, M. A. S. & Spaltro, M. 2014. Quantitative easing and bank lending : a panel data approach. Bank of England Working Paper No. 504.

Kahle, K. M. & Stulz, R. M. 2013. Access to capital, investment, and the financial crisis. Journal of Financial Economics 110 (2), 280-299.

Kashyap, A. K. & Stein, J. C. 2000. What do a million observations on banks say about the transmission of monetary policy? American Economic Review 90 (3), 407–428.

Kauko, K. 2005. Bank interest rates in a small European economy : Some exploratory macro level analyses using Finnish data. Bank of Finland Research Discussion Papers 9/2005.

Kauko, K. 2007. Kilpailutilanne Suomen vähittäispankkitoiminnassa 1996 ja 2006. BOF Online No. 17.

Kauko, K. 2009. Managers and efficiency in banking. Journal of Banking & Finance 33 (3), 546–556.

Kauko, K., Pylkkönen, P., Savolainen, E. & Vauhkonen, J. 2016. Pankkikilpailun merkityksestä PK- yritysten rahoituksen saatavuudelle. Bank of Finland Euro & Talous. Available at: https://helda.helsinki.fi/bof/handle/123456789/14415

Keeley, M. C. 1990. Deposit Insurance, Risk, and Market Power in Banking. The American Economic Review 80 (5), 1183–1200.

Kick, T. & Prieto, E. 2015. Bank risk and competition: Evidence from regional banking markets. Review of Finance 19 (3), 1185–1222.

Kim, M., Kliger, D. & Vale, B. 2003. Estimating switching costs: The case of banking. Journal of Financial Intermediation 12 (1), 25–56.

Kirschenmann, K. 2016. Credit rationing in small firm-bank relationships. Journal of Financial Intermediation 26, 68–99.

Kleimeier, S. & Sander, H. 2006. Expected versus unexpected monetary policy impulses and interest rate pass-through in euro-zone retail banking markets. Journal of Banking and Finance 30 (7), 1839–1870.

Klein, N. 2014. Small and Medium Size Enterprises, Credit Supply Shocks, and Economic Recovery in Europe. IMF Working Paper 14/98.

Koskenkylä, H. & Vesala, J. 1994. Finnish Deposit Banks 1980-1993: Years of Rapid Growth and Crisis. Bank of Finland Discussion Papers 16/94.

Laeven, L. & Valencia, F. 2013. Systemic Banking Crises Database. IMF Economic Review 61 (2), 225–270.

Langfield, S. & Pagano, M. 2015. Bank bias in Europe: effects on systemic risk and growth. ECB Working Paper Series No. 1797.

Lapteacru, I. 2014. Do more competitive banks have less market power? The evidence from Central and Eastern Europe. Journal of International Money and Finance 46, 41–60.

Leon, F. 2015. Does bank competition alleviate credit constraints in developing countries? Journal of Banking and Finance 57, 130–142.

Lepetit, L., Nys, E., Rous, P. & Tarazi, A. 2008. The expansion of services in European banking: Implications for loan pricing and interest margins. Journal of Banking and Finance 32 (11), 2325–2335.

Le Leslé, V. 2012. Bank Debt in Europe: "Are Funding Models Broken?" IMF Working Paper 12/299.

Liikanen, E. Bänziger, H., Campa, J. M., Gallois, L., Goyens, M., Krahnen, J. P., Mazzucchelli, M., Sergeant, M. Tuma, Z., Vanhevel, J. & Wijffels, H. 2012. High - level Expert Group on reforming the structure of the EU banking sector. Final report.

Longhofer, S. D. & Santos, J. A. C. 2000. The importance of bank seniority for relationship lending. Journal of Financial Intermediation 9, 57–89.

López-Espinosa, G., Moreno, A. & Pérez de Gracia, F. 2011. Banks' Net Interest Margin in the 2000s: A Macro-Accounting international perspective. Journal of International Money and Finance 30 (6), 1214–1233.

Mallet, T. & Sen, A. 2001. Does Local Competition Impact Interest Rates Charged on Small Business Loans? Empirical Evidence from Canada. Review of Industrial Organization 19, 437–452.

Martín, A., Salas, V. & Saurina, J. 2006. Risk premium and market power in credit markets. Economics Letters, 93, 450–456. http://doi.org/10.1016/j.econlet.2006.06.021

Martinez-Miera, D., & Repullo, R. 2010. Does competition reduce the risk of bank failure? Review of Financial Studies 23 (10), 3638–3664.

Mattes, J. A., Steffen, S. & Wahrenburg, M. 2013. Do Information Rents in Loan Spreads Persist over the Business Cycles? Journal of Financial Services Research 43 (2), 175–195.

Maudos, J. & Fernández de Guevara, J. 2004. Factors explaining the interest margin in the banking sectors of the European Union. Journal of Banking & Finance 28 (9), 2259–2281.

Maudos, J. & Solís, L. 2009. The determinants of net interest income in the Mexican banking system: An integrated model. Journal of Banking & Finance 33 (10), 1920–1931.

Mian, A. & Sufi, A. 2010. The Great Recession: Lessons from Microeconomic Data. American Economic Review: Papers and Proceedings 100 (May), 51–56.

Mojon, B. 2000. Financial structure and the interest rate channel of ECB monetary policy. ECB Working Paper Series No. 40.

Mörttinen, L. 1999. Essays on loan pricing and the credit channel of monetary policy. University of Helsinki. Department of Economics 85, Department of Economics.

Nash, R. M. & Beardsley, E. 2015. The future of Finance: The rise of the new Shadow Bank. Goldman Sachs Equity research.

Neumark, D. & Sharpe, S. A. 1992. Market Structure and the Nature of Price Rigidity : Evidence from the Market for Consumer Deposits. The Quarterly Journal of Economics 107 (2), 657–680.

Niskanen, J., & Niskanen, M. 1999. Pankkikilpailun ja pankkisuhteiden vaikutus yrityslainojen saatavuuteen ja ehtoihin : tutkimus pienistä ja keskisuurista yrityksistä. (The effect of bank competition and bank relationships on the availability and terms of small business loans). Tampereen yliopisto, Yrityksen taloustieteen ja yksityisoikeuden laitos, Sarja A1: Tutkimuksia 46.

Norden, L. & Weber, M. 2010. Credit line usage, checking account activity, and default risk of bank borrowers. Review of Financial Studies 23 (10), 3665–3699.

Nyberg, P. & Vihriälä, V. 1993. The Finnish Banking Crisis and Its Handling. Bank of Finland Discussion Papers No. 8.

Nätti, S. & Lähteenmäki, I. 2016. The evolution of market orientation in Finnish retail banking – from regulation to value creation. Management & Organizational History 11 (1), 28–47.

Olivero, M. P., Li, Y. & Jeon, B. N. 2011. Competition in banking and the lending channel: Evidence from bank-level data in Asia and Latin America. Journal of Banking & Finance 35 (3), 560–571.

Ono, A., Hasumi, R. & Hirata, H. 2014. Differentiated use of small business credit scoring by relationship lenders and transactional lenders: Evidence from firm-bank matched data in Japan. Journal of Banking & Finance 42 (1), 371–380.

Pagano, M., Langfield, S., Acharya, V., Boot, A., Brunnermeier, M. K., Buch, C., van den Burg, L. 2014. Is Europe Overbanked? Reports of the Advisory Scientific Committee.

Peek, J. & Rosengren, E. 1995. The Capital Crunch : Neither a Borrower nor a Lender Be. Journal of Money, Credit and Banking 27 (3), 625–638.

Peek, J. & Rosengren, E. S. 2005. Unnatural selection: Perverse incentives and the misallocation of credit in Japan. American Economic Review 95 (4), 1144–1166.

Peltoniemi, J. 2004. The value of relationship banking. University of Oulu. Faculty of Economics and Business Administration, Department of Accounting and Finance.

Peltoniemi, J. 2007. The benefits of relationship banking: Evidence from small business financing in Finland. Journal of Financial Services Research 31, 153–171.

Peltoniemi, J. & Vieru, M. 2013. Personal Guarantees, Loan Pricing, and Lending Structure in Finnish Small Business Loans. Journal of Small Business Management 51 (2), 235–255.

Petersen, M. A. & Rajan, R. G. 1994. The Benefits of Lending Relationships: Evidence from Small Business Data. Journal of Finance 49 (1), 3–37.

Petersen, M. A. & Rajan, R. G. 1995. The Effect of Credit Market Competition on Lending Relationships. The Quaterly Journal of Economics 110 (2), 407–443.

Peydró, J.-L. & Maddaloni, A. 2011. Bank Risk-taking, Securitization, Supervision, and Low Interest Rates: Evidence from the Euro-area and the U.S. Lending Standards. The Review of Financial Studies 24 (6), 2122–2165.

Popov, A. & van Horen, N. 2013. The impact of sovereign debt exposure on bank lending: Evidence from the European debt crisis. DNB Working Paper No. 382.

Puri, M., Rocholl, J. & Steffen, S. 2011a. Global retail lending in the aftermath of the US financial crisis: Distinguishing between supply and demand effects. Journal of Financial Economics 100 (3), 556–578.

Puri, M., Rocholl, J. & Steffen, S. 2011b. On the Importance of Prior Relationships in Bank Loans to Retail Customers. ECB Working Paper Series No. 1395.

Putkuri, H. 2010. Housing loan rate margins in Finland. Bank of Finland Research Discussion Papers No. 10/2010.

Pylkkönen, P. & Savolainen, E. 2013. The situation of SME finance in Finland. Bank of Finland Bulletin 87(2), 55–65.

Rajan, R. G. 1992. Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt. The Journal of Finance 47 (4), 1367–1400.

Rice, T. & Strahan, P. E. 2010. Does credit competition affect small-firm finance? The Journal of Finance 65 (3), 861–889.

Ritz, R. A. & Walther, A. 2015. How do banks respond to increased funding uncertainty? Journal of Financial Intermediation 24 (3), 386–410.

Rocha, M. D. 2012. Interest rate pass-through in Portugal: Interactions, asymmetries and heterogeneities. Journal of Policy Modeling 34 (1), 64–80.

Roengpitya, R., Tarashev, N. & Tsatsaronis, K. 2014. Bank business models. BIS Quarterly Review December 2014, 55–65.

Rosenfeld, C. M. 2014. The effect of banking relationships on the future of financially distressed firms. Journal of Corporate Finance 25, 403–418.

Ruckes, M. 2004. Bank competition and credit standards. Review of Financial Studies 17 (4), 1073–1101.

Santikian, L. 2014. The ties that bind: Bank relationships and small business lending. Journal of Financial Intermediation 23 (2), 177–213.
Santos, J. A. C. 2011. Bank Corporate Loan Pricing Following the Subprime Crisis. The Review of Financial Studies 24 (6), 1916–1943.
Santos, J. A. C. & Winton, A. 2008. Bank loans, bonds, and information monopolies across the business cycle. Journal of Finance 63 (3), 1315–1359.
Saunders, A. & Schumacher, L. 2000. The determinants of bank interest rate margins: an international study. Journal of International Money and Finance 19 (6), 813–832.
Schaeck, K., Cihak, M. & Wolfe, S. 2009. Are competitive banking systems more stable? Journal of Money, Credit and Banking 41 (4), 711–734.
Sharpe, S. A. 1990. Asymmetric Information, Bank Lending and Implicit Contracts: A Stylized Model of Customer Relationships. The Journal of Finance 45 (4), 1069–1087.
Shimizu, K. 2012. Bankruptcies of small firms and lending relationship. Journal of Banking & Finance 36 (3), 857–870.
Shin, H. S. 2012. Global Banking Glut and Loan Risk Premium. IMF Economic Review 60 (2), 155–192.
Singh, M. K., Gómez-Puig, M. & Sosvilla-Rivero, S. 2016. Sovereign-bank linkages: quantifying directional intensity of risk transfers in EMU countries. Journal of International Money and Finance 63, 137–164.
Soedarmono, W., Machrouh, F. & Tarazi, A. 2013. Bank competition, crisis and risk taking: Evidence from emerging markets in Asia. Journal of International Financial Markets, Institutions and Money 23, 196–221.
Sorensen, C. K. & Werner, T. 2006. Bank Interest Rate Pass-Through In The Euro Area: A Cross Country Comparison. ECB Working Paper Series No. 580.
Stein, J. C. 2002. Information Production and Capital Allocation: Decentralized versus Hierarchical Firms. The Journal of Finance 57 (5), 1891–1921.
Tabak, B. M., Fazio, D. M. & Cajueiro, D. O. 2012. The relationship between banking market competition and risk-taking: Do size and capitalization matter? Journal of Banking & Finance 36 (12), 3366–3381.
Taylor, A. M., Jorda, O. & Schularic, M. 2014. The Great Mortgaging: Housing Finance, Crises, and Business Cycles. NBER Working Paper Series No. 20501.
van Leuvensteijn, M., Sørensen, C. K., Bikker, J. A. & van Rixtel, A. 2013. Impact of bank competition on the interest rate pass-through in the euro area. Applied Economics 45 (11), 1359–1380.
Vesala, J. 1995. Testing for competition in banking: Behavioral evidence from Finland. Bank of Finland Studies E:1.
Vihriälä, V. 1996. Credit Crunch or Collateral Squeeze? An Empirical Analysis of Credit Supply of the Finnish Local Banks in 1990-1992. Bank of Finland Research Discussion Papers 11/96.
Vihriälä, V. 1999. Credit Growth and Moral Hazard: An Empirical Study of the Causes of Credit Expansion by the Finnish Local Banks in 1986-1990. Bank of Finland Research Discussion Papers 10/96.

Von Thadden, E.-L. 1995. Long-Term Contracts, Short-Term Investment and Monitoring. The Review of Economic Studies 62 (4), 557–575.

von Thadden, E. L. 2004. Asymmetric information, bank lending and implicit contracts: The winner's curse. Finance Research Letters 1 (1), 11–23.

Weinstein, D. E. & Yafeh, Y. 1998. On the Costs of a Bank-Centered Financial System: Evidence from the Changing Main Bank Relations in Japan. The Journal of Finance 53 (2), 635–672.

Wong, K. P. 1997. On the determinants of bank interest margins under credit and interest rate risks. Journal of Banking & Finance 21 (2), 251–271.

Zarruk, E. R. & Madura, J. 1992. Optimal bank interest margin under capital regulation and deposit insurance. Journal of Financial and Quantitative Analysis 27 (1), 143–149.

APPENDIX 1 The main changes in the European banking regulatory environment

The CRD IV-CRR/Basel III framework

The Basel III framework introduced tighter capital requirements compared to the Basel II and liquidity requirements as a new regulatory tool. Figure A1.1 presents the structure of new capital requirements. The main changes from the Basel II are higher requirements of Core Tier 1 Capital (CET 1) in the minimum requirement of 8 % as well as various buffers on top of that. Counter-cyclical capital buffer and G-SIFI surcharge are related to macroprudential regulation which has received increased attention in the aftermath of the global financial crisis.

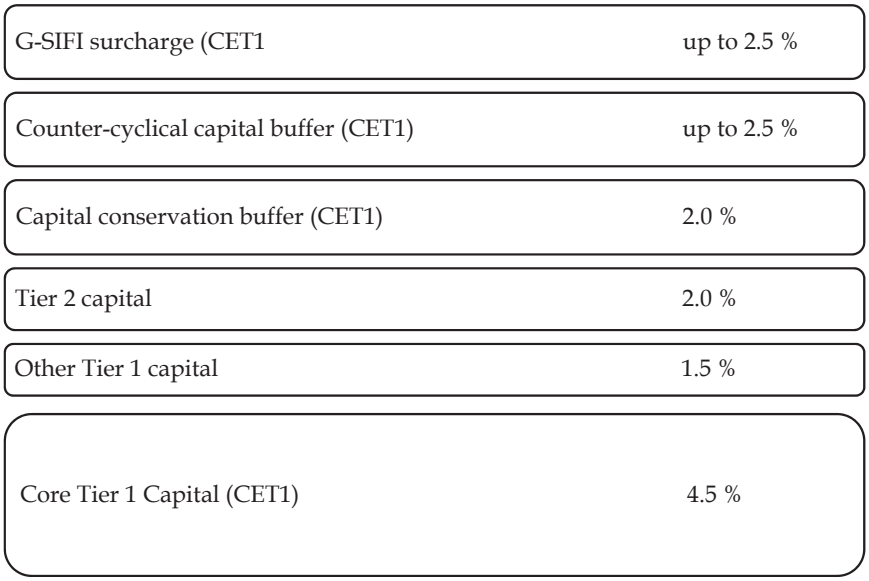

FIGURE A1.1 Capital requirements

Liquidity requirements are based on two components:

Liquidity Coverage Ratio (LCR) is the ratio of high-quality liquid assets to total net cash outflows over 30 days. The requirement has been implemented gradually and the final requirement 100 % will come into effect in 2019.

Net Stable Funding Ratio (NSFR) is the ratio of the available amount of stable funding to the required amount of stable funding. Various liabilities receive different weights based on which the amount of available stable funding is

calculated. In the same way, assets get different required stable funding weights based on which the required amount of stable funding is calculated. The minimum NSFR requirement 100% is expected to come into effect in 2018.[23]

Banking union

The banking union aims to the consistent application of EU banking rules in all EU countries. Figure A1.2 presents the structure of the banking union. There are two pillars, Single Supervisory Mechanism (SSM) and Single Resolution Mechanism (SRM), in place. Under the SSM, the ECB supervises the largest bank directly, and the remaining banks are supervised by the national supervisors based on common principles. Under the SRM, bank resolutions are managed through a single resolution board and a single resolution fund. The third planned pillar for the completed banking is European Deposit Insurance Scheme (EDIS) but it is under development and negotiations.[24]

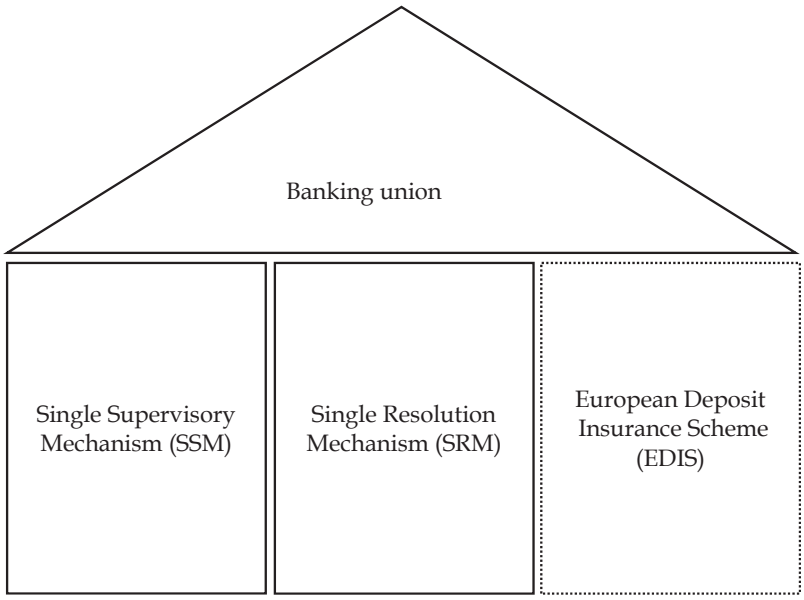

FIGURE A1.2 The structure of the Banking Union

23 See in more detail: https://www.bis.org/bcbs/basel3.htm?m=3%7C14%7C572
24 See in more detail: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/banking-union_en

APPENDIX 2

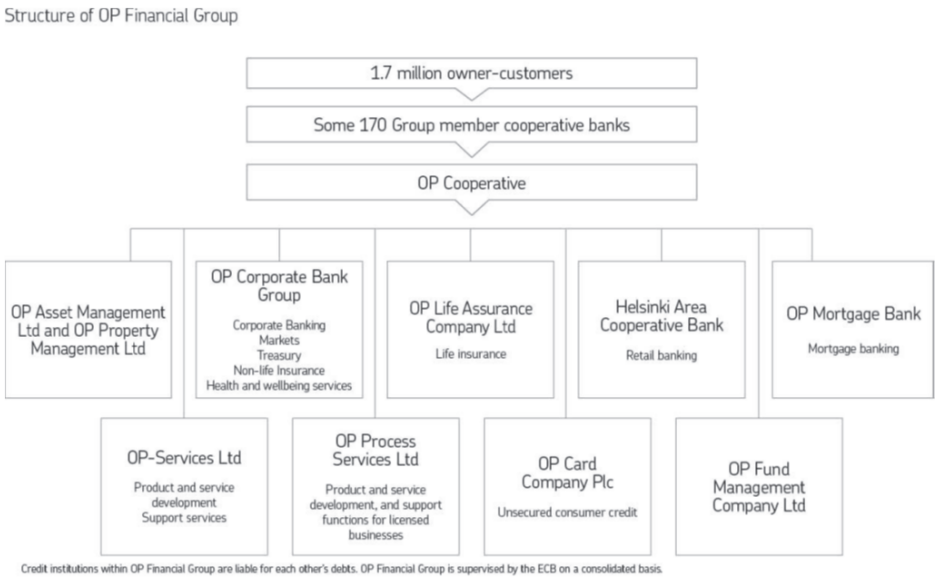

FIGURE A2.1 Structure of OP Financial Group. Source: OP Financial Group's Corporate Governance Statement 2016.

APPENDIX 3

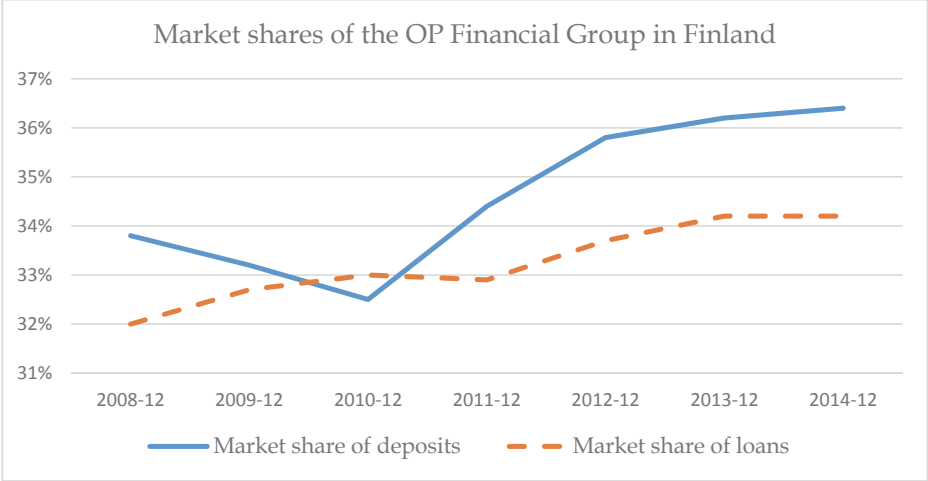

FIGURE A3.1 The evolution of the market shares of the OP Financial Group. Source: The Finnish banking reports of the Federation of Finnish Financial Services from 2008, 2009, 2010, 2011, 2012, 2013, and 2014.

2 LOCAL BANK COMPETITION AND SMALL BUSINESS LENDING AFTER THE ONSET OF THE FINANCIAL CRISIS *

Abstract

This paper examines whether the effects of the financial crisis on the volumes and prices of small business loans depended on the pre-crisis local competitive environment. To address this question, I employ a unique data set on Finnish cooperative banks. I find that the monthly volumes of new business loans decreased and the average loan margins increased after the onset of the crisis. The decrease in volumes and the increase in margins were greater in local banking markets that were more competitive before the crisis. The results for the loan margins are more robust than those obtained for the volumes. Auxiliary analyses suggest that the greater effects in the more competitive markets are due to competition leveling therein more after the onset of the crisis.

Keywords: financial crisis, small business lending, local bank competition
JEL classification: G01, G21, L11

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2.1 Introduction

The availability and cost of bank loans are crucial for many small businesses because these businesses often lack other options for external funding (Berger and Udell, 1998; Carbo-Valverde et al., 2009). Small business lending has traditionally been local because small firms are often informationally opaque (e.g., Agarwal and Hauswald, 2010). Thus, the availability and cost of loans to small businesses can depend on the behavior of competing local banks. When uncertainty is high, especially during crises, loan availability often declines to the greatest extent for opaque small businesses (see e.g., ECB, 2014).

In this paper, I examine whether, and if so how, the effect of the recent financial crisis on small business lending depended on the pre-crisis local competitive environment. In the previous literature, changes in loan supply during crises have been explained by bank balance sheet factors (e.g., Bernanke and Lown, 1991; Jiménez et al., 2012a). Studies concerning the availability and costs of bank loans during the recent crisis have, in particular, focused on the role of the bank funding structure (Cornett et al., 2011; Ivashina and Scharfstein, 2010) and examined the effects of loan losses (Puri et al., 2011; Santos, 2011) and more indirect factors, such as changes in risk tolerance (Albertazzi and Marchetti, 2010). I contribute to this literature by examining whether differences in banks' pre-crisis competitive environments explain why the changes in the volumes and prices of small business loans were heterogeneous after the onset of the financial crisis.

There is a wide body of literature on the relationship between market structure or bank competition and loan availability and prices (e.g., Carbo-Valverde et al., 2009; Chong et al., 2013; Hannan, 1997; Rice and Strahan, 2010). I consider the implications of this relationship for changes in lending behavior after the onset of the crisis. Differences in the pre-crisis competitive environments can explain heterogeneous changes in loan volumes and prices following a crisis, because there is a greater (lesser) scope for competition to decrease (increase) in markets where it was fierce (lax) to begin with. According to Ruckes (2004), the degree of competition generally decreases during crises, but changes in the degree of competition is not the only potential moderating factor. In addition, characteristics relevant for lending during crises — such as risk position, relationship banking and funding structure — can depend on the competitive environment (e.g., Boyd and De Nicolo, 2005; Craig and Dinger, 2013; Keeley, 1990; Petersen and Rajan, 1995). I therefore also consider various explanations for the relationship between the pre-crisis competitive environment and changes in lending after the onset of the crisis. I do so by examining how the change in the degree of competition after the onset of the crisis and the above mentioned bank characteristics depends the pre-crisis competitive environment.

I employ unique data on local cooperative banks of the Finnish OP-Pohjola Group. These data include monthly data on new small business loan

volumes and average margins from 2004 to 2010. I also utilize data on local economic characteristics and on the number of bank branches for each local banking market. My empirical identification makes use of the fact that the cooperative banks operate in differently competitive local markets, but they are similar in numerous respects as they share a common business model and group culture. The group culture and structure ensures that the lending information and the data used to control for bank-specific factors are consistent across the banks. In addition, my empirical identification relies on the collapse of Lehman Brothers and the subsequent turbulence in money markets. These events exaggerated both uncertainty and the poor economic outlook but were completely exogenous to the Finnish banking sector and economy.[1] Local demand conditions, particularly their adaption after the onset of the crisis, are controlled using local economic variables and separate province-specific time trends for the pre-crisis and crisis periods.

Because accurate measurement of bank competition is very challenging, I measure the competitiveness of local banking markets in two ways. My first measure is the standard Herfindahl-Hirschmann index (HHI). This index mirrors the market structure and is based on the number of branches of various banks in the main operating area of each cooperative bank. The second measure is the Lerner index, which refers to the gap between prices and marginal costs. It is a more direct measure of competition and has been used widely in the previous banking literature (Carbo et al., 2009).

My results indicate that the pre-crisis competitiveness of local banking markets affects how lending changed in response to the crisis. First, I find that after the onset of the financial crisis, the volumes of new small business loans decreased to a greater extent among the banks that operated in more competitive local markets before the crisis. In line with the previous literature, the volumes also decreased to a greater extent among the banks that were the most dependent on market-based funding (see e.g., Cornett et al., 2011; Gozzi and Goetz, 2010; Ivashina and Scharfstein, 2010; Iyer et al., 2014)[2]. Second, I find that the margins of new business loans increased to a greater extent among the banks that operated in more competitive local markets before the crisis. The loan margins were lower in the more competitive local markets to start with, in line with previous studies (e.g., Hannan, 1997). However, the difference between the more and less competitive markets diminished significantly after the onset of the crisis. This result indicates that differences in the pre-crisis competitive environments explain the heterogeneous effects of the crisis on loan prices.

My auxiliary analysis suggests that heterogeneous changes in the degree of competition is the main reason why banks' responses to the crisis vary across local markets with the different pre-crisis competitive environments. I find that after the onset of the crisis, the values of the competition measures and prices of

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1 For example, according to Laeven and Valencia (2013), no systemic banking crisis occurred in Finland from 2008 to 2010, and the effects of the global financial crisis on banking are primarily attributable to external factors.

2 Accordingly, the relative share of retail deposit funding is lower in these banks than in other banks.

various deposits and loans converged in the more competitive banking markets toward those of the less competitive banking markets. My results based on loan-specific data allow me to largely rule out the claim that changes in small business credit risks or bank risk-taking would explain the greater increases in loan margins in local markets that were more competitive before the crisis. Instead, the relatively lesser deterioration of average credit ratings of small business customers among the banks that operated in more competitive markets before the crisis tentatively supports the "flight to quality" explanation for greater volume declines.[3] I find also that the banks that faced fiercer competition before the crisis were more dependent on market-based funding at the onset of the crisis.[4] This association between the degree of competition and the dependence on market-based funding suggests an indirect effect of the pre-crisis competitive environment on lending behavior after the onset of the crisis.

Overall, my results indicate that differences in local competitive environments can induce heterogeneous changes in lending conditions between normal and crisis periods. This finding is relevant for bank regulation and supervision because it has implications for the debate over why there is excessive pro-cyclicality in lending. The results also complement Adams and Amel (2011), who study how the local market structure affects the pass-through of the federal funds rate. Moreover, these results suggest that the heterogeneous effects of crises on local economies transmitted through local banks (see Gozzi and Goetz, 2010) can also depend on the prevailing local competitive environments.

The remainder of this paper proceeds as follows: In the next section, I review previous theoretical and empirical literature to lay the foundations for my paper. Section 2.3 describes the data and empirical approach. The main results are presented in section 2.4. I discuss the results in section 2.5, where I also report a series of auxiliary analyses. Section 2.6 concludes.

2.2 Competitive environment and lending in normal and crisis periods

In this section, I consider how the competitive environment can affect loan availability and prices as well as certain bank characteristics. Based on this, I argue how different pre-crisis competitive environments can induce heterogeneous changes in lending after the onset of a crisis.

2.2.1 Loan pricing and lending standards

The market power hypothesis suggests that competition reduces loan prices and improves availability (e.g., Carbo-Valverde et al., 2009). Numerous

[3] The flight to quality phenomenon means that banks decrease lending relatively more to customers with high agency costs during crises (Bernanke et al., 1996).

[4] Accordingly, the relative share of retail deposit funding is lower in these banks than in other banks.

empirical papers support this hypothesis. Hannan (1997) examines US small business loans at the Metropolitan Statistical Area (MSA) level and finds that banks charge lower loan rates in more competitive markets. Corvoisier and Gropp (2002) use country-level European data and report a positive relationship between concentration and loan prices. Degryse and Ongena (2005) find that a firm's distance from rival banks of the lending bank is positively related to the loan rates it pays. Petersen and Rajan (1995) find, somewhat contrary to the hypothesis, that a higher concentration decreases loan rates for young and small firms in the U.S., but the effect diminishes as firms age. Ruckes (2004) theoretically describes how price competition intensifies during boom periods and diminishes during bust periods, but to my knowledge, no empirical analyses examine how changes in loan prices between boom and bust periods are related to changes in competition.

Lending standards, i.e., the strictness of various loan terms, is one way to explore changes in loan availability. The ECB Bank Lending survey asks banks to describe their lending standards, and it divides the relevant factors affecting these standards into three groups: competition, balance sheet position and risk perception (Berg et al., 2005). The lending standards in this survey include prices, collateral requirements, maturity, size, covenants and the loan-to-value ratio of loans. Empirical studies find that changes in lending standards based on surveys explain changes in credit growth and loan availability (Demiroglu et al., 2012; Lown and Morgan, 2006).

The relationship between competition and lending standards other than price has received little consideration. The theories of Ruckes (2004) and Dell'Ariccia and Marquez (2006) provide explanations for the relationship between increased competition and loosened lending standards. Dell'Ariccia and Marquez (2006) argue that the threat of competition or a larger number of competing banks can prompt reduced lending standards to protect or increase market shares. Ruckes (2004) argues that the increased average quality of customers in good times decreases the incentives of screening, which leads to increased competition and loosened lending standards and vice versa in bad times. Empirical work supports the view that lending standards are countercyclical and that they play a role in procyclical lending behavior, but such work does not examine the role of competition in this context (Asea and Blomberg, 1998; Dell'Ariccia et al., 2012; Peydró and Maddaloni, 2011). Jiménez and Saurina (2006) describe increasing competition as one of the possible reasons for looser lending standards during boom periods, but they do not examine its effect in detail. According to the ECB bank lending surveys, competition from other banks normally eases lending standards. However, this easing effect of competition on lending standards was not observed between the third quarter of 2007 and the third quarter of 2009, which suggests diminished competition during this period.[5]

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5 The ECB bank lending surveys are available at https://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html.

2.2.2 Risks and risk-taking

The traditional view is that fiercer bank competition increases risks. According to this competition-fragility view, greater competition leads to lower profit margins and franchise value, which encourages greater risk-taking (Keeley, 1990). In contrast, the competition-stability view suggests that higher prices in less competitive markets may cause greater repayment problems and exacerbate moral hazard and adverse selection problems (Boyd and De Nicolo, 2005). The model of Martinez-Miera and Repullo (2010) combines these opposite views and proposes a U-shaped relationship between competition and the risk of bank failure.

Empirical studies report U-shaped, inverse U-shaped, positive and negative relationships between competition and risk (Jiménez et al., 2013; Kick and Prieto, 2015; Tabak et al., 2012). Berger et al. (2009) illustrate how different measures of competition and risk can explain the divergent results. Fiordelisi and Salvatore (2014) study the relationship between competition and risk using data on European cooperative banks and find that competition increases stability.

Risk-taking behavior during normal periods can affect realized risks and thus willingness and ability to lend during crises. Jiménez and Saurina (2006) describe how competition can reduce the net interest margin and profitability of banks, thus encouraging increased volumes at the expense of quality. This does not necessarily lead to problem loans in the short run or during normal periods, allowing strong loan growth to continue. However, this can cause greater losses if the economy is affected by a crisis.

Appetite for risk can also change during crises. Bernanke et al. (1996) develop a model for so-called "flight to quality" behavior, which means that during bad periods, the relative decline in lending is greater for borrowers with high agency costs. Their empirical analysis supports the theory. Albertazzi and Marchetti (2010) examine this theory using Italian data during the recent financial crisis. They find that large and low capitalized banks began to grant relatively fewer loans to riskier firms.

2.2.3 Funding structure and costs

When banks also compete for deposits, the competitive environment can affect the funding structure and costs. The market power hypothesis proposes lower deposit rates in more concentrated markets. The empirical evidence supports this view (e.g., Berger and Hannan, 1989; Hannan and Prager, 2004; Hannan, 1997). There is little empirical evidence on how competition can affect banks' funding structures. Craig and Dinger (2013) describe how tight deposit competition increases deposit rates and thus incentives to resort to wholesale funding. However, they do not examine how competition affects the relative shares of deposit and wholesale funding. Instead, they explore the relationship between deposit market competition and risk-taking and find that fiercer competition increases the risks of banks.

According to many previous studies, the bank funding structure played a significant role in lending behavior during the recent financial crisis. Banks with a relatively large share of wholesale funding and, thus, a small share of core deposits were the most vulnerable to the freeze in global money markets and reduced lending to a greater extent (e.g., Ivashina and Scharfstein, 2010; Iyer et al., 2014).

2.2.4 Relationship banking

An essential aspect of banking and lending decisions is asymmetric information between lender and borrower. Banks develop close relationships with customers to ease such informational asymmetries (Boot, 2000). According to the information hypothesis, high bank competition can weaken banks' incentives to invest in soft information and, thus, relationship building. This mechanism entails reduced loan availability in more competitive markets (Petersen and Rajan, 1995). In contrast, the model of Boot and Thakor (2000) suggests that competition encourages relationship lending because it enables banks to maintain satisfactory prices in competitive markets. Empirical studies support both hypotheses (see Degryse et al., 2009, pp. 119–120).

The theoretical and empirical literature indicates that relationship banking plays a particular role during crises. The model of Bolton et al. (2013) suggests that relationship banking diminishes the effects of a crisis on lending. Relationship banks charge higher interest margins during normal periods but do not change their loan terms to the extent that transaction banks do during crises. Empirical analyses indicate that relationship banking diminished the overall increase in loan prices and the overall decrease in loan availability during the current crisis (Bolton et al., 2013; Cotugno et al., 2013; Gambacorta and Mistrulli, 2014; Puri et al., 2011).

2.2.5 Empirical predictions

The past theoretical and empirical studies imply that fiercer competition decreases interest rates on loans and loosens lending standards. The previous literature also suggests that the degree of competition declines during crises. The magnitude of this decline in competition is likely to depend on the pre-crisis competitive environment: there is a greater scope for competition to decrease if it was fierce before the crisis. Consequently, if competition declines more among the banks that operated in more competitive environments before the crisis, it can be predicted that loan prices increase relatively more among these banks. Because price and other lending standards determine loan availability and credit growth, it can also be predicted that loan volumes decrease more in those markets where the pre-crisis competition was fiercer.

The previous studies consider how competitive environments can affect risk-taking, realized risks, relationship banking and funding structure and how these are relevant factors for lending behavior during crises. This means that if the effect of the crisis on lending depends on the pre-crisis competitive

environment, the effect can also be transmitted through these factors. However, the past empirical and theoretical studies do not provide a consistent set of predictions of how the degree of competition and these other factors are related.

In sum, the effect of the pre-crisis competitive environment through the changes in the degree of competition suggests a larger increase in prices and a decrease in volumes among the most competitive banks after the onset of the crisis. However, the effects of other, more indirect, factors of the pre-crisis competitive environment are unclear. Thus, the issue is ultimately an empirical one, and a main focus of this paper is to examine the total effect of various factors of the pre-crisis competitive environment. The examination of both prices and volumes facilitate the separation of the supply effects from the demand effects (see Santos, 2011). For instance, if a larger decrease in loan volumes is combined with a larger increase in loan prices among the most competitive banks, this is consistent with the dominance of a supply shift; the dominance of a demand shift would indicate a larger decrease in volumes combined with a smaller increase in prices. Through an auxiliary analysis, I examine the contributions of various factors to the total effect of the pre-crisis competitive environment.

2.3 Data and empirical approach

In this section, I first describe the data used in this paper. Then, I present my empirical specifications.

2.3.1 The cooperative banks of OP-Pohjola Group

OP-Pohjola Group consists of an amalgamation of 197 independent and local cooperative banks.[6] The member banks are jointly and severally liable, but they operate independently in their own local markets. The member banks own the central institution, OP-Pohjola Central Cooperative, which controls, supervises and directs their activities. The central institution also has several subsidiaries, of which Pohjola Bank plc (Pohjola) is the most important. Pohjola is a commercial bank that acts as OP-Pohjola Group's central bank and manages the group's liquidity and international operations. It also manages corporate lending for large and mid-sized firms.

OP-Pohjola Group plays a significant role in the Finnish banking sector. Local operating areas of the member banks cover the entire area of Finland. The member banks focus primarily on small business operations, household lending and retail deposits. The Group's market share in various retail loans and

[6] This was case by the end of 2012. Bank mergers that occurred during the data period are accounted for through the use of consolidated data based on late 2012 conditions. Although the number of member banks and organizational structures has changed since then, the data description and institutional background are based on the conditions of the data period.

deposits amounted to approximately 25 to 35 percent during the data collection period.

Although this group structure and shared business model render the banks homogeneous in some respects, the banks are also heterogeneous, particularly with respect to their size and operational environment.[7] The following features are relevant to my analysis. First, cooperative banks operate in their own local markets, in which they compete primarily with other banks.[8] Second, cooperative banks operate within the Central Cooperative guidelines and constraints but make independent decisions. In turn, the common limitations and targets of several economic indicators (regarding, e.g., capital adequacy and risk) are measured in a consistent manner (see also Hakenes et al., 2015). In addition, member banks receive common guidelines on lending terms (e.g., in the form of pricing models). The key issue for the empirical analysis of this paper is that even though the banks adhere to common guidelines, they ultimately operate independently, which can result, for example, in deviations from pricing model recommendations or risk/risk-taking variations within limits.

Third, the liquidity management and market funding of the cooperative banks are addressed through Pohjola. The cooperative banks have checking accounts with an overdraft facility, and they can secure short-term debt funding from Pohjola. The price of a certain short-term debt at a given time is identical for all banks and reflects the price of Pohjola's own wholesale funding. This indicates that the availability of short-term funding is not a problem for the individual cooperative banks, but the costs vary over time according to the price of wholesale funding for Pohjola. This can affect their willingness to resort to this type of funding at various times.

Finally, the cooperative business model can affect lending behaviors at various times in relation to other banks. On the one hand, this paper presents a favorable approach in that my data exclude the heterogeneous effects of the crisis on lending based on organizational forms. On the other hand, lending behaviors of other banks relative to cooperative banks can affect loan demands in cooperative banks, and this effect may depend on competitive environments. This issue is considered when interpreting the results.

2.3.2 Data sources

The bank data collected from within the OP-Pohjola Central Cooperative include detailed monthly lending information for all cooperative banks between January 2004 and October 2010. The price and volume information is available for both outstanding and new business loans, mortgages and

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7 Hyytinen and Toivanen (2004) use data on the same cooperative banks to study whether the banks use their branch network to invest in monitoring and/or market power and how this affects loan interest rates and credit losses.

8 The main rival banks include nationwide commercial banks, such as Nordea, Danske Bank, Aktia and Handelsbanken, local saving banks, and local cooperative banks that do not belong to OP-Pohjola Group.

consumer loans. The data also contain detailed balance sheet, income statement and deposit information for each cooperative bank. Additionally, the information on small business lending is complemented by loan-specific data that are available beginning in September 2008.[9]

The data on the branch locations of all Finnish banks come from the establishment data of the business register of Statistics Finland. Annual data between 2004 and 2010 include enterprise (bank) name and business ID, establishment (branch) name and code, municipality and zip code. Local economic data are at the municipal level and are collected from the statistical databases StatFin and Altika of Statistics Finland.

The number of the branches of all banks is assigned to each cooperative bank based on zip codes. The local economic data are combined at the municipality level, and hence, local variables are calculated based on all municipalities in which a cooperative bank operates.

2.3.3 Small business lending data and dependent variables

The corporate loans of the cooperative banks are primarily small business loans because Pohjola manages the loans for larger companies.[10] The dependent variables include both price and volume measures of new business loans. The volume variable is *new business loans per month divided by total assets in the previous month.* More precisely, the data are on the new withdrawn loans, which primarily consist of new contracts but also include drawdowns of existing loan commitments.[11] Because my interest is in the purely new lending activity, the effect of drawdowns of existing loan commitments is diminished by using the lagged value of off-balance sheet items, which include the undrawn commitments, as a control variable in the estimations. My measure better describes the changes in loan supply and demand than the change in outstanding loans used in many previous papers (e.g., Cornett et al., 2011) because the latter measure is also affected by loan repayments.

The price variable is *average loan margin*, which is the average margin on monthly new variable rate business loans with either the Euribor rates or banks' own prime rate as a reference rate.[12] A loan margin is a commonly used measure for loan pricing in previous literature and often calculated as the average loan rate minus some market interest rate (e.g., Lepetit et al., 2008). In this paper, I can use detailed data that are used for an internal comparison of the loan margins between the products and member banks in the OP-Pohjola

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9 These loan-specific data allow credit risk with internal credit ratings that are not included in the bank-specific data to be controlled.

10 Based on loan-specific data between October 2008 and June 2013, 89 percent of new business loan contracts were under 250 000 euros and 96 percent were under one million.

11 I use the term "new loans" throughout the text, even if the precise measure is new withdrawn loans.

12 The average total interest rate on small business loans is dependent on market interest rates, and it decreased during the crisis due to decreased market interest rates, despite that the margins on new loans increased.

Group. These data enable a precise and consistent measure of pricing across the banks.[13]

The general volume and margin trends of cooperative banks' new business loans are presented in Figures 1 and 2. The vertical lines that appear at October 2008 denote the start of the crisis period, which is determined based on the collapse of Lehman Brothers on September 15, 2008. This event is typically viewed as the start of the global financial crisis, and many papers that use European data identify it as the start of the crisis period (Albertazzi and Marchetti, 2010; Bolton et al., 2013; Gambacorta and Mistrulli, 2014).[14]

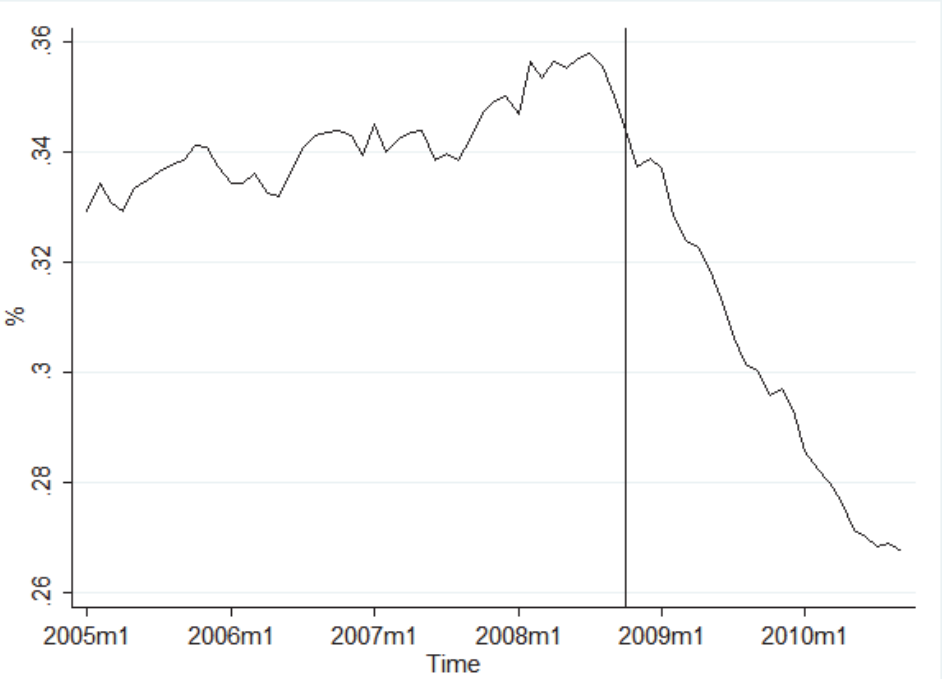

FIGURE 1 The development of the average volume of new business loans. The figure depicts the average trend in the volumes of new business loans among the cooperative banks of OP-Pohjola Group for the January 2004 to September 2010 period. The graph is the 12-month moving average of banks' average monthly loan volumes, measured as the percentage of new business loans divided by total assets in the previous month.

13 The loan margins and their changes over time broadly reflect the loan pricing model of the Group that is used to control pricing behavior of the member banks. The model is common to all banks and produces recommended loan margins based on several factors. However, individual banks can deviate from these recommended loan margins, which enables the examination of heterogeneous pricing behavior between the banks.

14 The subprime crisis had already started in the third quarter of 2007, and this is often viewed as the beginning of the crisis period in studies that use US data (e.g., Cornett et al., 2011) and in studies that examine effects of subprime-related loss exposure for European banks (e.g., Puri et al., 2011a).

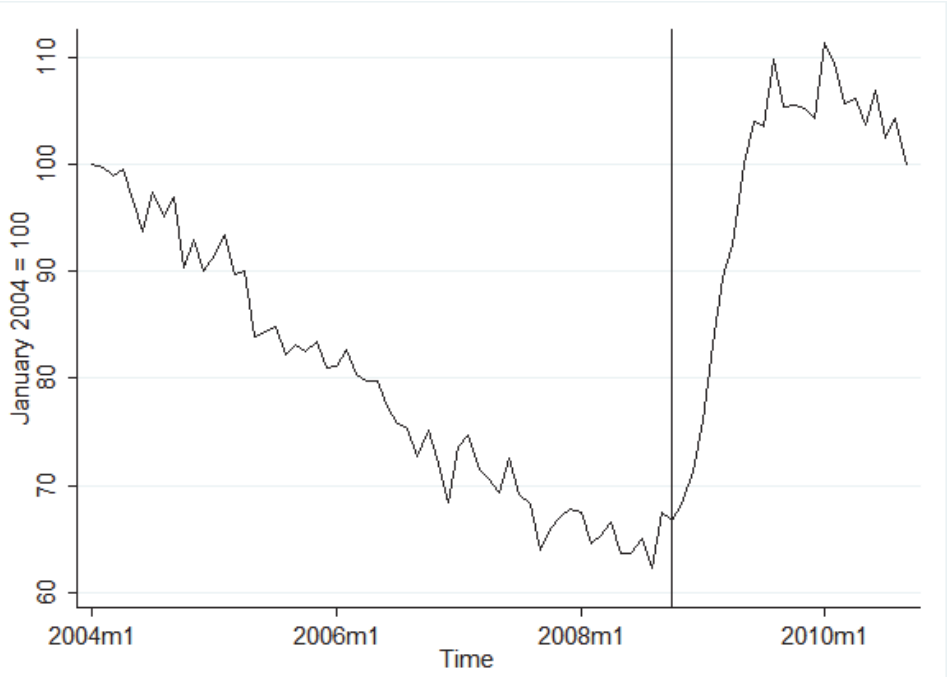

FIGURE 2 The development of the average margin of new business loans. The figure depicts the average trend in the margins of new business loans among the cooperative banks of OP-Pohjola Group for the January 2004 to September 2010 period. The graph is an index of the monthly average margin of cooperative banks' new business loans. The index is used for reasons of data confidentiality.

2.3.4 Competition measures

Bank competition measures are typically classified based on the Traditional and New Empirical Industrial Organization (IO) literature. The traditional IO literature uses market structure measures, whereas new measures attempt to gauge market power more directly.[15] Carbo et al. (2009) compare various competition measures and report that these are only weakly related. The recent literature often argues that national concentration is an inappropriate measure of bank competition (Bikker et al., 2012; Claessens and Laeven, 2004; Schaeck et al., 2009). Schaeck et al. (2009) note that if bank markets are local, national concentration measures can, in principle, be a misleading approach to gauging competition. I employ both a traditional market structure measure, the Herfindahl–Hirschman Index (HHI), and a more direct market power measure, the Lerner index, to define the competitiveness of markets. Both measures are calculated at the bank level, and a bank operating area constitutes one local market.

[15] Traditional measures include, e.g., concentration ratios, number of banks or Herfindahl indices (Beck et al., 2010). The new IO measures include, e.g., the Lerner index and Panzar and Rosse H-statistics. Other competition measures employed include, e.g., the net interest margin and return on assets (see e.g., Carbo et al., 2009).

For the empirical analysis, I classify the banks into two groups based on either the average HHI or the average Lerner index before the crisis. A bank is in the more competitive environment if its pre-crisis average of the relevant competition measure is in the first quintile.[16] I employ the pre-crisis averages of competition measures in order to avoid endogeneity problems, as the changes in competition are part of the outcome of the crisis.

The HHI is based on the locations of branches of the cooperative banks and of all other banks in Finland. It is computed by assuming that the share of branches represents the market share, as in Degryse and Ongena (2007) and Chong et al. (2013).[17] Consequently, the HHI is calculated for each cooperative bank based on the number of its branches and the number of other bank branches present in its local operating area. This is calculated at the zip code level (see Appendix 1 for details).

The Lerner index denotes the relative markup of price over marginal cost. In previous literature, the Lerner index is computed in various ways, depending on data availability and the study purpose. It is typically computed using the average price of bank activities based on total revenues or interest revenues and the marginal costs of total funding and operating costs, which generates a single indicator of banking activity (see e.g., Fernández de Guevara et al., 2005). Even if the Lerner index constructed in this way is based on market power on the loan/asset side, it also captures the impact of market power on the deposits/funding side through the marginal costs (see e.g., Beck et al. 2013). A more precise measurement of market power separately in the loan or deposit market requires more detailed data and consideration of the separability of the loan and deposit markets (e.g., Jiménez et al., 2013). Previous literature has used various approaches to calculate the Lerner index that are unaffected by market power in the deposit/funding market. The funding adjusted Lerner index omits funding costs in the calculation of the marginal costs (e.g., Fiordelisi and Salvatore, 2014). Another way is to use the Lerner index such that the marginal costs consist of the market interest rate and risk premium (e.g., Jiménez et al., 2013).

I construct the Lerner index for each cooperative bank using the ratio of total interest revenues over interest-bearing assets as the price of output. In the main analysis, the marginal costs are calculated based on three input prices: the price of labor, the price of physical capital and the price of funding. (See Appendix 1 for details.) This single indicator of banking activity is suitable for this paper because the effect of the pre-crisis local competitive environment on lending behavior after the onset of the crisis can come partly through the pre-crisis competitive environment in the deposit market.[18] It seems also that

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16 Lower Lerner index and HHI values indicate fiercer competition. I use the first quantile to clearly separate more competitive local markets. In addition, I conduct robustness checks using different classification and continuous values of pre-crisis averages.

17 I conduct robustness checks by modifying the normal HHI such that different bank branches have different effects on market shares because branch sizes can vary.

18 See section 2

market power in the loan and deposit markets are clearly positively correlated.[19]

In addition, I consider the issue focusing only market power on the asset/loan side. I conduct a number of robustness checks with competition measures that are based on market power only in the loan/asset market and that are unaffected by the market power in the deposit/funding market. I use both the funding adjusted Lerner index and the simple market power measure based on the average loan rates and the market interest rate. (See Appendix 1 and footnote 19.) In this way, I can compare the results based on both the separation and non-separation assumptions because I cannot explicitly assume whether the loan and deposit markets are separable, and this can also differ across local markets.[20]

Both the HHI and the Lerner index have disadvantages as a measure of market competitiveness, and I use these as complementary to obtain more reliable results. The Lerner index can measure the competitiveness of a bank (especially cost efficiency) in addition to or instead of market competition. Instead, because the HHI measures market concentration, it is not directly related to the competitiveness of a bank. However, as discussed above, its ability to measure market competition has been questioned in the previous literature. Lapteacru (2014) considers the theoretical differences between the HHI and the Lerner index and notes how empirical studies often do not take these differences into account and use measures interchangeably. In this paper, I do not assume that the HHI and the Lerner index measure precisely the same thing; rather, the main purpose is to identify differences across the banking markets. I assume that both measures can gauge some aspects of the local competitive environment even if they both have their own shortcomings. The previous literature based on national level data does not find a strong correlation between the Lerner index and the HHI (e.g., Carbo et al., 2009), but in my data, the correlation between these two measures is significantly positive.[21]

2.3.5 Control variables and descriptive statistics

I control for the key transmission channel of crisis effects on the loan supply observed in the previous literature (e.g., Iyer et al., 2014), i.e., the dependence on short-term, market-based funding, by classifying the banks into those that

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19 I calculate simple separate measures for the market power in the loans and deposits markets and the positive correlation of the pre-crisis averages of banks is 0.31. The variable for the market power in the deposits market is (3-month Euribor-average deposit rate)/3-month Euribor) and in the loans market is ((average loan rate-3-month Euribor)/average loan rate). It is obvious that more precise measures for marginal costs, especially for loans, should include, e.g., risk premium (see Jiménez et al., 2013), but here, the purpose is just to show that the degree of market power in the deposit and loan markets are correlated.

20 The banks in my data vary in terms of their funding structure and operate in different kinds of environments.

21 The positive correlation in the whole data period is 0.31. The correlation is larger before the crisis (0.43) than during the crisis (0.29).

are most dependent and the others. This classification is based on one-year averages of the share of short-term, market-based funding of total assets before the onset of the crisis, and the most-dependent banks are those in the top quintile. This accounts for the effects of funding structures on lending during the crisis as serious problems in money markets, and thus, the difficulties banks faced in obtaining short-term, market-based funding, was a key feature of the crisis period. Even if the availability of short-term, market-based funding from the central bank, Pohjola, was similar for all cooperative banks at a certain time, the exposure of an individual bank to turbulence in money markets was dependent on the relative amount of this type of funding, as Pohjola's pricing over time reflects its own cost of wholesale funding.

I use local economic variables and province-specific time trends to control for the dynamics of loan demand. The local economic variables include the unemployment rate, the growth of sales in establishments, personal income and the growth in the number of corporations (see e.g., Adams and Amel, 2011; Keeton, 2009). I use the province-specific time trends separately for the pre-crisis and crisis periods to take into account heterogeneous changes in local demand conditions after the onset of the crisis.

I also control bank characteristics that can affect loan supply and pricing based on the previous literature (e.g., Gambacorta and Mistrulli, 2014; Jiménez et al., 2012b). Size, capitalization, liquidity and non-performing loans are commonly used bank-specific factors. Off-balance-sheet commitments are an important control in my setting because my volume measure, new loans, also includes drawdowns of existing loan commitments. I measure these control variables as follows: The capitalization variable is the regulatory capital adequacy ratio, defined as Tier 1 capital divided by total risk-weighted assets. The liquidity variable is liquid assets divided by total assets. Liquid assets consist of cash, demand deposits held by other banks (especially Pohjola) and debt securities eligible for refinancing with central banks. Bank size is measured by the logarithm of total assets. Non-performing loans are loans that have been in default for 90 days, and these are also scaled by total assets. The relative size of off-balance-sheet activity is measured by the amount of irrevocable commitments to customers divided by total assets.

Table 1 shows descriptive statistics for variables used in the estimations, presented separately for the crisis period and for the period preceding the crisis. Competition and local economic variables are measured at yearly intervals, and all other variables are measured at monthly intervals. All 197 banks are observed from January 2004 to September 2010; thus, 15,957 monthly observations and 1,379 yearly observations were made.[22] The average of new business loans divided by total assets decreased from 0.34 % before the crisis to 0.28 % during the crisis, and the average loan margin increased from 1.29 to 1.58 percentage points.

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22 The lack of observations for some variables is attributable to months without new business lending and to missing information on individual banks.

TABLE 1 Descriptive statistics before and during the crisis

	mean		standard deviation		number of observations	
	before crisis	crisis	before crisis	crisis	before crisis	crisis
Dependent variables						
New business loans/total assets (%)	0.34	0.28	0.34	0.30	11032	4728
Margin of new business loans (%-points)	1.29	1.58	0.49	0.52	10140	4322
Competition variables						
Lerner index	0.31	0.18	0.10	0.13	959	392
HHI	0.59	0.61	0.29	0.30	980	392
Bank characteristics						
Short-term, market-based funding/assets (%)	5.02	5.82	5.02	8.09	10938	4707
Capital adequacy ratio (%)	21.27	23.04	5.88	6.02	11229	4728
Liquid assets/total assets (%)	3.01	2.30	2.90	2.47	11229	4728
The log of the total assets	18.18	18.41	1.10	1.10	11229	4728
Nonperforming loans/total assets (%)	0.66	0.59	0.55	0.53	11229	4728
OBS commitments/total assets (%)	4.80	4.87	1.86	1.90	11229	4728
Local economic conditions						
Unemployment rate (%)	10.15	10.42	3.80	3.19	985	384
Personal income (thousand euros)	22.38	23.62	2.97	2.75	985	394
The change in number of corporations (%)	2.78	1.28	2.41	2.52	980	392
The change in sales of establishments (%)	6.44	-3.55	9.43	13.02	985	394

The average Lerner index of all banks is lower during the crisis period, which should denote increased competition. However, this may reflect problems with using the Lerner index as a competition measure in a low interest rate environment that coincides with the crisis period. This is particularly relevant if deposit funding plays a significant role and if loans have floating interest rates, which are both the case in my data. In a low interest rate environment, deposit rates can fall to lower limits, and funding costs become rigid to market interest rates, while floating loan rates continue to change in line with market interest rates. [23] Because this paper examines the effect of different pre-crisis

[23] First, the share of deposits in the total debt funding is 91.5 percent in my data. The significant share of these deposits are current account deposits of which interest rates are typically much lower than market interest rates. Second, there is clear evidence that the net interest margin decreases significantly along with market interest rates if variable rate loans are dominant (e.g., ECB, 2015b, pp. 65–68). Furthermore, it seems

competitive environments on changes in lending behavior during the crisis, the analysis focuses on the pre-crisis averages of Lerner indices. When effects of the heterogeneous changes in the degree of competition in different pre-crisis competition environments after the onset of the crisis are examined in the auxiliary analyses, the empirical analysis is based on relative changes in Lerner indices.

2.3.6 Empirical specifications

I apply a difference-in-differences (DID) approach to analyze whether the effect of the crisis on margins and volumes of new small business loans depends on the pre-crisis competitive environment. I estimate the following econometric models:

$$\frac{\text{New business loans}_{it}}{\text{Total assets}_{i,t-1}} = \alpha + \beta_1 \text{Crisis} + \beta_2 \text{Comp} + \beta_3 \text{Comp x Crisis} + \beta_2 \text{Shortdebt} + \beta_3 \text{Short debt x Crisis} + \sum_{j=1}^{J} \delta_j X_{j,i,t-1} + \sum_{k=1}^{K} \theta_k R_{k,i,t} + \sum_{l=1}^{L} \gamma_l \text{Province}_l * t_{\text{before}} + \sum_{l=1}^{L} \kappa_l \text{Province}_l * t_{\text{crisis}} + \varepsilon_{it}, \quad (1)$$

and

$$\text{Average loan margin}_{it} = \alpha + \beta_1 \text{Crisis} + \beta_2 \text{Comp} + \beta_3 \text{Comp x Crisis} + \beta_2 \text{Shortdebt} + \beta_3 \text{Short debt x Crisis} + \sum_{j=1}^{J} \delta_j X_{j,i,t-1} + \sum_{k=1}^{K} \theta_k R_{k,i,t} + \sum_{l=1}^{L} \gamma_l \text{Province}_l * t_{\text{before}} + \sum_{l=1}^{L} \kappa_l \text{Province}_l * t_{\text{crisis}} + \varepsilon_{it}, \quad (2)$$

where i is the bank and t is the month. The *Crisis* dummy takes value zero for the pre-crisis period from January 2004 to September 2008. The *Crisis* dummy takes value one for the crisis period from October 2008 to September 2010. The *Comp* dummy takes value one for the banks in the most competitive environments before the crisis and zero for the other banks.

The model is first estimated without controls, i.e., using only the *Crisis* and *Comp* dummies and their interaction term. This specification of the model allows for two differences. The first difference is a comparison between the pre-crisis period and the crisis period. This difference is captured by coefficient β_1, which measures the common effect of the crisis on the volumes or prices of new small business loans in both competitive environment groups. The second difference is a comparison between the banks that operated in the most competitive environments in the pre-crisis period and the other banks. Coefficient $\beta_2$indicates whether loan volumes or prices were higher (or lower) in the most competitive environments before the crisis. My primary interest is in the DID estimate, i.e., in the coefficient β_3 of the interaction term of Crisis and

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that the decrease in the Lerner index along with market interest rates during the crisis is not specific to my data (see e.g., Beck et al., 2013).

Comp (cf., e.g., Dewally and Shao, 2014).[24] This coefficient measures whether the effect of the crisis on the loan volumes and prices is different between the banks that operated in the most competitive environment before the crisis and the other banks. For example, a positive β_3 in equation 2 would indicate that, after the onset of the crisis, loan margins increased more (or decreased less) in the banks that operated in the most competitive environment before the crisis compared to the banks that operated in less competitive environments.

In the above simple specification that includes no controls, the identification of the effect of the pre-crisis competitive environment on how the crisis affected the loan volumes and prices relies on the assumption that the effect of the crisis on lending is independent of other local market factors and bank characteristics. This assumption is quite strong. To relax it, I consider the following controls. First, I control for (potentially) heterogeneous changes in local loan demand conditions by using a vector of local market factors, denoted R above, and province-specific time trends.[25] The province-specific time trends are separately specified for the pre-crisis and crisis periods such that t_before=1,…,57 from January 2004 to September 2008 and zero otherwise and such that t_crisis=1,…,24 from October 2008 to September 2010 and zero otherwise. Moreover, I control for the effects of a bank's dependence on short-term funding by using the Short debt dummy and its interaction with the Crisis dummy. The Short debt dummy takes value one for the banks that were most dependent on short-term, market based funding at the onset of the crisis and is zero for the other banks.

In addition, the DID approach relies on the assumption that trends in loan volumes and prices would have been similar in the more and less competitive environments in the absence of the crisis. This is the parallel trend assumption. This assumption cannot be directly tested, but the evolution of the average volumes and margins in the more and less competitive environments before the crisis support the assumption, particularly for the margins (see Appendix 2). In addition, the inclusion of the vector of bank-specific factors (X) relaxes the parallel trends assumption: it ought to hold conditional on the bank-specific factor being in the model.

Finally, I estimate the model with bank and time fixed effects. The bank fixed effects control for unobservable, time-invariant differences between banks and their local environments.[26] The time (year-month) fixed effects control for the common changes in the lending environment, such as changes in monetary policy and new regulatory initiatives. In particular, this specification captures the effect of the level of the market interest rate on the loan margin.[27]

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24 In terms of the pure DID setting, where it is assumed that the treatment affects only one of the groups, the treatment can be interpreted as the combined effect of the crisis and pre-crisis competitive environment.

25 The number of provinces is 19.

26 The *Comp* and *Short* debt dummies are not used when bank fixed effects are included because they are constant for individual banks over time.

27 This is especially important if the loan and deposit markets are separated and the market interest rate is the most important element of the marginal costs when calculating market power in the loan market. The separation of the loan and deposit mar-

A relevant issue for the working of the DID methodology is how stable the classification of the banks into the more and less competitive groups is over time. According to my classification, a bank belongs to the same group of banks over the whole sample period: the classification of banks into the most competitive and the others is based on the pre-crisis averages of competition measures, measured for the five-year period just before the crisis. This choice follows directly from my aim to examine how the effect of the crisis depends on the pre-crisis competitive environment. I have also checked that the two groups were reasonably stable before the crisis by exploring how their composition would change if the classification is performed yearly.[28] It is important to note that if the composition of the banks in the two groups were allowed to change after the onset of the crisis, this could cause an endogeneity problem, as changes in the degree of competition is part of the outcome of the crisis.

2.4 Empirical analysis

This section presents the results of the main empirical analysis regarding the effect of the pre-crisis competitive environment on the changes in volumes and prices of small business loans after the onset of the financial crisis. In addition, this section includes several robustness checks.

2.4.1 Main results

Table 2 presents the bivariate results of the mean DID estimates of the volumes and margins of new business loans for the banks that operated in the most competitive environments before the crisis and for the other banks.[29] The classification of the banks into two groups is based on the pre-crisis average of the Lerner index in panels A and C and the pre-crisis average of the HHI in panels B and D. The volume of new business loans relative to total assets was, on average, significantly lower during the crisis than before the crisis in both groups (panels A and B of Table 2). More importantly, the interaction terms of the pre-crisis competitive environment and the crisis, i.e., DID estimates, are negative and statistically significant. Whereas the average of new business loans divided by total assets of the previous month decreased by 17 % (0.411 → 0.340) and 19 % (0.389 → 0.315) among the most competitive banks based on the Lerner index and HHI, respectively, the decline was 15 % (0.297 → 0.253) and 14 % (0.302 → 0.258) for the other banks, respectively.

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kets and the importance of the market interest rate in the marginal costs likely differ across banks due to, e.g., the differences in their funding structure.

28 In the case of the Lerner index, the yearly first quintiles include 74-85 percent of the banks classified into the most competitive environment. In the case of the HHI, the annually most competitive banks remain completely the same.

29 Analogous results to those in Table 2 and when the classification is based on the Lerner index are presented in Figures A2.1 and A2.2 in Appendix 2.

TABLE 2 Volumes and margins of new business loans before and after the onset of the financial crisis (bivariate tests).

	Competitive	Other	Difference
Panel A: New loans/ Total assets in the previous month, Competition measure: Lerner index			
Before October 2008	0.411	0.297	-0.113***
After October 2008	0.340	0.253	-0.087***
Difference	-0.071***	-0.045***	**-0.026****
Panel B: New loans / Total assets in the previous month, Competition measure: HHI			
Before October 2008	0.389	0.302	-0.087***
After October 2008	0.315	0.258	-0.056***
Difference	-0.074***	-0.043***	**-0.031*****
Panel C: Margin of new business loans, Competition measure: Lerner index			
Before October 2008	1.089	1.324	0.235***
After October 2008	1.523	1.561	0.037**
Difference	0.434***	0.237***	**0.197*****
Panel D: Margin of new business loans, Competition measure: HHI			
Before October 2008	1.101	1.323	0.218***
After October 2008	1.503	1.567	0.064***
Difference	0.398***	0.244***	**0.154*****

This table presents mean difference-in-difference (DID) estimates in which, in panels A and B, the dependent variable is the percentage of monthly new business loans divided by total assets in the previous month and in panels C and D the average margin of monthly new business loans. Dependent variables are winsorized at the 99th percentile. The cooperative banks are classified into two groups: competitive, when a cooperative bank's *pre-crisis* average of the competition measure is at the first quantile; other, otherwise. The classification is based on the Lerner index in panels A and C and on the HHI in panels B and D. The DID estimates are printed in bold. ***, **, and * denote that the coefficients are statistically significantly different from zero at the 1%, 5%, and 10% levels, respectively.

The margins of new business loans increased significantly after the onset of the financial crisis (panels C and D of Table 2). Before the crisis, the average loan margin was significantly lower among the banks that operated in the most competitive environment than among the other banks, but the difference between these groups nearly vanished after the onset of the crisis. The results indicate that the average loan margin of the pre-crisis most competitive banks increased by 43 or 40 basis points and by 24 basis points among the other banks. These differences, i.e., the DID estimates, are also statistically significant.

Table 3 presents results for volumes (Panel A) and prices (Panel B) when the effect of dependence on short-term, market-based funding is considered and when bank-specific and local environmental controls are included (columns 2-3). The estimates presented in column 4 also include bank and time fixed effects. The classification of the banks into the competitive environment groups is based on the Lerner index in these estimations. Column 5 presents the results obtained when the HHI is used to define the pre-crisis competitive environment, and all controls and bank and time fixed effects are included. Standard errors are clustered at the bank level to account for potential serial correlations, which are particularly critical in the case of DID estimation (Bertrand et al., 2004).

TABLE 3 Volumes and margins of new business loans before and after the onset of the financial crisis (multivariate tests)

Panel A. Dependent variable: New loans/ Total assets in the previous month					
	(1)	(2)	(3)	(4)	(5)
Crisis	-0.045***	-0.026***	0.018	0.010	0.010
	(0.008)	(0.009)	(0.015)	(0.038)	(0.037)
Competitive (Lerner)	0.113***	-0.010	-0.006		
	(0.021)	(0.027)	(0.026)		
Crisis x Competitive (Lerner)	-0.026*	-0.021	-0.019	-0.023	
	(0.015)	(0.017)	(0.016)	(0.017)	
Crisis x Competitive (HHI)					-0.034**
					(0.015)
Short market-based debt dummy		0.041*	0.046*		
		(0.024)	(0.025)		
Crisis x Short market-based debt		-0.032*	-0.033*	-0.028	-0.309*
		(0.017)	(0.017)	(0.018)	(0.017)
Bank-specific controls	no	yes	yes	yes	yes
Local economic variables	no	yes	yes	yes	yes
Province-specific time trends (before and during crisis)	no	no	yes	yes	yes
Time fixed effects	no	no	no	yes	yes
Bank fixed effects	no	no	no	yes	yes
Number of observations	15602	15419	15419	15419	15419
R-squared	0.032	0.095	0.109	0.047	0.047
Panel B. Dependent variable: Margin of new business loans					
	(1)	(2)	(3)	(4)	(5)
Crisis	0.237***	0.262***	-0.345***	-0.516***	-0.489***
	(0.017)	(0.022)	(0.034)	(0.069)	(0.071)
Competitive (Lerner)	-0.235***	-0.051	-0.041		
	(0.035)	(0.044)	(0.036)		
Crisis x Competitive (Lerner)	0.197***	0.204***	0.199***	0.189***	
	(0.033)	(0.030)	(0.029)	(0.029)	
Crisis x Competitive (HHI)					0.129***
					(0.037)
Short market-based debt dummy		0.056*	0.023		
		(0.029)	(0.029)		
Crisis x Short market-based debt		0.002	0.015	0.022	0.062*
		(0.030)	(0.031)	(0.031)	(0.034)
Bank-specific controls	no	yes	yes	yes	yes
Local economic variables	no	yes	yes	yes	yes
Province-specific time trends (before and during crisis)	no	no	yes	yes	yes
Time fixed effects	no	no	no	yes	yes
Bank fixed effects	no	no	no	yes	yes
Number of observations	14317	13980	13980	13980	13980
R-squared	0.103	0.201	0.320	0.320	0.317

This table presents the result of a regression of loan volumes and margins on crisis, competitive environments, dependence on short-term, market-based funding, and their interactions plus bank and local environment controls. The dependent variable is the percentage of monthly new business loans divided by total assets in the previous month in panel A and the average margin of monthly new business loans in panel B. Dependent variables are winsorized at the 99th percentile. *Crisis* takes value one after September 2008 and zero otherwise. *Competitive* takes value one when cooperative bank's *pre-crisis* average of the competition measure is in the top quantile and zero otherwise. Standard errors, clustered at the bank level, are reported in parentheses. ***, **, and * denote that the coefficients are statistically significantly different from zero at the 1%, 5%, and 10% levels, respectively.

Panel A of Table 3 indicates that, in the volume regressions, the interaction term coefficient of the pre-crisis competitive environment and crisis dummies remains negative and fairly stable, but it becomes statistically insignificant when controls are included and when the competitive environment classification is based on the Lerner index.[30] Instead, the coefficient of this interaction term is negative and statistically significant when the pre-crisis competitive environment is classified based on the HHI and when all controls are included. These results suggest that volume declines after the onset of the crisis were greater among the banks that operated in the most competitive environments before the crisis than among the other banks. The interaction coefficient values roughly range between 0.02 and 0.03, or at approximately half of the average decrease for all banks after the onset of the crisis (see Table 1), although these estimates are not statistically robust in every specification.

Panel B of Table 3 shows, that in the margin regressions, the interaction term coefficient of the pre-crisis competitive environment and crisis dummies is positive and does not change substantially when controls are added and that it is also statistically significant in all specifications. This result remains when the HHI is used to classify the pre-crisis competitive environment. This finding confirms the bivariate analysis results, which show that the new small business loan margin increases after the onset of the crisis were greater among the banks that operated in the most competitive environments before the crisis than among the other banks. The average margin increases are approximately 20 or 13 basis points higher among the banks that operated in the most competitive environments, according to the Lerner index and HHI, respectively. The economic relevance becomes evident when this finding is compared with the average increase among all banks of 29 basis points (Table 1).

2.4.2 Robustness checks

I conduct various robustness checks to consider possible problems in the main analysis. The difference-in-difference analysis based on the two groups, namely, the banks in more and less competitive environments before the crisis, assumes a discontinuous effect of the competition measures because the variables only take a value of one or zero. Now, I use continuous values instead of dummies for the competition measures and keep the estimations otherwise unchanged. The results are reported in Table 4. They are comparable to Table 3 and indicate that my main results are robust to the use of continuous competition variables.[31]

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30 The estimate of interest is the coefficient of the interaction term for all specifications. For example, the crisis dummy estimate becomes insignificant in columns 3-5, but this estimate no longer has the same meaning as in the specifications of columns 1 and 2 because the common effects of the crisis period are also captured by separate province-specific time trends for the pre-crisis and crisis periods and by time fixed effects.

31 The additional sixth column not present in Table 3 omits an observation if the pre-crisis HHI average is equal to one. These omitted observations are primarily of very small banks.

TABLE 4 Volumes and margins of new business loans before and after the onset of the financial crisis when competition measures are continuous (cf. Table 3)

Panel A. Dependent variable: New loans/ Total assets in the previous month						
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis	-0.103***	-0.070***	-0.023	-0.033	-0.021	-0.043
	(0.022)	(0.025)	(0.027)	(0.043)	(0.053)	(0.053)
Average Lerner before crisis	-0.566***	0.041	0.002			
	(0.086)	(0.128)	(0.132)			
Crisis x Average Lerner before crisis	0.170**	0.142*	0.134*	0.147**		
	(0.071)	(0.072)	(0.069)	(0.071)		
Crisis x Average HHI before crisis					0.053**	0.093*
					(0.025)	(0.054)
Short market-based debt/assets (year average before crisis)		0.271**	0.259*			
		(0.119)	(0.132)			
Crisis x Short market-based debt		-0.215**	-0.214**	-0.172*	-0.204**	-0.236**
		(0.084)	(0.090)	(0.088)	(0.080)	(0.114)
Local economic and bank controls	no	yes	yes	yes	yes	yes
Province-specific time trends	no	no	yes	yes	yes	yes
Time fixed effects	no	no	no	yes	yes	yes
Bank fixed effects	no	no	no	yes	yes	yes
Number of observations	15524	15282	15282	15282	15262	10689
R-squared	0.035	0.097	0.110	0.047	0.048	0.058
Panel B. Dependent variable: Margin of new business loans						
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis	0.624***	0.605***	0.017	-0.185**	-0.362***	-0.321***
	(0.053)	(0.055)	(0.053)	(0.078)	(0.074)	(0.100)
Average Lerner before crisis	1.333***	0.618***	0.484**			
	(0.156)	(0.235)	(0.219)			
Crisis x Average Lerner before crisis	-1.121***	-1.015***	-1.076***	-1.012***		
	(0.170)	(0.170)	(0.143)	(0.140)		
Crisis x Average HHI before crisis					-0.168***	-0.354***
					(0.053)	(0.125)
Short market-based debt/assets (year average before crisis)		0.189	0.066			
		(0.176)	(0.160)			
Crisis x Short market-based debt		0.257	0.261	0.347**	0.688***	0.914***
		(0.159)	(0.160)	(0.164)	(0.170)	(0.261)
Local economic and bank controls	no	yes	yes	yes	yes	yes
Province-specific time trends	no	no	yes	yes	yes	yes
Time fixed effects	no	no	no	yes	yes	yes
Bank fixed effects	no	no	no	yes	yes	yes
Number of observations	14236	13845	13845	13845	13854	10133
R-squared	0.120	0.207	0.325	0.326	0.322	0.356

This table presents the regression of loan volumes and margins on crisis, competitive environments, dependence on short-term, market-based funding, and their interactions plus bank and local environment controls. The dependent variable in panel A is the percentage of monthly new business loans divided by total assets in the previous month and in panel B is the average margin of monthly new business loans. Dependent variables are winsorized at the 99th percentile. *Crisis* takes value one after September 2008 and zero otherwise. The competition measures are calculated as the *pre-crisis* average. Standard errors, clustered at the bank level, are reported in parentheses. ***, **, and * denote that the coefficients are statistically significantly different from zero at the 1%, 5%, and 10% levels, respectively.

When estimating volumes, the interaction term coefficients of the crisis and the pre-crisis averages of the competition measures are positive and statistically significant in all specifications (Panel A of Table 4). Because a greater Lerner index and HHI value denotes less competition, these positive interaction term coefficients denote that the decline in new small business loans after the onset of the crisis was smaller among banks that operated in less competitive environments before the crisis. Evaluated at the tenth (0.169) and ninetieth (0.384) percentiles of the average pre-crisis value of the Lerner index and based on the coefficient of the final model in the fourth column, the decline in the loan volume measure was 0.03 percentage points lower in the least competitive environments than it was in the most competitive environments. The corresponding evaluation based on the HHI as a competition measure in the sixth column also shows a 0.03 percentage point difference. The average decrease for all of the banks was 0.06 percentage points (see Table 1).

In the margin estimations, the interaction term coefficients of the crisis and the pre-crisis average of competition measures are negative and highly statistically significant in all specifications, thereby denoting a greater increase in the loan margins of banks that operated in more competitive environments before the crisis (Panel B of Table 4). Evaluated for the tenth and ninetieth percentiles of the average pre-crisis value of the Lerner index and based on the coefficient shown in the fourth column, the increase in loan margins was 22 basis points lower in the least competitive environments than in the most competitive environments. The difference amounts to 11 basis points when the evaluation is based on the average pre-crisis values of the HHI in column 6. The average increase for all banks was 29 basis points (see Table 1).

I also estimate the DID model for two groups such that the classification of the most competitive environments is based on the lowest third of the values of average pre-crisis competition measures rather than those of the first quintile. I find that the interaction term coefficients of the crisis and the pre-crisis competitive environment change only marginally. In the case of volumes, the effect is statistically insignificant when the Lerner index is used as the classification variable and is significant when HHI is used. The interaction term coefficients of the pre-crisis competitive environment and crisis dummies are generally slightly smaller.

While crisis period identification forms an essential element of the analysis, the length of this period is not definitive. Hence, I conduct a robustness test using a one-year/12-month crisis period instead of the two-year period that is used in the primary analysis. The results are largely similar, as the estimates of the interaction terms are only slightly lower than those of the primary analysis and are more robust for margins than for volumes.

I define the modified HHI based on weighted branches of various banks as an alternative concentration measure in Appendix 1, and I conduct robustness tests using this in place of the normal HHI. The results based on this modified HHI are consistent with the results based on the normal HHI, although the effect of the pre-crisis competitive environment on volume

changes after the onset of the crisis is not as statistically significant as shown in the primary analysis.

Finally, I conduct robustness checks based on the measures of market power in the loan/asset market that are unaffected by market power in the deposit/funding market. I use the funding adjusted Lerner index and the simple market power measure for the loan market defined in section 2.3.4 and estimate the same models as in Tables 2-4. In the margin regressions, the estimates of the interaction terms are statistically significant and slightly lower than those of the primary analysis. In the volume regressions, the effects of the pre-crisis competitive environment are largely similar when the simple market power measure is used but are insignificant with the adjusted Lerner index. In sum, the various robustness checks support the results of the primary analysis, especially regarding the results of the price changes.

2.5 Discussion and auxiliary analysis

This section discusses the results of the main empirical analysis. In addition, the section includes an auxiliary analysis that further examines various explanations behind the main results.

2.5.1 Discussion of the main results

The results indicate that the average margins of new business loans were lower before the crisis in more competitive local markets, which supports the market power hypothesis (e.g., Hannan, 1997). More important for the purpose of my study, the increase in average loan margins after the onset of the crisis was significantly greater in banks that operated in more competitive environments before the crisis. This result suggests that the pre-crisis competitive environment can explain the heterogeneous effects of the crisis on loan prices, in addition to factors such as loan losses and liquidity that are considered in the previous literature (Gambacorta and Mistrulli, 2014; Santos, 2011).

The results also reveal that the volumes of new business loans decreased to a greater extent in more competitive environments after the onset of the crisis, but this result is not as statistically robust as that for loan prices. In conjunction with the results concerning loan prices, this suggests that banks that operated in more competitive environments before the crisis reduced their loan supply to a greater extent after the onset of the crisis. If the effect of demand shock was a dominant factor behind the larger decrease in loan volumes in more competitive environments, this should be reflected by a smaller increase in loan prices. Hence, the results indicate how differences in pre-crisis competitive environments can explain the heterogeneous changes in loan supply in addition to factors, such as funding problems and loan losses, considered in the previous literature (e.g., Iyer et al., 2014; Puri et al., 2011). However, this interpretation must be considered with caution, as I cannot completely control for loan

demand or consider lending standards other than price due to data limitation, and the results for loan volumes are not very robust.

The results are based on a unique dataset and period, and thus, generalization issues are of particular relevance. First, the results concerning the changes in loan volumes might be affected by the lending behavior of the cooperative banks related to other banks in the same local market due to differences in organizational forms.[32] Second, it is a relevant question how the results apply to other countries and loan markets. It is obvious that more empirical research is needed to better understand the role of different competitive environments in heterogeneous effects of crises. This paper argues how the effect of competitive environments on responses to crises can come through various factors, whose contributions are next analyzed via auxiliary analyses.

2.5.2 Auxiliary analyses of the competitive environment effects

I explore possible economic mechanisms for the study finding that, after the onset of the crisis, volumes and prices of business loans changed more in the banks that operated in more competitive environments before the crisis. First, I examine the effect of the changes in the degree of competition. I then tentatively examine the role of the relationship between competitive environments and funding structures. Finally, I examine whether changes in risks can explain the main results. I am unable to consider the role of relationship lending in different competitive environments due to data limitations.

I consider the changes in the degree of competition by comparing the average Lerner index values between competitive environment groups used in the main analysis before and after the crisis. I also use the interest rate spread, i.e., the difference between the average interest rate on new loans and the average deposit rate, as a complementary measure to approximately capture the combined effect of loan and deposit competition. To complete a more detailed examination, I compare variations in the average margins of new mortgages and consumer loans and the average interest rates of current account, saving and new term deposits.

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32 For a discussion of the effects of the cooperative business model on lending behavior during the crisis, see, e.g., Groeneveld and Vries (2009) and EACB (2010). In general, cooperative banks seemed to be more resilient to the crisis than other kinds of banks (Ferri et al., 2014). OP-Pohjola Group's market share of business loans in Finland as a whole increased from 26.8 percent to 29.2 percent between 2008 and 2010, which suggests that at least some rival banks increased prices, tightened their lending standards and/or increased rationing to a greater extent than the cooperative banks. This could mean shifts of customers to the cooperative banks. Thus, increased loan prices and possibly tightened lending standards would not have affected the reduction in loan volumes to such an extent as in the absence of different reactions of different banks. In particular, this effect might be greater in local markets with more rival banks.

TABLE 5 Comparison of competition measures, prices and dependence on short-term, market-based funding between the banks that operated in the most competitive environments before the crisis and the other banks before and during the crisis

	Before October 2008			After October 2008			
Variable	Competitive	Other	Difference	Competitive	Other	Difference	Diff-in-Diff
Lerner index	0.198	0.362	0.164***	0.085	0.236	0.150***	-0.013***
Interest spread	2.604	2.953	0.349***	1.627	1.870	0.243***	-0.106***
Interest rates							
Interest rate on current account deposits	0.815	0.722	-0.094***	0.446	0.437	-0.009	-0.085***
Interest rate on saving deposits	2.384	2.406	0.022	1.323	1.368	0.045	-0.023
Interest rate on new term deposits	3.438	3.343	-0.096***	1.952	1.968	0.016	-0.111***
Average margin on mortgages	1.067	1.265	0.199***	1.341	1.430	0.089***	-0.109***
Average margin on consumer loans	1.527	1.771	0.244***	1.857	1.937	0.080***	-0.163***
Short market-based debt/asset	0.111	0.035	-0.077***	0.090	0.050	-0.040***	-0.037***

This table presents mean difference-in-difference (DID) estimates of competition variables and prices of various loan and deposits. The classification of competitive environment groups is based on the *pre-crisis* Lerner index. All values are averages for banks in each group. The interest rate spread denotes the difference between the average interest rate on new loans and deposits. Interest rates relate to new monthly deposits and loans. ***, **, and * denote that the coefficients are statistically significantly different from zero at the 1%, 5%, and 10% levels, respectively

Table 5 shows that after the onset of the crisis, the differences in both competition measures and the prices of various types of deposits and loans diminished between the banks that operated in the most competitive environments before the crisis and the other banks. The DID estimates are also statistically significant, but not in the case of saving deposits. This finding suggests that after the onset of the crisis, the degree of (price) competition leveled off among different local markets and resulted in a greater increase in the loan margins of banks that operated in more competitive environments before the crisis. This result indirectly supports Ruckes' (2004) theory on decreasing price competition in bust periods.[33] I cannot directly examine how

[33] The alternative interpretation would mean that competition increased after the onset of the crisis and more so in local environments that were less competitive before the crisis. This interpretations is not very convincing because, for example, margins of various loans increased significantly during the crisis.

competition changed overall after the onset of the crisis, due to problems associated with uses of the Lerner index as a competition measure in a low interest rate environment.[34]

The relation between competitive environments and dependence on short-term, market-based funding is considered based on the following observations. First, my main analysis results show (Tables 3 and 4) that estimates of pre-crisis competitive environment effects on loan volumes decrease when a variable that measures dependence on short-term, market-based funding is included in the analysis. Second, Table 5 shows that the data also support the market power hypothesis for deposit rates. This finding complements the findings of previous studies (e.g., Hannan and Prager, 2004; Hannan, 1997). Third, Table 5 shows that the shares of short-term, market-based funding of total assets were, on average, larger among the banks that operated in the most competitive environments before the crisis than among the other banks, and that this difference declined after the onset of the crisis. This finding tentatively suggests that competition can increase the share of short-term funding other than deposit funding, and it supports the few findings published on the issue, which also refer to this mechanism (see Craig and Dinger, 2013). However, the effect of competition on funding structures and, thus, on bank vulnerability to various funding shocks, requires further analysis.

Finally, credit risk and thus credit ratings constitute an important aspect of loan pricing, and changes in the credit ratings of small business customers can reflect changes in risk-taking and in the overall riskiness of small businesses. The bank-specific data used in the main analysis do not include credit rating information, but I can exploit the loan-specific data with internal credit ratings for the shorter period from September 2008. I calculate the average credit ratings of outstanding business loans for each cooperative bank at the start and end of the crisis period. In addition, I estimate the effect of competitive environments on loan margins at the loan level and thus control risks based on internal credit ratings. I also control loan sizes, which serve as a key element of loan pricing. Because I only use data for the period following September 2008, I first estimate a cross-sectional regression on the margins of the entire stock of business loans at the start of the crisis period. Second, I estimate the regression on margins of new business loans for the crisis period using monthly fixed effects. The corresponding results are presented in Table 6.

The results shown in panel A of Table 6 indicate that the average credit rating of small businesses is, on average, lower (better) for the group of the most competitive banks both in September 2008 and September 2010. However, the difference in average credit ratings at the start of the crisis is not statistically significant. The average credit ratings of outstanding business loans were slightly higher in September 2010 than they were in September 2008 in both competitive environment groups, which illustrates that the

[34] For a further discussion of this issue, see section 2.3.4.

average credit risks increased after the onset of the crisis. Although the change in difference, i.e., DID estimate, is not statistically significant, these results indicate that, if anything, credit risks increased to a greater extent after the onset of the crisis in banks that operated in less competitive environments before the crisis. This finding has two implications.[35] First, changes in the riskiness of business loans do not appear to explain more significant increases in loan margins in more competitive environments. Second, while I cannot control for changes in the riskiness of loan applicants, the greater difference in average credit ratings between the competitive environment groups at the end of the crisis could imply that the banks that operated in the most competitive environments before the crisis limited loan supply to the most risky businesses to a greater extent than the other banks. This finding suggests that "flight to quality" processes during the crisis might depend on the pre-crisis competitive environment, thus contributing to previous literature that has considered, for example, the effect of bank size and capitalization on changes in risk-taking tendencies during the crisis (Albertazzi and Marchetti, 2010).

TABLE 6 An examination of the role of credit risk in heterogeneous changes in volumes and margins of business loans

Panel A. Comparison between average credit ratings of business loans between the banks that operated in the most competitive environments before the crisis and the other banks at the beginning and at the end of the crisis period

	September 2008			September 2010			
Variable	Competitive	Other	Difference	Competitive	Other	Difference	Diff-in-Diff
Average risk rating of business loans	6.657	6.771	0.113	6.823	7.106	0.279***	-0.166
Number of observations	39	158		39	158		

(continues)

[35] Note that the datasets used in the main analysis and this credit risk analysis are not fully comparable, but the purpose is to provide approximate evidence.

Table 6 continues
Panel B. The effect of the pre-crisis competitive environment on loan margin based on loan-specific data.

	Margin of stock of business loans in September 2008		Margin of new business loans during the crisis	
	(1)	(2)	(3)	(4)
Competitive (Lerner)	-0.122***		0.062***	
	(0.005)		(0.006)	
Competitive (HHI)		-0.077***		0.056***
		(0.005)		(0.006)
Risk rating	0.088***	0.088***	0.081***	0.081***
	(0.001)	(0.001)	(0.002)	(0.002)
Ln(loan amount)	-0.154***	-0.156***	-0.125***	-0.124***
	(0.002)	(0.002)	(0.003)	(0.003)
Time fixed effects	no	no	yes	yes
Number of observations	49110	49110	30099	30099
R-squared	0.225	0.219	0.213	0.213

This table presents mean difference-in-difference (DID) estimates of average credit ratings for different pre-crisis competition environments (panel A) and loan-level regressions of loan margins for competitive environments, internal credit ratings and loan sizes (panel B). *Competitive* takes value one when cooperative bank's *pre-crisis* average of the competition measure is in the top quantile and zero otherwise. Standard errors are reported in parentheses in panel B. ***, **, and * denote that coefficients differ significantly from zero at the 1%, 5%, and 10% levels, respectively.

The results shown in panel B of Table 6 confirm that the greater increase in loan margins after the onset of the crisis among the banks that operated in the most competitive environment before the crisis is not attributable to changes in risks. According to the estimates, at the start of the crisis, the loan margins are 12 and 8 basis points lower in the group of banks that operated in the most competitive environment before the crisis based on the Lerner index and HHI, respectively.[36] During the crisis, margins of new business loans are 6 basis points higher for this same group of banks. Differences between the estimates of the pre-crisis competitive environment indicator variables for the start of the crisis and for the entire crisis period closely reflect the estimates of the interaction terms shown in Table 3.[37]

2.6 Conclusion

In this paper, I examined whether the effects of the financial crisis on the volumes and prices of small business loans depended on the pre-crisis local competitive environment. Using detailed data on Finnish cooperative banks, I found that the volumes of new small business loans relative to total assets decreased and that the average loan margins increased after the onset of the

36 These loan-level data are also advantageous in that they enable one to exclude withdrawals of existing credit limits and to directly analyze new loan contract margins.

37 Based on the Lerner index, 0.184(0.062+0.122), and based on the HHI, 0.133(0.056+0.077). The interaction terms in the final specifications in panel B of Table 3 are 0.195 and 0.129, respectively.

crisis. More importantly, both changes were greater among the banks that operated in more competitive local environments before the crisis. The results are more robust for the loan margins and they indicate that relative to the banks operating in the less competitive environments, the increase in the average margin of new business loans was almost twice as large among the banks in the most competitive environments. These results suggest that the pre-crisis competitive environment is a relevant but previously overlooked factor for the transmission of the effects of crises.

I also examined possible reasons for the relationship between the pre-crisis competitive environment and changes in the prices and volumes of small business loans after the onset of the financial crisis. The results suggest that competition changed heterogeneously in different pre-crisis competitive environments such that differences in the degree of competition between more and less competitive environments leveled off after the onset of the crisis. This differential change appears to explain the greater changes in margins and volumes among the banks that operated in more competitive environments before the crisis. Risks and risk-taking did not differ significantly across different pre-crisis competitive environments and, if anything, should have resulted in a smaller increase in loan margins in the more competitive environments. Funding structures were somewhat different, such that the banks in more competitive environments were more dependent on market-based funding at the onset of the crisis, and these banks decreased their loan volumes to a greater extent during the crisis. This result tentatively supports an indirect effect of the pre-crisis competitive environment.

Overall, the results indicate that the local competitive environment can serve as a significant factor in determining heterogeneous effects of the crisis on small business lending. The results also further our awareness of channels through which the crisis affected bank lending. Finally, the results highlight the potential role of competition in procyclical lending, which currently constitutes a central issue of bank supervision and regulation.

REFERENCES

Adams, R.M. & Amel, D.F. 2011. Market structure and the pass-through of the federal funds rate. Journal of Banking and Finance 35 (5), 1087–1096.

Agarwal, S. & Hauswald, R. 2010. Distance and Private Information in Lending. Review of Financial Studies 23 (7), 2757–2788.

Albertazzi, U. & Marchetti, D.J. 2010. Credit Crunch, Flight to Quality and Evergreening : An Analysis of Bank-Firm Relationships After Lehman. Working paper, Bank of Italy.

Asea, P.K. & Blomberg, B. 1998. Lending cycles. Journal of Econometrics 83 (1-2), 89–128.

Beck, T., Coyle, D., Dewatripoint, M., Freixas, X. & Seabright, P. 2010. Bailing out the Banks: Reconciling Stability and Competition. Centre for Economic Policy Research (CEPR).

Beck, T., De Jonghe, O. & Schepens, G. 2013. Bank competition and stability: Cross-country heterogeneity. Journal of Financial Intermediation 22 (2), 218–244.

Berg, J., Van Rixtel, A., Ferrando, A., De Bondt, G. & Scopel, S. 2005. The Bank Lending Survey for the Euro Area. ECB Occasional Paper Series No. 23.

Berger, A.N. & Hannan, H. 1989. The Price-Concentration Relationship in Banking. The Review of Economics and Statistics 71 (2), 291–299.

Berger, A.N., Klapper, L.F. & Turk-Ariss, R. 2009. Bank Competition and Financial Stability. Journal of Financial Services Research 35 (2), 99–118.

Berger, A.N. & Udell, G.F. 1998. The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. Journal of Banking & Finance 22 (6-8), 613–673.

Bernanke, B.S., Gertler, M. & Gilchrist, S. 1996. The financial accelerator and the flight to quality. The Review of Economics and Statistics 78 (1), 1–15.

Bernanke, B.S. & Lown, C.S. 1991. The Credit Crunch. Brookings Papers on Economic Activity 1991 (2), 205–247.

Bertrand, M., Duflo, E. & Mullainathan, S. 2004. How Much Should We Trust Differences-In-Differences Estimates? The Quarterly Journal of Economics 119 (1), 249–275.

Bikker, J.A., Shaffer, S. & Spierdijk, L. 2012. Assessing competition with the Panzar-Rosse model: The role of scale, costs, and equilibrium. The Review of Economics and Statistics 94 (4), 1025–1044.

Bolton, P., Freixas, X., Gambacorta, L. & Mistrulli, P.E. 2013. Relationship and Transaction Lending in a Crisis. BIS Working Papers No. 417.

Boot, A.W.A. 2000. Relationship Banking: What Do We Know? Journal of Financial Intermediation 9 (1), 7–25.

Boot, A.W.A. & Thakor, A. V. 2000. Can Relationship Banking Survive Competition? The Journal of Finance 55 (2), 679–713.

Boyd, J.H. & De Nicolo, G. 2005. The Theory of Bank Risk Taking and Competition Revisited. The Journal of Finance 60 (3), 1329–1343.

Carbo, S., Humphrey, D., Maudos, J. & Molyneux, P. 2009. Cross-country comparisons of competition and pricing power in European banking. Journal of International Money and Finance 28 (1), 115–134.

Carbo-Valverde, S., Rodriguez-Fernandez, F. & Udell, G.F. 2009. Bank Market Power and SME Financing Constraints. Review of Finance 13 (2), 309–340.

Chong, T.T.L., Lu, L. & Ongena, S. 2013. Does banking competition alleviate or worsen credit constraints faced by small- and medium-sized enterprises? Evidence from China. Journal of Banking and Finance 37 (9), 3412–3424.

Claessens, S. & Laeven, L. 2004. What Drives Bank Competition ? Some International Evidence. Journal of Money, Credit & Banking 36 (3), 563–583.

Cornett, M.M., McNutt, J.J., Strahan, P.E. & Tehranian, H. 2011. Liquidity risk management and credit supply in the financial crisis. Journal of Financial Economics 101 (2), 297–312.

Corvoisier, S. & Gropp, R. 2002. Bank concentration and retail interest rates. Journal of Banking and Finance 26 (11), 2155–2189.

Cotugno, M., Monferrà, S. & Sampagnaro, G. 2013. Relationship lending, hierarchical distance and credit tightening: Evidence from the financial crisis. Journal of Banking and Finance 37 (5), 1372–1385.

Craig, B.R. & Dinger, V. 2013. Deposit market competition, wholesale funding, and bank risk. Journal of Banking and Finance 37 (9), 3605–3622.

Degryse, H., Kim, M. & Ongena, S. 2009. Microeconometrics of Banking: Methods, Applications, and Results. Oxford University Press, New York.

Degryse, H. & Ongena, S. 2007. The impact of competition on bank orientation. Journal of Financial Intermediation 16 (3), 399–424.

Degryse, H. & Ongena, S. 2005. Distance, Lending Relationships, and Competition. The Journal of Finance 60 (1), 231–266.

Dell'Ariccia, G., Igan, D. & Laeven, L. 2012. Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market. Journal of Money, Credit & Banking 44 (2-3), 367–384.

Dell'Ariccia, G. & Marquez, R. 2006. Lending Booms and Lending Standards. The Journal of Finance 61 (5), 2511–2546.

Demiroglu, C., James, C. & Kizilaslan, A. 2012. Bank Lending Standards and Access to Lines of Credit. Journal of Money, Credit and Banking 44 (2-3), 1063–1089.

Dewally, M. & Shao, Y. 2014. Liquidity crisis, relationship lending and corporate finance. Journal of Banking and Finance 39, 223–239.

European Association of Co-operative Banks (EACB). 2010. European Co-operative Banks in the financial and economic turmoil. Research Paper, European Association of Cooperative Banks, Brussels.

European Central Bank (ECB). 2015. ECB Financial Stability Review November 2015.

European Central Bank (ECB). 2014. SME access to finance in the euro area: barriers and potential policy remedies. ECB Monthly Bulletin July 2014, 79–98.

Fernández de Guevara, J., Maudos, J. & Perez, F. 2005. Market Power in European Banking Sectors. Journal of Financial Services Research 27 (2), 109–137.

Ferri, G., Kalmi, P. & Kerola, E. 2014. Organizational Structure and Exposure to Crisis among European Banks : Evidence from Rating Changes. Journal of Entrepreneurial and Organizational Diversity 3 (1), 35–55.

Fiordelisi, F. & Salvatore, D. 2014. Competition and financial stability in European cooperative banks. Journal of International Money and Finance 45, 1–16.

Gambacorta, L. & Mistrulli, P.E. 2014. Bank Heterogeneity and Interest Rate Setting: What Lessons Have We Learned since Lehman Brothers? Journal of Money, Credit and Banking 46 (4), 753–778.

Gozzi, J.C. & Goetz, M. 2010. Liquidity Shocks , Local Banks , and Economic Activity : Evidence from the 2007-2009 Crisis. Available at SSRN: http://dx.doi.org/10.2139/ssrn.1709677.

Groeneveld, H. & De Vries, B. 2009. European co-operative banks: First lessons of the subprime crisis. The International Journal of Cooperative Management 4(2), 8-21.

Hakenes, H., Hasan, I., Molyneux, P. & Xie, R. 2015. Small banks and local economic development. Review of Finance 19 (2), 653–683.

Hannan, T.H. 1997. Market Share Inequality, the Number of Competitors, and the HHI: An Examination of Bank Pricing. Review of Industrial Organization 12 (1), 23–35.

Hannan, T.H. & Prager, R.A. 2004. The competitive implications of multimarket bank branching. Journal of Banking and Finance 28 (8), 1889–1914.

Hyytinen, A. & Toivanen, O. 2004. Monitoring and market power in credit markets. International Journal of Industrial Organization 22 (2), 269–288.

Ivashina, V. & Scharfstein, D. 2010. Bank lending during the financial crisis of 2008. Journal of Financial Economics 97 (3), 319–338.

Iyer, R., Peydro, J.-L., Da-Rocha-Lopes, S. & Schoar, A. 2014. Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007-2009 Crisis. Review of Financial Studies 27 (1), 347–372.

Jiménez, G., Lopez, J. A. & Saurina, J. 2013. How does competition affect bank risk-taking? Journal of Financial Stability 9 (2), 185–195.

Jimenéz, G., Ongena, S., Peydró, J. & Saurina, J. 2012a. Credit Supply versus Demand : Bank and Firm Balance-Sheet Channels in Good and Crisis Times. European Banking Center Discussion Paper.

Jiménez, G., Ongena, S., Peydró, J.L. & Saurina, J. 2012b. Credit supply and monetary policy: Identifying the bank balance-sheet channel with loan applications. American Economic Review 102, 2301–2326.

Jiménez, G. & Saurina, J. 2006. Credit Cycles, Credit Risk, and Prudential Regulation. International Journal of Central Banking June 2006, 65–98.

Keeley, M.C. 1990. Deposit Insurance, Risk, and Market Power in Banking. The American Economic Review 80 (5), 1183–1200.

Keeton, W.R. 2009. Has Multi-Market Banking Changed the Response of Small Business Lending to Local Economic Shocks? Federal Reserve Bank of Kansas City Economic Review First Quarter 2009, 5–36.

Kick, T. & Prieto, E. 2015. Bank risk and competition: Evidence from regional banking markets. Review of Finance 19 (3), 1185–1222.

Laeven, L. & Valencia, F. 2013. Systemic Banking Crises Database. IMF Economic Review 61 (2), 225–270.

Lapteacru, I. 2014. Do more competitive banks have less market power ? The evidence from Central and Eastern Europe. Journal of International Money and Finance 46, 41–60.

Lepetit, L., Nys, E., Rous, P. & Tarazi, A. 2008. The expansion of services in European banking: Implications for loan pricing and interest margins. Journal of Banking and Finance 32 (11), 2325–2335

Lown, C. & Morgan, D.P. 2006. The Credit Cycle and the Business Cycle: New Findings Using the Loan Officer Opinion Survey. Journal of Money, Credit and Banking 38 (6), 1575–1597.

Martinez-Miera, D. & Repullo, R. 2010. Does competition reduce the risk of bank failure? Review of Financial Studies 23 (10), 3638–3664.

Petersen, M.A. & Rajan, R.G. 1995. The Effect of Credit Market Competition on Lending Relationships. The Quaterly Journal of Economics 110 (2), 407–443.

Peydró, J.-L. & Maddaloni, A. 2011. Bank Risk-taking, Securitization, Supervision, and Low Interest Rates: Evidence from the Euro-area and the U.S. Lending Standards. The Review of Financial Studies 24 (6), 2122–2165.

Puri, M., Rocholl, J. & Steffen, S. 2011. Global retail lending in the aftermath of the US financial crisis: Distinguishing between supply and demand effects. Journal of Financial Economics 100 (3), 556–578.

Rice, T. & Strahan, P.E. 2010. Does credit competition affect small-firm finance? The Journal of Finance 65 (3), 861–889.

Ruckes, M. 2004. Bank competition and credit standards. Review of Financial Studies 17 (4), 1073–1101.

Santos, J.A.C. 2011. Bank Corporate Loan Pricing Following the Subprime Crisis. The Review of Financial Studies 24 (6), 1916–1943.

Schaeck, K., Cihak, M. & Wolfe, S. 2009. Are competitive banking systems more stable? Journal of Money, Credit and Banking 41 (4), 711–734.

Tabak, B.M., Fazio, D.M. & Cajueiro, D.O. 2012. The relationship between banking market competition and risk-taking: Do size and capitalization matter? Journal of Banking and Finance 36 (12), 3366–3381.

APPENDIX 1 Measurement of the degree of competition

Branch HHI

The HHI based on the number of branches is calculated in the following manner:

$$\text{Branch HHI}_{bt} = \sum_{i=1}^{n}(\text{Number of Branches}_{ibt}/\text{All branches}_{bt})^2 \quad \text{(A.1)}$$

where b is the operating area of an individual cooperative bank, i refers to various banks and t is the year.

I perform robustness checks by modifying the normal HHI such that different bank branches have different effects on market share, as branch sizes vary. Branch weights are based on total bank business loan market shares for Finland relative to the total number of branches and are calculated in the following manner:

$$\text{Branch weight}_{it} = \text{Market share of business loans in Finland}_{it} / \frac{\text{Number of branches in Finland}_{it}}{\sum_{i=1}^{n}\text{Number of branches in Finland}_{it}} * 100 \quad \text{(A.2)}$$

This means that the branch weight of a bank is greater than 1 if its market share of business loans is larger than its share of branches and vice versa. Now, the weighted branch HHI can be calculated as:

$$\text{Weighted Branch HHI}_{bt} = \sum_{i=1}^{n}(\text{Branch weight}_{it} \times \text{Number of Branches}_{ibt}/ \text{All weighted branches}_{bt})^2. \quad \text{(A.3)}$$

Lerner index

The Lerner index is defined by:

$$\text{Lerner}_{it} = \frac{P_{it} - MC_{it}}{P_{it}}, \quad \text{(A.4)}$$

where P_{it} is the price of output and MC_{it} is the marginal cost. The price of output can be calculated in various ways depending on the data and research objective, and here, it is interest revenues to interest-bearing assets. The marginal costs are derived by first estimating the translog cost function:

$$\ln \text{Cost}_{it} = \beta_0 + \beta_1 \ln Q_{it} + \frac{1}{2}\beta_2 \ln Q_{it}^2 + \sum_{k=1}^{3}\gamma_k \ln W_{k,it} + \frac{1}{2}\sum_{k=1}^{3}\delta_k \ln Q_{it} \ln W_{k,it} + \frac{1}{2}\sum_{k=1}^{3}\sum_{j=1}^{3}\theta_{kj} \ln W_{k,it} \ln W_{j,it} + \propto_i + \gamma_t + \varepsilon_{it}, \quad \text{(A.5)}$$

where *Cost* denotes total costs, Q interest-bearing assets, W_1 the price of labor (labor costs to the number of employees), W_2 the price of physical capital (other costs to total assets) and W_3 the price of funding (interest costs to interest-bearing liabilities). Then, the marginal costs are calculated by using the estimates and the following equation:

$$MC_{it} = \frac{Cost_{it}}{Q_{it}}\left[\widehat{\beta_1} + \widehat{\beta_2}\ln Q_{it} + \sum_{k=1}^{3}\widehat{\delta_k}\ln W_{k,it}\right] \qquad (A.6)$$

I perform robustness checks using the funding adjusted Lerner index that does not include the price of funding and is thus unaffected by market power in the deposit market. Now, the marginal costs are based on the slightly modified translog cost function:

$$\ln Cost_{it} = \beta_0 + \beta_1 \ln Q_{it} + \frac{1}{2}\beta_2 \ln Q_{it}^2 + \sum_{k=1}^{2}\gamma_k \ln W_{k,it} + \frac{1}{2}\sum_{k=1}^{2}\delta_k \ln Q_{it}\ln W_{k,it} + \frac{1}{2}\sum_{k=1}^{2}\sum_{j=1}^{2}\theta_{kj}\ln W_{k,it}\ln W_{j,it} + \propto_i + \gamma_t + \varepsilon_{it}, \qquad (A.7)$$

where *Cost* denotes total costs minus funding costs, and correspondingly only W_1 and W_2 are included in the estimation of the translog cost function and in the calculation of the marginal costs.

APPENDIX 2

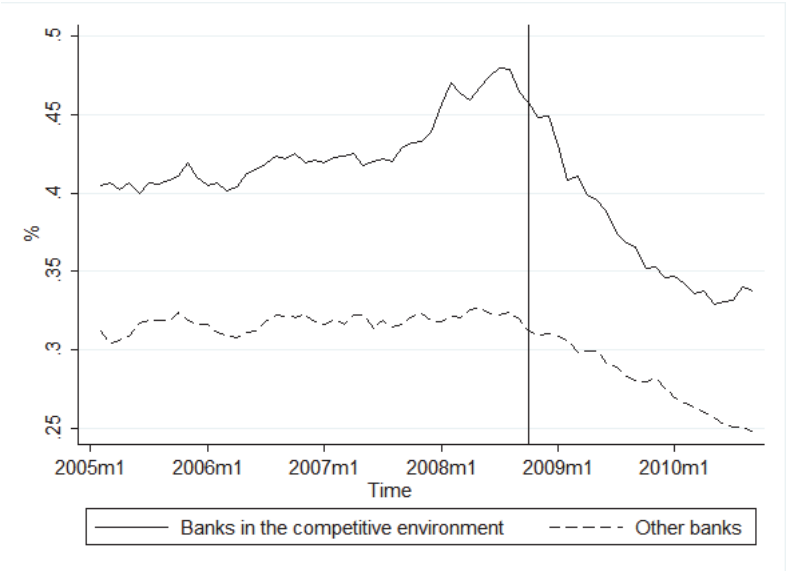

FIGURE A2.1 The development of the average volume of new business loans. The figure depicts the average trends in the volumes of new business loans among the banks that operated in the most competitive environments before the crisis and among the other banks. The graphs are the 12-month moving averages of banks' average monthly loan volumes, measured as the percentage of new business loans divided by total assets in the previous month.

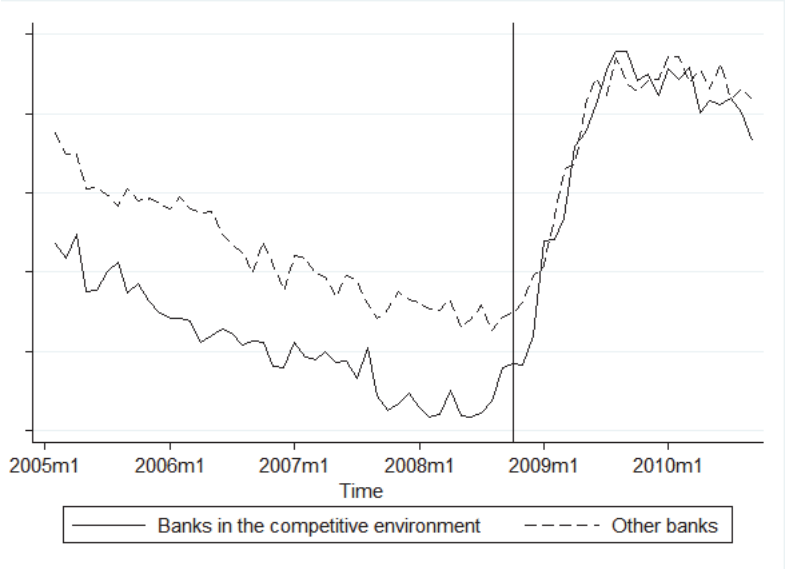

FIGURE A2.2 The development of the average margin of new business loans. The figure depicts the average trends in the margins of new business loans among the banks that operated in the most competitive environments before the crisis and among the other banks.

3 RETAIL BANK INTEREST MARGINS IN LOW INTEREST RATE ENVIRONMENTS*

Abstract

This paper examines the relationship between market interest rates and retail bank interest margins. I allow for non-linearities, i.e., differences in these relationships with varying interest rate environments, which have particular implications for bank profitability and the interest rate channel of monetary policy in a low interest rate environment. I find that the interest rate spread between stocks of loans and deposits, as well as between new loans and deposits, are generally positively related to market interest rates, mainly because of highly rigid interest rates on current account deposits. In a low interest rate environment, the combination of increasing core deposit rate rigidity and variable rate loans strengthens the positive relationship between market interest rates and the interest rate spread between stocks of loans and deposits, which exerts pressure on bank profitability. The results for the interest rate spread between new loans and deposits indicate that banks react to increased deposit rate rigidity by significantly increasing spreads on new loans. Such a reaction affects the interest rate channel of monetary policy.

Keywords: retail banking, bank interest margin, low interest rate environment, bank profitability, interest rate channel of monetary policy

JEL classification: G21; E52

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3.1 Introduction

Central bank policy rates are near or below zero in a large fraction of the developed world. Arguably the interest rate policies of central banks are based on the linear models of the macro economy that implicitly embed a linear model of the financial system's behavior. Because bank retail deposits compete with consumer holdings of currency as a store of wealth, non-linearities may however emerge when policy rates falls to low levels. Thus, an important issue is what low policy rates imply for bank profitability and behavior and what that might mean for the efficacy of very low and negative policy rates. This paper considers these questions by analyzing the behavior of loan and deposit rates in different interest rate environments using data on retail banks that are most likely affected by low policy rates. Moreover, it does so in a country where banks are in good condition, implying that the interpretation of the results is not complicated by bank, depositor, or supervisory responses to bank distresses that have coincided with the recent low interest rate environment in many countries.

My empirical analysis of retail banks' pricing behavior and profitability is based on the examination of the interest rate spread, i.e., difference between average loan rates and average deposit rates that constitutes an essential element of retail bank profitability. Specifically, I examine the relationship between market interest rates and interest rate spreads and highlight how the relationship is affected by a special characteristic of low interest rate environments: the (zero) lower bound for deposit rates.[1] The paper builds on interest margin literature that identifies various bank-specific, macroeconomic and institutional factors that determine the level of bank interest margins (see e.g. Angbazo, 1997; Beck and Hesse, 2009; Demirgüç-Kunt and Huizinga, 1999; Ho and Saunders, 1981). [2] However, this literature has devoted limited attention to the level of market interest rates as a determinant of interest margins (see, Aliaga-Diaz and Olivero, 2011; Demirgüç-Kunt and Huizinga, 1999; Lepetit et al., 2008). In particular, the potential non-linearity in the relationship between market interest rates and interest margins has been studied rarely (Borio et al. 2015).

I contribute to the literature in three ways. First, I examine the effects of market interest rates on interest rate spreads using detailed bank-specific data on different types of loans and deposits. Second, I allow for non-linearities in the relationship between market interest rates and interest rate spreads to take into account the special effects of a low interest rate environment. Third, I examine

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1 The zero lower bound for deposit rates is not absolute, but the basic obstacle, at least for large negative rates, is a guaranteed zero nominal interest rate for paper currency (see e.g. Agarwal and Kimball, 2015). In practice, the zero lower bound for retail deposits has been a relevant restriction, and negative rates have been rare exceptions.

2 This literature often uses the spread between interest revenues on assets and interest expenses on liabilities, and relative to interest-bearing assets or total assets, this spread is called the (net) interest margin. Henceforth, the *interest margin* denotes the difference between interest revenues and interest expenses relative to interest-bearing or total assets, and the *interest rate spread* is the difference between the average loan rate and the average deposit rate.

both the interest rate spread between stocks of loans and deposits and the interest rate spread between new loans and deposits. This distinction is essential because the interest margins earned on the stocks of loans and deposits reflect past pricing decisions and contract types, while interest margins earned on new loans and deposits reflect current pricing behavior (see ECB, 2000).[3]

There are many reasons for loan and deposit rate rigidities to changes in market interest rates, and their determination differs fundamentally for new and stocks of loans and deposits. Importantly, a low interest rate environment can cause significant changes to these rigidities. Previous research provides various explanations for rigidities in the pricing of new loans and deposits (e.g. Berger and Udell, 1992; Berlin and Mester, 1999; Carbo-Valverde et al., 2011; De Graeve et al., 2007; Hutchison, 1995; Neumark and Sharpe, 1992; Sorensen and Werner, 2006). The empirical evidence indicates that interest rates on core deposits are usually the most rigid, which suggests a positive relationship between market interest rates and the interest rate spread between new loans and deposits (see e.g. De Graeve et al., 2007; Sorensen and Werner, 2006). The majority of interest rates on the stocks of loans and deposits change automatically (or remain unchanged) along with market interest rates based on existing contracts. This is particularly relevant for the determination of average loan rates because banks' loan portfolios typically include large shares of long-term contracts. If variable rate loans are dominant, a positive relationship between market interest rates and the interest rate spread between stocks of loans and deposits is expected (see, ECB, 2010, 2009a). If fixed rates loans are dominant, the slope of the yield curve is expected to play a relatively larger role than the level of the market interest rate (ECB, 2015b, pp. 65–68). In a low interest rate environment, the average rigidity of deposit rates can increase significantly (see e.g. Darracq-Paries et al., 2014). As market interest rates fall, the interest rates on core deposits, which are typically below market interest rates, are the first to reach the (zero) lower bound. This can induce non-linearities between market interest rates and the interest rate spreads (see Borio et al., 2015).

I employ a detailed data set of Finnish local retail banks covering the period between January 2005 and March 2014. This period witnessed significant changes in ECB policy rates and market interest rates and, consequently, experienced a shift to a low interest rate environment. Several features make these data appropriate for the empirical analysis. First, the data include monthly volumes and interest revenues or the costs of both new and stocks of different loans and deposits. Second, these banks are traditional retail banks with a large share of retail loans and deposits. Third, the Finnish banking sector entered the financial crisis of 2008 in good condition and has weathered the entire crisis period relatively well.[4] This is an important feature because a low interest rate environment is closely related to crisis periods that can affect banks'

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3 Although basic theories (e.g. Ho and Saunders, 1981) are concerned with the interest rate spread between new loans and deposits, empirical studies are mainly based on the entire stocks of interest-bearing assets and liabilities.

4 See, e.g., Laeven and Valencia (2013)

conditions and behaviors in many ways and can, in turn, affect interest margins. Finally, a feature that fundamentally affects the interpretation of the results is that the banks included in the sample are characterized by a predominance of variable rate loans.[5]

The empirical findings exhibit strong positive relationships between the market interest rate (3-month Euribor) and the interest rate spreads, which are mainly attributable to rigid interest rates on current account deposits. The results based on smooth transition regression (STR) models indicate non-linear relationships, revealing a significant effect of a low interest rate environment on the interest rate spreads. The STR results also highlight differentials between the interest rate spread between stocks of loans and deposits and the interest rate spread between new loans and deposits. The positive relationship between the market interest rate and the interest rate spread between stocks of loans and deposits is significantly stronger when the 3-month Euribor is below approximately 2%. This result reflects a combination of mechanically changing interest rates on variable rate outstanding loans and increasing rigidity of interest rates on core deposits in a low interest rate environment. However, the positive relationship between the market interest rate and the interest rate spread between new loans and deposits disappears and becomes negative as the 3-month Euribor falls below the 1% level and approaches zero. This result is due to significant increases in the spreads on new loans, reflecting banks' pricing reactions to maintain a sufficient interest rate spread between new loans and deposits in a low interest rate environment.[6]

The documented non-linear relationships between market interest rates and the interest rates spreads have two main policy implications that I further examine in auxiliary analyses. First, the strong positive relationship between market interest rates and the interest rate spread between stocks of loans and deposits exerts pressure on bank profitability in a low interest rate environment (see Borio et al., 2015). This result is particularly relevant for those retail banks in which variable rate loans are dominant. Weak bank profitability may be a threat to financial stability because it hampers the building of capital buffers and can increase banks' risk-taking incentives (see e.g. Borio and Zhu, 2012; ECB, 2015a; Jimenez et al., 2014).[7]

Second, the results highlight that in a low interest rate environment wherein deposit rates can adjust downwards only slightly or not at all, banks can maintain or improve the interest rate spread between new loans and deposits only by increasing spreads on new loans. As a result of increased loan spreads, the transmission of policy rates to new retail loan rates weakens

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5 In addition to Finland, euro area countries where variable rate loans are prevalent include Austria, Cyprus, Greece, Ireland, Italy, Luxembourg, Portugal, Slovenia and Spain (ECB, 2015b, p. 67).

6 Interest rate spreads can be defined as the sums of loan and deposit spreads. Loan spreads are differences between loan rates (new or stock) and market interest rates, and deposit spreads are differences between market interest rates and deposit rates.

7 Of course, the final profitability is dependent on whether banks can compensate for decreased interest rate spreads with other revenues and on whether there are other factors weakening profitability, such as significant credit losses.

significantly. The need to maintain a sufficient interest rate spread between new loans and deposits is a relevant explanation for the impaired pass-through of policy rates to retail rates observed during the recent crisis and post-crisis periods. This explanation is consistent with Illes et al. (2015), who recommend comparing loan rates to the average cost of funding rather than to policy rates when considering bank pricing behavior. Most of the existing literature examining impaired interest rate pass-through during the recent crisis period do not take into account the role of the zero lower bound for deposit rates, explaining it instead through risk, sovereign debt tension, and bank resilience and financial conditions (see e.g. Darracq-Paries et al., 2014; ECB, 2013; Gambacorta et al., 2014; Illes and Lombardi, 2013).

3.2 Level of market interest rates as a determinant of bank interest margins

In this section, I consider why the level of market interest rates affects interest rates spreads and how this is related to the previous literature on the determinants of interest margins. Moreover, I highlight the specific effects of a low interest rate environment. Finally, I summarize the predictions and questions examined in the empirical analysis of this paper based on these previous empirical and theoretical considerations.

The seminal paper by Ho and Saunders (1981) presents a theoretical model of the determinants of bank interest margins. According to the model, the spread between loan and deposit rates is dependent on interest rate risk, risk aversion, market structure, and average transaction size.[8] Subsequent studies extend this model to account for credit risk and its interactions with interest rate risk (Angbazo, 1997), operating costs (Maudos and Fernández de Guevara, 2004), and interest rate risk specifically through maturity transformation (Entrop et al., 2015). A broad empirical literature supports these theories and identifies many other determinants of interest margins, such the cost of reserves, implicit interest payments, capital adequacy, off-balance sheet activities, and various macro, institutional and regulatory factors (e.g. Angbazo 1997; Brock and Rojas Suarez 2000; Saunders and Schumacher 2000; Maudos and Fernández de Guevara 2004; Lepetit et al. 2008; Beck and Hesse 2009; López-Espinosa et al. 2011).[9]

Previous research on interest margins considers the effects of market interest rates mainly from the perspective of how interest rate risk affects the

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8 The theory considers the pricing of loans and deposits and, thus, regarding the definitions in this paper, the interest rate spread between new loans and deposits.

9 In these empirical studies, interest margins are usually calculated based on balance sheets (Beck and Hesse (2009) being an exception). This means that these measures are based on total volumes instead of new volumes and often on all interest rate revenues and costs rather than on loan and deposit rates. Brock and Rojas Suarez (2000) compare alternative interest margins measures and find significant differences.

pricing of loans and deposits. Variability of market interest rates exposes banks to risk due to the stochastic arrival of deposits and loans (e.g. Ho and Saunders, 1981) and maturity mismatch between assets and liabilities (e.g. Entrop et al. 2015). In empirical analyses, interest rate risk is measured as the volatility of market interest rates and/or bank-specific maturity mismatch. The effect of the level of market interest rates on interest margins has received much less attention. Empirical studies that take into account the level of market interest rates use it mainly as a macroeconomic control variable. Empirical studies find positive effects of the level of market interest rates, which are explained in some studies by the high rigidity of deposit rates or by opportunity costs without detailed examinations (Lepetit et al., 2008; Beck and Hesse, 2009; Demirgüç-Kunt and Huizinga, 1999; Aliaga-Diaz and Olivero, 2011).

The literature indicates that it is essential to distinguish rigidities in the interest rates of new and stocks of loans and deposits. The former reflect banks' current pricing behaviors along with market interest rates, while the latter are mainly dependent on contract types and maturities of loans and deposits (see ECB, 2000). However, as a large portion of deposits is usually short-term, the determination of interest rates along with market interest rates does not differ significantly between new and stocks of deposits, mainly reflecting current pricing behaviors. Potential explanations for the emergence of rigid deposit rates include market power (Hannan and Berger, 1991; Neumark and Sharpe, 1992), cluster pricing (Kahn et al., 1999), regulation (Chiappori et al., 1995), and switching costs (Carbo-Valverde et al., 2011). Moreover, Hutchison (1995) theorizes that deposit spreads increase when market interest rates increase. This is based on the idea that market interest rates and demand for liquidity increase in parallel when economic activity increases; thus, the interest rate on liquid deposits does not need to rise in line with market interest rates. Hannan and Berger (1991) and Neumark and Sharpe (1992) find that banks with market power increase deposit rates more slowly when market interest rates rise than they reduce them when market interest rates decline. This asymmetry suggests that, if market power exists, deposit rates are more rigid when market interest rates increase than when they decrease.

As large portions of bank retail loans are typically long-term, the determination of their interest rates along market interest rates differs significantly between new and stock of loans.[10] Regarding the pricing of new loans, the literature provides various explanations for the emergence of rigid loan rates. Such explanations include at least implicit interest rate insurance (Berger and Udell, 1992) and money illusion (Machauer and Weber, 1998). The rigidities of interest rates on stocks of loans depend on contract characteristics. Whether contracts have variable or fixed interest rates is essential. Further, changes in market interest rates affect interest rates on stock of loans depending on the time intervals of rate changes in the former case and on the lock-in periods in the latter case (ECB, 2000).

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10 For Finnish banks in 2014, approximately 80 percent of loans to euro area non-financial corporations and households had maturities of over 5 years.

The empirical literature on pass-through from policy or market interest rates to different retail rates focuses on new loans and deposits. The results indicate that long-term pass-through is weaker for deposit rates than for loan rates, as interest rates on current account and saving deposits, i.e., core deposits, are often the most rigid retail rates (De Bondt, 2002; De Graeve et al., 2007; ECB, 2009b; Gambacorta, 2008; Sorensen and Werner, 2006). The pass-through of market interest rates to the stock of loans is examined less often. ECB (2009a) and ECB (2010) take into account the relevance of typical loan contracts for the relationship between market interest rates and bank interest income, and the results show that the relationship is clearly positive in euro area countries where variable rate loans are prevalent but that the relationship is only slightly positive, or even negative, in euro area countries where fixed rate loans are prevalent.

The specific effects of a low interest rate environment on interest rate spreads stem from increased deposit rate rigidity. When market interest rates are very low, further decreases in market interest rates are difficult or impossible to pass through to deposit rates for two reasons (see Darracq-Paries et al., 2014). First, a zero interest rate on paper currency restricts negative deposit rates to a significant extent. In practice, negative interest rates on bank deposits have been rare and applied mainly to large corporate deposits. Second, banks may need to pay strictly positive interest rates to prevent reductions in deposits. There is some empirical evidence that pass-through of policy rates to deposit rates decreases in a low interest rate environment (e.g. Darracq-Paries et al. 2014). How banks react to increased rigidity of deposit rates when pricing new loans to maintain a sufficient interest rate spread between new loans and deposits remains unexplored.

In sum, while certain expectations can be formed about the relationships between market interest rates and interest rate spreads, some aspects are empirical questions. First, it is expected that, under normal market conditions, market interest rates have a positive effect on interest rate spreads. This is because the rigidity of average deposit rates is higher than that of average loan rates to changes in market interest rates, which is mainly attributable to the particularly high rigidity of interest rates on core deposits. Accordingly, the effect of market interest rates on each bank's interest rate spreads is expected to depend on its deposit composition.

Second, it is expected that the relationships between market interest rates and interest rate spreads change in a low interest rate environment because the lower bound for deposit rates increases their rigidity, i.e., the relationships are non-linear. The positive relationship between market interest rates and the interest rate spread between stocks of loans and deposits is expected to be stronger when variable rate loans predominate. As the interest rate spread between new loans and deposits results from banks' current pricing behaviors, how banks react to restricted deposit spreads is an empirical question. If banks do not change spreads on new loans when deposit spreads decrease, the interest rate spread between new loans and deposits also decreases significantly in a low interest rate environment. An alternative is to increase spreads on new

loans to compensate for restricted deposit spreads and to maintain a sufficient interest rate spread between new loans and deposits.

3.3 Data and empirical approach

3.3.1 Bank data and institutional background

I use confidential bank data, which have been collected by the Finnish OP Financial Group, which consists of 181 member cooperative banks[11] and their central organization, the OP Cooperative.[12] The OP Financial Group is a key player in the Finnish retail banking market. The banks engage in retail banking in their local operating areas, covering the entire area of Finland. The Group's market share of retail loans and deposits amounted to approximately 30–36 percent during the data collection period. The member banks compete in their own local operating areas mainly with other banks.[13] The major rival banks include nationwide commercial banks, such as Nordea, Danske Bank, Aktia and Handelsbanken; local saving banks; and local cooperative banks that do not belong to the OP Financial Group.

The bank-level data consist of monthly observations of volumes and interest revenues or the costs of banks' new and stocks of business loans, mortgages, consumer loans, term deposits, saving deposits, and current account deposits. In addition, the data cover the banks' monthly income statements and balance sheet information. These bank-specific data are from the period between January 2005 and March 2014, yielding 20,091 total observations. Over the whole period and for all banks, on average, 95.4% of loans are based on variable rates of interest. The most common reference rates are the 12-month Euribor, the 3-month Euribor and the Group's own prime rate, with shares of total loans of 40.7%, 27.6% and 25.2%, respectively. These shares evolved over time in such a way that the share of loans linked to the 12-month Euribor remained relatively stable, the share of loans linked to the 3-month Euribor increased significantly, and correspondingly, the share of loans linked to the prime rate decreased.

The following features of the bank data are important to my analysis of the relationship between market interest rates and retail bank interest margins. First, retail loans and deposits constitute large portions of banks' assets and liabilities, indicating that the interest rate spread between loan and deposit rates is vital for profitability. This focus on retail banking is typical for cooperative banks (e.g. Köhler, 2015). Second, detailed data on both new and outstanding retail rates allow the precise measurement of interest margins. These panel data

11 As of March 2014.
12 Data on the same cooperative banks are used, e.g., in Hyytinen and Toivanen (2004).
13 Other papers also use data on local operating areas to measure the effects of local competition and other local characteristics on lenders' behavior (see e.g. Canann and Evans 2014)

with monthly observations enable the examination of the effect of deposit composition on the development of interest margins along with market interest rates. In addition, although the member banks are jointly and severally liable and operate within OP Cooperative guidelines and constraints, they make ultimately own decisions, and this also holds in pricing behavior. Thus, it is important to control for bank-specific factors affecting interest margins, and my data include a rich set of controls. Finally, the group structure ensures that the data are consistent across banks and, thus, that various interest rates and control variables that I use in the econometric analysis are fully comparable.

However, several issues must be taken into account in terms of how well the member banks of the OP Financial Group embody typical retail banks during the study period. Both the cooperative business model and the Finnish banking sector can have specific effects. Cooperative banks are owned by their members, and their objective is typically to maximize members' value by providing services, as well as distributing of profits (Cihák and Hesse, 2007; Fiordelisi and Salvatore, 2014). Thus, profit maximization is not the objective per se, but profits are a necessary condition for growth, investments and solvency (Bos and Kool, 2006; EACB, 2010). The objectives of the OP Financial Group, "promoting the prosperity, well-being and security of its owner-members, customers and business partners", correspond well to these general objectives (see OP Financial Group, 2016).

As the objectives of cooperative banks differ somewhat from those of other kinds of banks, how well their pricing behavior and thus the evolution of interest margins correspond to retail banks in general is a relevant question. Cooperative banks play a large role in European banking sector, particularly in retail banking (see e.g. Chiaramonte et al., 2013; EC, 2007). Thus, the behavior and performance of cooperative banks themselves have significant effects on European retail banking. There is scant research comparing the retail rates of cooperative banks with those of other kinds of banks. Hasan et al. (2014) hypothesize and find empirically that local cooperative banks provide loans for SMEs at lower costs than large domestic banks and foreign-owned banks. Their hypothesis is based on a large role of relationship banking in local cooperative banks, but they also note that existing literature is ambiguous about the effect of bank relationships on loan rates.

The following characteristics of the Finnish banking sector are relevant to the examination of interest margins in different interest rate environments. First, the Finnish banking sector entered the financial crisis of 2008 and the subsequent low interest rate environment in good condition. Second, as in the OP Financial Group, variable rate loans dominate the whole Finnish banking sector. Third, compared to other euro area/European countries, the Finnish banking sector is relatively concentrated, but the average interest rates on loans suggest relatively tight competition (ECB, 2015c).[14]The interest rates on both

[14] A new statistical tool available from the ECB provides an easy way to compare loan and deposit prices in the euro area. It is available at: https://www.euro-area-statistics.org/?cr=eur&lg=en

household and business loans were lower, on average, than those in the euro area before the crisis. With the onset of the crisis and the low interest rate environment, differences in loan rates increased significantly, reflecting problems in the banking sectors of vulnerable euro area countries.[15] The development of retail rates in Finland remains quite similar to those in, e.g., Austria, which can be classified as a non-vulnerable country and in which variable rate loans are also dominant.

Fourth, retail deposits constitute a large portion of Finnish households' and firms' financial assets, and consequently, they are a key funding source for Finnish retail banks. The role of alternative investment products for retail deposits, such money market funds, is minor in Finland.[16] Deposit insurance likely plays a relevant role in the popularity of retail deposits, and it currently covers up to 100 000 euros as in most other EU countries.[17] The average interest rates on various deposits in Finland were very similar to those in the rest of the euro area before the crisis. After the onset of the crisis and, thus, in the low interest rate environment, the development of interest rates on current account deposits has, on average, remained largely similar in Finland and in the euro area. Instead, average interest rates on term deposits became lower in Finland than in euro area, reflecting funding problems in many euro countries. However, the evolution of term deposit rates in Finland has been largely similar to those of other non-vulnerable countries, such as Germany and Austria. In sum, these relatively low loan and deposit rates indicate that both the zero lower bound for deposit rates and its effect on retail bank interest margins are particularly relevant in Finland and in my data set. In general, this pattern holds for retail banks that did not have specific problems during the crisis.

3.3.2 Other data and variable definitions

In addition to the OP Financial Group bank data, I use data on the locations of the branches of all Finnish banks and on macroeconomic variables obtained from Statistics Finland and the Bank of Finland. The branch location data are used to measure the local market structures of individual banks. The macroeconomic data include various market interest rates and control variables for macroeconomics conditions. In the robustness checks, I also control for the expectations of market interest rates, and the data for LIFFE 3-month Euribor are obtained from Quandl.

To explore the relationship between market interest rates and retail bank interest margins and how this relationship evolves in a low interest rate

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15 The group of vulnerable euro area countries typically consist of Spain, Italy, Portugal, Greece, Cyprus and Slovenia (see e.g. ECB, 2015b).

16 At the end of the data period, i.e., in March 2014, the outstanding amount of retail deposits was 81.1 billion euros, and the outstanding amount of money market funds was 3.2 billion euros. In addition, the share of foreign branches of public deposits was only 5.4 %.

17 Note that the maximum insured amount was 25 000 euros before the crisis, which increased to 50 000 euros in October 2008 and to 100 000 euros by the beginning of 2011.

environment, I estimate various models in which a bank interest rate margin is the dependent variable. Such a margin can be defined in many ways, depending on the purpose and data availability (see e.g. Brock and Rojas Suarez, 2000). In this paper, I focus on differences between loan and deposit rates, i.e., interest rate spreads. Unlike many previous studies, I calculate interest rate spreads using exact information about interest revenues and costs for new and stocks of loans and deposits instead of balance sheet information (see Beck and Hesse, 2009). When I analyze the *interest rate spread between the stocks of loans and deposits*, the dependent variable is the difference between the average interest rate on the stock of loans and the average interest rate on the stock of deposits. When I analyze the *interest rate spread between new loans and deposits*, the dependent variable is the difference between the average interest rate on new loans and the average interest rate on new deposits.[18] I also separately examine the relationship between market interest rates and loan and deposit spreads. The loan spread is the difference between the average loan rate (new or stock) and the market interest rate, and the deposit spread is the difference between the market interest rate and the average deposit rate.

The primary *market interest rate* measure is the 3-month Euribor, which is often used as a proxy for the market interest (e.g. ECB, 2009a; Gropp et al., 2007) or the monetary policy stance (Jiménez et al., 2012) in the euro area. In robustness checks, I use the ECB policy rate (the main refinancing rate) and the 12-month Euribor as alternative measures. In addition, I examine the effect of interest rate expectations based on the 3-month Euribor future rate with a forecast horizon of six months.

The time series of the 3-month Euribor and banks' average interest rate spreads for both new and stocks of loans and deposits are depicted in panels A and B of Figure 1.[19] Panel A of Figure 1 illustrates that the relationship between the 3-month Euribor and the interest rate spread between the stocks of loans and deposits is positive and particularly strong in a low interest rate environment. Panel B of Figure 1 shows that the relationship between the 3-month Euribor and the interest rate spread between new loans and deposits is also mainly positive, but there is a significant increase in this spread at the end of the period even though the market interest rates do not change much. This suggests a change in pricing behavior in response to a very low interest rate environment. The reaction is also likely affected by expectations of a persistent low interest rate environment.

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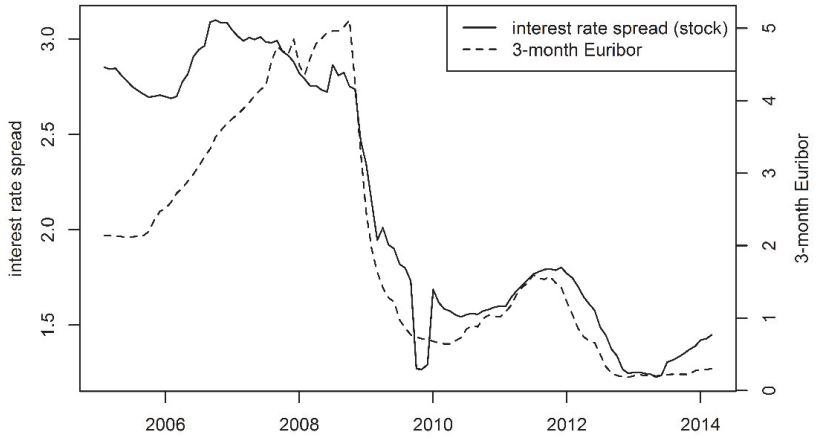
18 Interest rates on new deposits are calculated based on a weighted average of interest rates on new term deposits and the stock of other deposits. The weights are based on the stocks of various deposits. This kind of measure is used because the number of new current account and saving deposit contracts is small. Instead, the volumes of these deposits vary over time within the contracts, and the interest rates on these deposits vary mainly based on existing terms.

19 The evolution of the average interest rate spread between stocks of loans and deposits of all Finnish banks is very similar to that of cooperative banks during this period, particularly in a low interest rate environment. The data for this comparison are available from the Bank of Finland: http://www.suomenpankki.fi/en/tilastot/tase_ja_korko/Pages/tilastot_rahalaitosten_lainat_talletukset_ja_korot_markkinaosuudet_ja_korkomarginaalit_k_6F9D8359.aspx

A



B

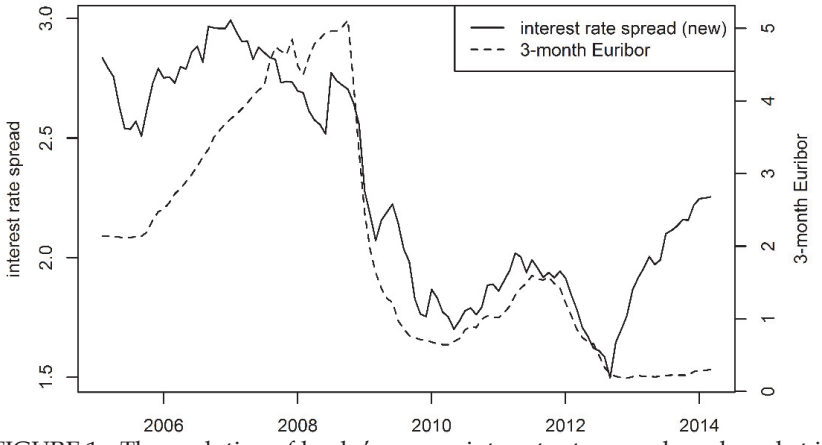


FIGURE 1 The evolution of banks' average interest rate spreads and market interest rates. Panel A depicts the time series of the 3-month Euribor and the average difference between interest rates on stocks of loans and deposits. Panel B depicts the time series of the 3-month Euribor and the average difference between interest rates on new loans and deposits in cooperative banks.

Naturally, the relationship between market interest rates and retail bank interest margins depends on the funding structure of a bank. The positive effect of market interest rates on the interest rate spreads can be expected to be larger for banks whose funding relies more heavily on core deposits. The reason is that core deposit rates are known to be the most rigid retail rates (see e.g. De Graeve et al., 2007). I use both deposit composition and its interaction with the market interest rate as explanatory variables to allow for this heterogeneity between banks. The interaction terms enable me to consider the heterogeneous effect of the market interest rate on the interest rate spreads depending on the

deposit composition of individual banks. Deposit composition is measured as the relative shares of current account, saving and term deposits.

TABLE 1 Descriptive statistics for the interest margins, macro variables, loan and deposit compositions, and bank characteristics over the period between January 2005 and March 2014.

Variable	Mean	Standard deviation	Number of observations
Interest margins			
Interest rate on new loans – interest rate on new deposits	2.29	0.59	19821
Interest rate on stock of loans – interest rate on stock of deposits	2.14	0.73	20091
(Interest revenues – interest costs)/interest-bearing assets bearing assets	2.20	0.71	20091
Market interest rate and other macro variables			
3-month Euribor	2.00	1.56	111
Volatility of 3-month Euribor	0.04	0.05	111
Inflation	2.00	1.32	111
GDP growth	0.80	4.01	111
Shares of different deposits			
Current account deposits/total deposits	0.53	0.09	20091
Saving deposits/total deposits	0.23	0.10	20091
Term deposits/total deposits	0.24	0.08	20091
Other bank characteristics			
Log of average size of new loans	9.87	0.48	20091
Log of average size of stock of loans	10.12	0.28	20091
Log of average size of deposits	8.88	0.18	20091
Log of total assets	18.43	1.12	20091
Total loans/total deposits	1.05	0.22	20091
Nonperforming loans/total assets (%)	0.57	0.49	20091
Operating costs/total assets (%)	0.12	0.03	20091
Fee and commission income/total income	0.14	0.37	20091
Liquid assets/total assets (%)	2.45	2.65	20091
Equity/total assets (%)	11.52	3.83	20079

The control variables are based on the previous literature on the determinants of interest margins (e.g. Maudos and Fernández de Guevara, 2004; Saunders and Schumacher, 2000). Bank-specific characteristics include the following variables. Banks are divided into four *market structure* groups according to their average Herfindahl-Hirschmann index (HHI) values between 2005 and 2011.[20] The HHI is calculated for each cooperative bank based on its number of branches and the number of branches of the other banks in its operating area. The calculation is conducted at the zip code level and is based on the assumption that the share of branches represents the market share as in, e.g.,

[20] The establishment data from the business register of Statistics Finland are available for this period.

Degryse and Ongena (2007).[21] *Operating costs* refer to the ratio of staff and personnel costs to total assets. The effect of revenues from other activities is measured as *fee and commission income* divided by total income. *Capital adequacy* is measured as equity divided by total assets. *Credit risk* is the ratio of nonperforming loans over total assets. *Transaction size* is measured as the logarithm of the loan volume divided by the number of loan contracts and the deposit volume divided by the number of deposit contracts. *Liquidity risk* is liquid assets divided by total assets. *Bank size* is the logarithm of total assets. The *loans to deposit ratio* is included to control for the effect of a funding gap. Macroeconomic controls include the following variables. *Interest rate risk* is measured as the volatility of the 3-month Euribor. *Inflation* is the annual change in the consumer price index. *GDP growth* is only available at a quarterly frequency, and the same value is used for each of the three months in a quarter. All other variables are measured monthly. Descriptive statistics for the dependent and explanatory variables are presented in Table 1.

3.3.3 Econometric approach

3.3.3.1 Linear regression analysis

To investigate the general effect of market interest rates on interest rate spreads, I use the following linear panel regression model:

$$\text{Interest rate spread}_{it} = \mu_{(i)} + \alpha mr_t + \boldsymbol{\beta S_{i,t-1}} + \boldsymbol{\theta} mr_t \text{ x } \mathbf{S_{i,t-1}} + \text{bank}_{i,t-1} + \text{macro}_t + \varepsilon_{it}, \quad (1)$$

where i is the bank, and t is the month. The dependent variable is the interest rate spread between stocks of loans and deposits or the interest rate spread between new loans and deposits. The key explanatory variables of interest are the market interest rate at the beginning of the month (mr_t) and its interaction terms with the vector of the one-month lagged shares of different deposits (mr_t x $\mathbf{S_{it-1}}$). These variables measure the effect of the market interest rate on the interest rate spreads, and the extent to which this effect depends on the relative amounts of different types of deposits.

The vector of lagged shares of different deposits ($\mathbf{S_{it-1}}$) is included because current account deposits typically have the lowest interest rates, whereas term deposits have the highest interest rates. The set of bank and macro variables includes the control variables presented above. I use one-month lagged values of bank variables, except for the average transaction size, to avoid potential endogeneity problems.

I also estimate specifications that include bank and time fixed effects. The bank fixed effects control for unobserved, fixed bank characteristics. The time (year-month) fixed effects capture, e.g., changes in overall economic conditions and interest rate expectations. Including time fixed effects is relevant for this

[21] In robustness checks, I measure the competitive environments of cooperative banks using the Lerner index instead of the HHI.

data period, as it includes both normal periods and various phases of the crisis. However, the estimation of the (total) effect of market interest rates is not possible when the time fixed effects are included. I use this specification to explore how the effects of market interest rates on the interest rate spreads depend on the deposit compositions of banks.

3.3.3.2 Smooth transition regression analysis

STR models allow the regression coefficients to change between two or more regimes.[22] In this paper, the use of STR models allows the coefficients of the market interest rates to differ by interest rate environment. STR models produce estimates for the levels of market interest rates at which the regimes change and allow for gradual changes in the coefficients during the shift from one regime to another. STR models are appropriate in this analysis, as the potential non-linear effect of the market interest rate on the interest rate spreads is due to the changing rigidities of different loans and deposits. If these various rigidities change smoothly and/or at different interest rate levels, the changes in the relationship between the market interest rate and the interest rate spreads between interest rate environments can be smooth.[23] However, the flexibility of STR models also allows for thresholds effects, in which case the shift between regimes is instantaneous.

Because I use panel data, a panel smooth transition regression (PSTR) model (Gonzalez et al., 2005) is justified. I include the same bank-specific and macro controls as in the linear panel regression. The empirical model is:

$$\text{Interest rate spread}_{it} = \mu_0 + \alpha_0 mr_t + \boldsymbol{\beta}\mathbf{S_{i,t-1}} + \boldsymbol{\theta} mr_t \text{ x } \mathbf{S_{i,t-1}} + \text{bank}_{i,t-1} + \text{macro}_t + (\mu_1 + \alpha_1 mr_t + \boldsymbol{\delta} mr_t \text{ x } \mathbf{S_{i,t-1}})G(\gamma, \mathbf{c}, s_t) + \varepsilon_{it}. \quad (2)$$

The inclusion of the transition function $G(\gamma, \mathbf{c}, s_t)$ allows for a non-linear relationship between market interest rates and interest rate spreads. This transition function is bounded between 0 and 1 and is continuous for the transition variable s_t. In this analysis, the transition variable is the same as the key explanatory variable mr_t, i.e., the market interest rate. The smoothness parameter γ defines the smoothness of the transition between regimes, i.e., interest rate environments. The vector of location parameters $\mathbf{c}$ determines the interest rate level at which the relationship between the market interest rate and the interest rate spreads changes. Thus, I can examine the extent to which the relationships between market interest rates and interest rate spreads change in different interest rate environments and whether these relationships and their changes are dependent on banks' deposit compositions. I also use a

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22 The presentation of smooth transition regression analysis in this section is based on Teräsvirta et al. (2010, pp. 37–39).

23 For example, as interest rates on current account deposits are typically lower than those on saving deposits, they face a (zero) lower bound at different interest rates levels.

specification that includes bank fixed effects: when they are included, the estimation follows the procedure described in Gonzalez et al. (2005).

When a logistic transition function is used, the model is called a logistic STR (LSTR) model. The general form of the transition function is defined as:

$$G(\gamma, \mathbf{c}, s_t) = (1 + \exp\{-\gamma \prod_{k=1}^{K}(s_t - c_k)\})^{-1}, \gamma > 0. \quad (3)$$

The most common choice for K is either K=1 (LSTR1) or K=2 (LSTR2). If LSTR1 is used, the transition function increases monotonously with the transition variable. In my analysis, monotonicity implies that the effects of market interest rates on interest rate spreads differ in high and low interest rate environments. If LSTR2 is used, the logistic function is quadratic, and the transition function is non-monotonic in the transition variable. Allowing for such "re-switching" would imply that the effects of market interest rates on interest rate spreads are similar in both high and low market interest rate environments but different for intermediate market interest rate levels.

The key reason to expect that there is a non-linear relationship between the market interest rate and the interest rate spreads is the zero lower bound for deposit rates in a low interest rate environment. This bound implies that compared to normal times, the effect of the market interest rate on the interest rate spreads is different in the low interest rate environment. This prior reasoning supports the use of LSTR1. However, I also run specification tests for the choice between LSTR1 and LSTR2 based on Teräsvirta et al. (2010, p. 376–379).

3.4 Empirical results

3.4.1 Results of the linear regression analysis

The results of the linear panel regressions of the interest rate spreads are presented in Table 2. The dependent variables are the interest rate spread between stocks of loans and deposits in panel A and the interest rate spread between new loans and deposits in panel B.

The first columns of panels A and B in Table 2 indicate that the market interest rate is positively related to both the interest rate spread between stocks of loans and deposits and the interest rates spread between new loans and deposits when all of the bank-specific and macro controls are included in the model. The coefficients of the 3-month Euribor indicate that a 100-basis-point increase (decrease) in the market interest rate increases (decreases) the interest rate spread between stocks of loans and deposits by 39 basis points and the interest rate spread between new loans and deposits by 25 basis points. The positive coefficients for the market interest rate are statistically significant at the 1% level. The effects are also economically relevant, as the average interest rate spreads across banks and over the whole period are 214 basis points and 229

basis points for stocks of loans and deposits and new loans and deposits, respectively (Table 1).

TABLE 2 The results of the linear panel data regression of the interest rate spreads on the market interest rate

Panel A: Interest rate spread between stocks of loans and deposits					
Explanatory variable	(1)	(2)	(3)	(4)	(5)
3-month Euribor	0.39***	0.09**	0.08**		
	(0.01)	(0.04)	(0.04)		
(Current account deposits/total deposits)$_{t-1}$	2.33***	1.16***	1.78***	1.22***	1.09***
	(0.17)	(0.20)	(0.26)	(0.21)	(0.23)
(Saving deposits/total deposits)$_{t-1}$	0.55***	0.44**	0.83***	0.90***	1.01***
	(0.14)	(0.18)	(0.17)	(0.19)	(0.16)
3-month Euribor x (Current account deposits/ total deposits)$_{t-1}$		0.56***	0.45***	0.36***	0.40***
		(0.06)	(0.06)	(0.06)	(0.06)
3-month Euribor x (Saving deposits/ total deposits)$_{t-1}$		0.04	-0.08*	-0.15***	-0.11**
		(0.05)	(0.05)	0.05	(0.05)
Bank-specific controls	yes	yes	yes	yes	yes
Macro controls	yes	yes	yes	no	no
Bank fixed effects	no	no	yes	no	yes
Time fixed effects	no	no	no	yes	yes
Number of observations	19898	19898	19898	19898	19898
R-squared	0.88	0.89	0.95	0.94	0.97
Panel B: Interest rate spread between new loans and deposits					
Explanatory variable	(1)	(2)	(3)	(4)	(5)
3-month Euribor	0.25***	0.04	0.04		
	(0.01)	(0.04)	(0.04)		
(Current account deposits/total deposits)$_{t-1}$	2.66***	1.78***	2.87***	0.86***	0.58*
	(0.19)	(0.23)	(0.26)	(0.21)	(0.32)
(Saving deposits/total deposits)$_{t-1}$	0.79***	0.84**	1.33***	0.27	0.16
	(0.17)	(0.21)	(0.25)	(0.22)	(0.23)
3-month Euribor x (Current account deposits/ total deposits)$_{t-1}$		0.42***	0.41***	0.49***	0.51***
		(0.06)	(0.06)	(0.06)	(0.06)
3-month Euribor x (Saving deposits/ total deposits)$_{t-1}$		-0.04	-0.05	0.09	0.12**
		(0.06)	(0.05)	(0.06)	(0.05)
Bank-specific controls	yes	yes	yes	yes	yes
Macro controls	yes	yes	yes	no	no
Bank fixed effects	no	no	yes	no	yes
Time fixed effects	no	no	no	yes	yes
Number of observations	19633	19633	19633	19633	19633
R-squared	0.69	0.70	0.72	0.77	0.81

This table presents the results from the linear panel regression analysis of the interest rate spreads on the market interest rate; the shares of different deposits and their interactions with the market interest rate; other bank-specific factors; and macro variables based on Equation (1). In panel A, the dependent variable is the interest rate spread between stocks of loans and deposits, i.e., the difference between the average interest rate on stock loans and the average interest rate on stock of deposits. In panel B, the dependent variable is the interest rate spread between new loans and deposits, i.e., the difference between the average interest rate on new loans and the average interest rate on new deposits. Bank controls include average loan size, average deposit size, bank size, loan/deposit ratio, market structure (HHI groups), nonperforming loans, operating costs, liquidity, capital adequacy, and the share of fee and commission income. Macro controls include GDP growth, inflation, and market interest rate volatility. Standard errors are clustered at the bank level. *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

The estimated effects of the shares of different types of deposits indicate that higher amounts of core deposits (i.e., current account and saving deposits) relative to term deposits increase the interest rate spreads.[24] This finding is intuitive.

The second columns of panels A and B in Table 2 include the interaction terms between the market interest rate and the shares of current account and saving deposits. The results show that the positive effects of the market interest rate derive mainly from the coefficient for the interaction between the share of current account deposits and the market interest rate. To explore the economic relevance of this effect, I compare the effect of the market interest rate on the interest rate spreads in banks with low and high shares of current account deposits (the tenth (= 42%) versus the ninetieth (= 65%) percentiles). The results show that for a 100-basis-point increase in the market interest rate, banks with high shares of current account deposits experience an increase in the interest rate spread between stocks of loans and deposits that is 13 basis points greater compared that of banks with low shares of current account deposits. In the case of the interest rate spread between new loans and deposits, the corresponding difference is 10 basis points.

As columns (3)–(5) of Table 2 show, the key results remain similar when bank fixed effects and time fixed effects are included. When time fixed effects are included, the market interest rate variable and macroeconomic controls are dropped, and the identification comes entirely from the interactions. Importantly, the estimated coefficients for the interactions between market interest rates and shares of current account deposits are quite similar to those reported above.

In sum, the results indicate that the market interest rate is significantly and positively related to the interest rate spreads.[25] This positive effect of market interest rates is consistent with the views proposed in the previous literature (e.g. Aliaga-Diaz and Olivero, 2011; Lepetit et al., 2008). The results show a significant effect of the share of current account deposits. This indicates the importance of high rigidity on current account deposits for the positive relationship between market interest rates and interest rate spreads, which is consistent with expectations (see also Sheehan, 2013).

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24 The effects of the shares of current account and saving deposits are relative to the share of term deposits, which is not included in the model because of multicollinearity.

25 The estimates for non-reported bank and macro controls usually indicate positive effects for market interest rate volatility, nonperforming loan shares, operating costs, and market concentration. Negative effects are observed for inflation, loan size, and fees and commissions related to total income, bank size, and the loan-deposit ratio. Not all variable estimates are statistically significant across all specifications. These results are in line with the previous empirical literature, except for the effect of inflation (e.g. Beck and Hesse, 2009; Maudos and Fernández de Guevara, 2004).

3.4.2 Results from smooth transition regression analysis

The specification tests for linearity against the STR model and for choosing between LSTR1 and LSTR2 models generate two findings (see Appendix 1). First, the linearity of the relationship between the market interest rate and the interest rate spreads is rejected. This finding supports the use of STR models. Second, the specification test for selecting one of the two alternative transition models supports the use of LSTR1 models, although this support is somewhat weak in the case of the interest rate spread between stocks of loans and deposits.

The estimation results of the STR models for the interest rate spread between stocks of loan and deposits and the interest rate spread between new loans and deposits are presented in Tables 3 and 4, respectively. The results indicate a clear difference in the relationship between the market interest rate and the interest rate spreads in different interest rate environments.[26] In addition, the results for the interest rate spread between stocks of loans and deposits and for the interest rate spread between new loans and deposits differ substantially.

The results in Table 3 show that the positive effect of the market interest rate on the interest rate spread between stocks of loans and deposits is significantly greater in a low interest rate environment than in a high interest rate environment. The first column of Table 3 shows that the coefficient for the market interest rate is 0.22 in the high interest rate environment and 0.59 in the low interest rate environment. The value of the location parameter is 1.98 (i.e., roughly at the 2% level for the 3-month Euribor) and that of the smoothness parameter 21.94.[27] The results indicate that the positive relationship between the market interest rate and the interest rate spread between stocks of loans and deposits is nearly three times greater in the low interest rate environment than in the high interest rate environment.

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26 I estimate the STR models using the R software environment. I have modified the LSTAR model in the tsDyn package to be applicable to my empirical model with panel data. The method involves nonlinear numerical searches for the smoothness parameter γ and the location parameter c, where the starting values of the parameters are based on a grid search. After the numerical search, the regression parameters are recovered by OLS. I also use two different methods of non-linear optimization to test the robustness of the results. One is a quasi-Newton method; the other, a variant of simulated annealing belonging to the class of stochastic global optimization methods.

27 This result was obtained after estimating the STR model in many different ways. The estimate of the location parameter was not reasonable when the starting values based on a grid search were used, as it is far beyond the observed range of market interest rates (see Teräsvirta (1994) for further discussion). The results with different starting values and two different non-linear optimization methods revealed two optima wherein the estimated location parameters are over 10 and roughly 2. The estimates of the smoothness parameter vary quite a bit, depending on the starting values, but this had minor effects on the other estimates in the optimum, where the value of the location parameter is reasonable, i.e., roughly 2. The previous literature highlights the difficulty of estimating the smoothness parameter accurately, especially when this parameter is large (e.g. Teräsvirta 1994; Van Dijk et al. 2000).

TABLE 3 The results of STRs of the interest rate spread between stocks of loans and deposits on the market interest rate

	(1)	(2)	(3)
Transition function parameters			
Location: c_1	1.98	1.96	1.96
Smoothness: γ	21.94	71.72	71.72
3-month Euribor			
α_0 (low interest rate environment)	0.59***(0.01)	0.12***(0.04)	0.30***(0.01)
α_1	-0.37***(0.01)	-0.14***(0.04)	-0.31***(0.01)
$\alpha_0 + \alpha_1$ (high interest rate environment)	0.22	-0.02	-0.01
3-month Euribor x (Current account deposits/ total deposits)$_{t-1}$			
θ_1 (low interest rate environment)		0.70***(0.07)	0.42***(0.02)
δ_1		-0.23***(0.06)	0.05***(0.01)
$\theta_1 + \delta_1$ (high interest rate environment)		0.47	0.47
3-month Euribor x (Saving deposits/ total deposits)$_{t-1}$			
θ_2 (low interest rate environment)		0.38***(0.05)	-0.14***(0.02)
δ_2		-0.43***(0.04)	0.03***(0.01)
$\theta_2 + \delta_2$(high interest rate environment)		-0.05	-0.11
Constants			
μ_0	1.40***(0.13)	1.48***(0.13)	0.50***(0.01)
μ_1	0.93***(0.01)	0.94***(0.01)	0.74***(0.01)
Shares of different deposits			
(Current account deposits/total deposits)$_{t-1}$	2.05***(0.03)	0.97***(0.06)	1.05***(0.05)
(Saving deposits/total deposits)$_{t-1}$	0.65***(0.02)	0.52***(0.05)	0.93***(0.04)
Macro controls	yes	yes	yes
Bank-specific controls	yes	yes	yes
Bank fixed effects	no	no	yes
Number of observations	19633	19633	19633
R-squared	0.91	0.92	0.95

This table presents the results from the STRs of the interest rate spread between stocks of loans and deposits on the market interest rate; shares of different deposits and their interactions with the market interest rate; other bank-specific factors; and macro variables based on Equation (2). The dependent variable is the difference between the average interest rate on stock of loans and the average interest rate on stock of deposits. Bank controls include average loan size, average deposit size, bank size, loan/deposit ratio, market structure (HHI groups), nonperforming loans, operating costs, liquidity, capital adequacy, and the share of fee and commission income. Macro controls include GDP growth, inflation, and market interest rate volatility. *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

In the second column of Table 3, the interactions between the one-month lagged shares of current account and saving deposits and the market interest rate are included.[28] The results indicate that the increased positive relationship between the market interest rate and the interest rate spread between stocks of loans and

[28] In this specification, the estimates are reasonable with the initial starting values based on a grid search. The estimates location parameter is very close to that in the specification in column 1, indicating the robustness of the results. I also estimate this model using different starting values and methods, and the results remain robust.

deposits in a low interest rate environment is positively dependent on the shares of current account and saving deposits relative to the size of term deposits. However, when bank fixed effects are included, the interaction terms change notably (column 3). The results of this specification do not indicate an increased effect of the share of core deposits on the positive relationship between the market interest rate and the interest rate spread between stocks of loans and deposits in the low interest rate environment. This may reflect the fact that within-bank variation in the shares of different deposits is clearly lower than between-bank variation.[29]

Figure 2 illustrates the effect of the market interest rate in different interest rate environments. The figure depicts the marginal effect of the market interest rate on the interest rate spread between stocks of loans and deposits based on the results presented in column 1 of Table 3. It shows that the marginal effect of the market interest rate increases significantly in the low interest rate environment and that the shift between regimes is rapid but not instantaneous.

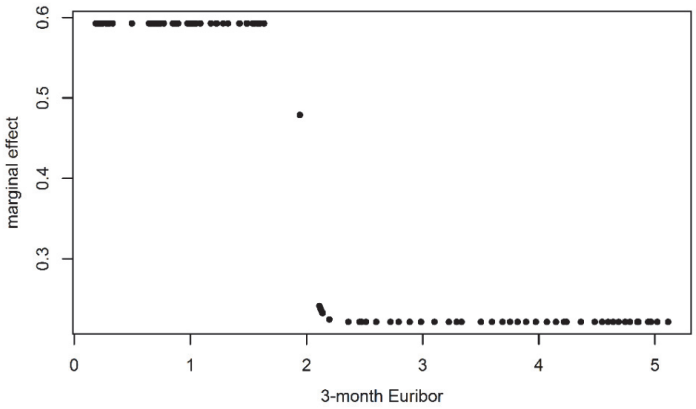

FIGURE 2 Marginal effect of the market interest rate on the interest rate spread between stocks of loans and deposits against the market interest rate. The measurement is based on the results in column 1 of Table 3.

The results in Table 4 show that the generally positive relationship between the market interest rate and the interest rate spread between new loans and deposits disappears and becomes negative when market interest rates fall sufficiently low.[30] In a high interest rate environment, the effect of the market interest rate is positive, and the magnitude of this effect is close to that of the linear model (see column 1 of panel B in Table 2**)**. The estimated location parameter is 0.85, which indicates that a shift to a low interest rate environment occurs at around the 0.85% level for the 3-month Euribor. The negative relationship in the low interest rate

[29] In addition, within-bank variation is particularly low in the low interest rate environment.

[30] The estimated location parameter is robust to different starting values of the non-linear parameters in all specifications when a global maximization method is used. There is some variation in the estimates of the smoothness parameter when different starting values are used, but this has little effect on the other parameters.

environment (below approximately 1% for the 3-month Euribor) indicates that the interest rate spread between new loans and deposits increases when the market interest rate decreases. Because deposit rates are expected to become increasingly rigid close to the zero lower bound, this negative relationship suggests that spreads on new loans increase significantly when the market interest rate decreases further in the low interest rate environment.

TABLE 4 The results of STRs of the interest rate spread between new loans and deposits on the market interest rate.

	(1)	(2)	(3)
Transition function parameters			
Location: c_1	0.85	0.86	0.87
Smoothness: γ	9.80	10.12	10.61
3-month Euribor			
α_0 (low interest rate environment)	-0.72***(0.02)	-0.37**(0.17)	-0.63***(0.03)
α_1	0.95***(0.02)	0.43***(0.16)	0.65***(0.02)
$\alpha_0 + \alpha_1$ (high interest rate environment)	0.23	0.06	0.02
3-month Euribor x (Current account deposits/ total deposits)$_{t-1}$			
θ_1 (low interest rate environment)		-0.32(0.26)	0.15***(0.03)
δ_1		0.67***(0.24)	0.27***(0.02)
$\theta_1 + \delta_1$ (high interest rate environment)		0.35	0.42
3-month Euribor x (Saving deposits/ total deposits)$_{t-1}$			
θ_2 (low interest rate environment)		-0.61***(0.21)	-0.28***(0.03)
δ_2		0.56***(0.20)	0.26***(0.02)
$\theta_2 + \delta_2$(high interest rate environment)		-0.05	-0.02
Constants			
μ_0	2.26***(0.18)	2.31***(0.19)	-0.50***(0.03)
μ_1	-0.30***(0.01)	-0.29***(0.01)	-0.28***(0.01)
Shares of different deposits			
(Current account deposits /total deposits)$_{t-1}$	2.19***(0.04)	1.54***(0.09)	1.70***(0.08)
(Saving deposits/total deposits)$_{t-1}$	0.63***(0.03)	0.80***(0.08)	0.98***(0.07)
Macro controls	yes	yes	yes
Bank-specific controls	yes	yes	yes
Bank fixed effects	no	no	yes
Number of observations	19633	19633	19633
R-squared	0.72	0.72	0.75

This table presents the results from STRs of the interest rate spread between new loans and deposits on the market interest rate; the shares of different deposits and their interactions with the market interest rate; other bank-specific factors; and macro variables based on Equation (2). The dependent variable is the difference between the average interest rate on new loans and the average interest rate on new deposits. Bank controls include average loan size, average deposit size, bank size, loan/deposit ratio, market structure (HHI groups), nonperforming loans, operating costs, liquidity, capital adequacy, and the share of fee and commission income. Macro controls include GDP growth, inflation, and market interest rate volatility. *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

The results show that the positive effect of the market interest rate is highly dependent on the relative share of current account deposits in a high interest rate environment (column 2, Table 4). This is in line with the findings of the linear regression analysis. In the low interest rate environment, the coefficient for the interaction between the market interest rate and the share of current account deposits is not statistically significantly different from zero, and the interaction with the share of savings deposits is negative.[31] These results suggest that the relationship between the market interest rate and the interest rate spread between new loans and deposits reflects the evolution of interest rates other than those on current account deposits when the 3-month Euribor falls below 1%. When bank fixed effects are included, the coefficients for the interactions between the market interest rate and the shares of different deposits change notably. Again, this may reflect the fact that within-bank variation in the shares of different deposits is clearly lower than between-bank variation. In any case, the key result is that the relationship between the market interest rate and the interest rate spread between new loans and deposits changes significantly in the low interest rate environment, which holds across specifications.

The effects of the market interest rate in different interest rate environments are illustrated in Figure 3. This figure depicts the marginal effect of the market interest rate on the interest rate spread between new loans and deposits based on the results in column 1 of Table 4. It shows that the marginal effect of the market interest rate decreases significantly and becomes negative as the 3-month Euribor falls below the 1% level and approaches zero.

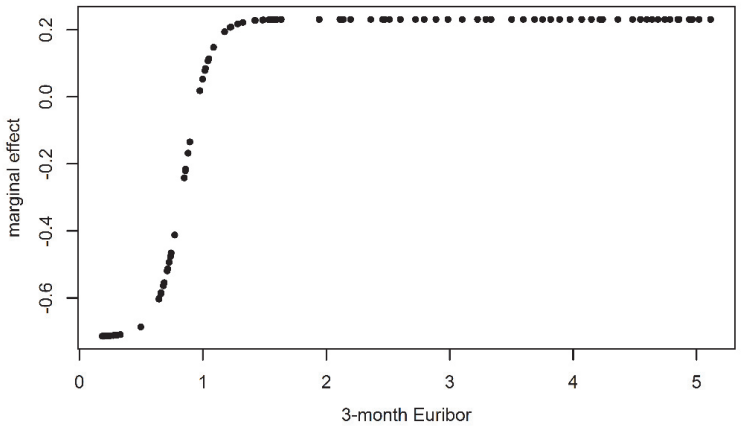

FIGURE 3 Marginal effect of the market interest rate on the interest rate spread between new loans and deposits against the level of the market interest rate. The measurement is based on the results in column 1 of Table 4.

31 The location parameter value is similar to that from the first model; thus, the low interest rate environment corresponds to a level below 1% of the 3-month Euribor.

In sum, the results show that the positive relationship between the market interest rate and the interest rate spread between stocks of loans and deposits is significantly stronger in a low interest rate environment than in a high interest rate environment, which is consistent with expectations. However, the results indicate that the positive relationship between the market interest rate and the interest rate spread between new loans and deposits in a high interest rate environment disappears and even becomes negative in a very low interest rate environment. This result indicates a large change in pricing when interest rates fall to very low level. These results highlight an important distinction between the two interest rate spreads: The interest rate spread between stocks of loans and deposits changes with market interest rates mainly mechanically based on existing contracts, especially on the loan side, while the interest rate spread between new loans and deposits reflects banks' pricing behaviors in different interest rate environments.

3.4.3 Robustness tests

First, I perform robustness checks using the 12-month Euribor and the ECB policy rate (the main refinancing rate) as the market interest rate variables remain similar. The results of the linear panel data regressions for both interest rate spreads. The estimates for the 12-month Euribor and the ECB policy rate are 0.44 and 0.46, respectively, in the case of the interest rate spread between stocks of loans and deposits, and 0.26 and 0.29, respectively, in the case of the interest rate spread between new loans and deposits.[32] In addition, the share of current account deposits plays a significant role in the positive relationship between market interest rates and interest rate spreads when these alternative market interest rate variables are used.

The STR models yield reasonable estimates when the 12-month Euribor is used as the market interest rate variable, but they do not work well with the ECB policy rate in all specifications. A likely reason for the latter finding is that there is much less variation over time in the ECB policy rate. In the specification with the interest rate spread between stocks of loans and deposits and the 12-month Euribor, the coefficient of the market interest rate is 0.61 in a low interest rate environment and 0.28 in a high interest rate environment, and the value of the location parameter is 2.17.[33] When the interaction between one-month lagged shares of current account and saving deposits and the 12-month is included, the estimates are consistent with the main results.

When the dependent variable is the interest rate spread between new loans and deposits, the STR models with the 12-month Euribor and ECB policy rate as the market interest rates support the main results. The values of the

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[32] The corresponding estimates from the main specifications are 0.39 and 0.25 for the interest rate spread between stocks of loans and deposits and the interest rate spread between new loans and deposits, respectively (see Table 2).

[33] These are 0.59 for the market interest rate in a low interest rate environment, 0.22 for the market interest rate in a high interest rate environment, and 1.98 for the location parameter (see Table 3).

location parameter are close to those of the main results with the 12-month Euribor and lower with the ECB policy rate. The values of the smoothness parameter are lower than with the 3-month Euribor, which indicates smoother shifts between regimes. The estimates for the market interest rate and its interactions with the shares of different deposits are consistent with the main results.

Second, I control for the competitive environment using the Lerner index instead of the HHI. I divide banks into four groups based on the average Lerner index value over the whole period.[34] The effects of market interest rate and its interaction with deposit composition are very similar in both the linear and STR analyses to those in the main analysis. The effect of the competitive environment based on the Lerner index is as expected, i.e., the interest rate spreads are lower in more competitive environments. The coefficients of competitive environment groups are also statistically significant.

Finally, I conduct a robustness check in which I control for interest rate expectations. This is especially important for the interest rate spread between new loans and deposits because it reflects current pricing behavior. I add the 3-month Euribor future rate with a forecast horizon of six months as a control variable. The effect of the level of market interest rate remain consistent with the main results of both the linear and non-linear analyses. The values of the market interest rate coefficients decrease slightly, and the coefficients of the 3-month Euribor future rate are positive in all estimations. The changes in the coefficients for the interactions between the market interest rates and the shares of different deposits are minor.

3.5 Auxiliary analyses and discussion

In this section, I conduct auxiliary analyses and discuss the policy implications of the results. I focus on the effects of a low interest rate environment.

3.5.1 Analysis of average monthly loan and deposit spreads

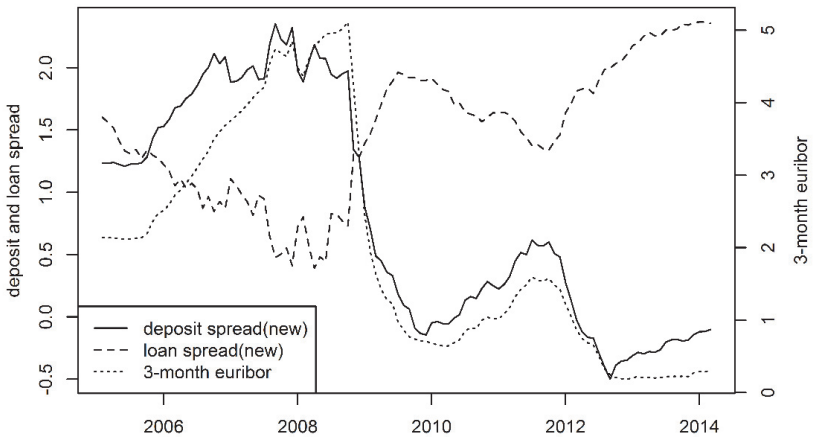
I examine the evolution of the loan and deposit spreads along with market interest rates to provide insights into their contributions to interest rate spreads in different interest rate environments. This analysis is conducted using the time series averages of the cooperative banks and takes into account possible non-linearities.

Figure 4 depicts the time series for the 3-month Euribor and for the average loan and deposit spreads based on both new and stocks of loans and deposits. It illustrates how the loan and deposit spreads evolve in opposite directions most of the time such that the loan spreads decrease and the deposit spreads increase when the market interest rate increases. At the end of the

[34] The calculation of the Lerner index is similar to that in, e.g., Lapteacru (2014).

period, i.e., as the market interest rate becomes very low, the spread on new loans increases significantly even if the market interest rate does not change much. This significant increase in the spread on new loans seems to explain the dramatic change in the relationship between the market interest rate and the interest rate spread between new loans and deposits in a low interest rate environment.

A



B

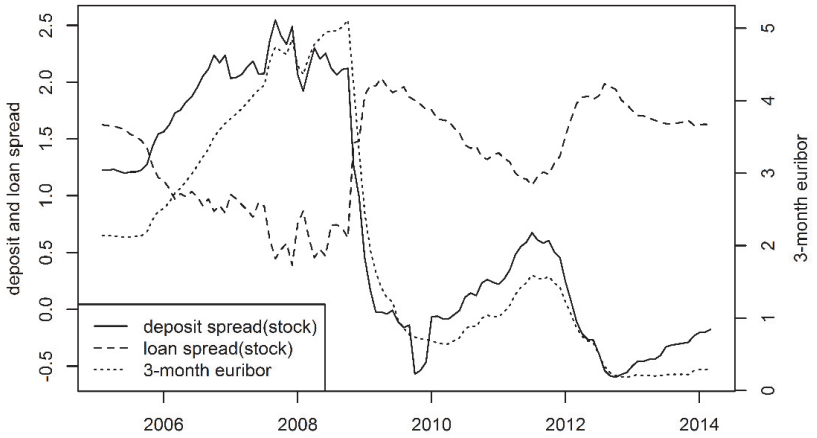


FIGURE 4 The evolution figure of banks' average loan and deposit spreads and market interest rates. The loan spread is the average loan rate minus the market interest rate. The deposit spread is the market interest rate minus the average deposit rate. Panel A depicts the time series of the 3-month Euribor and the spreads that are based on new loan and deposits. Panel B depicts the time series of the 3-month Euribor and the spreads that are based on stocks of loans and deposits.

Next, I use regression models to examine the relationship between the market interest rate and the banks' average loan and deposit spreads. First, I test the linearity of the relationship of the market interest rate to the spread on new and stock of loans, as well as to the spread on stock of deposits.[35] Linearity is rejected for both the spread on new loans and the spread on stock of deposits, suggesting that the rigidity of deposit rates and interest rates on new loans changes notably between high and low interest rate environments. However, linearity cannot be rejected for the spread on the stock of loans, which is logical because the share of new loans of the stock of loans is small. Thus, the average interest rates on the stock of loans are mainly determined based on existing long-term contracts.

TABLE 5 The relationship between loan and deposit spreads and the market interest rate.

	Deposit spread	Spread on new loans	Spread on stock of loans
	STR	STR	Linear
3-month Euribor			
β_1 (low interest rate environment)	0.53***	2.30**	-0.24***
	(0.07)	(0.97)	(0.01)
β_2	-0.37***	-2.59***	
	(0.06)	(0.10)	
$\beta_1 + \beta_2$ (high interest rate environment)	0.26	-0.29	
Constants			
α_1	-0.55***	1.72***	1.84***
	(0.06)	(0.22)	(0.03)
α_2	2.01***	0.26	
	(0.24)	(0.22)	
Transition function parameters			
Location 1: c_1	2.25	0.32	
Smoothness: γ	2.45	99.01	
Number of observations	110	110	110
R-squared	0.95	0.94	0.74

This table presents the results from STRs and linear regressions of loan and deposit spreads on the market interest rate (3-month Euribor). The deposit spread is the market interest rate minus the average interest rate on stock of deposits. The spread on new loans is the average interest rate on new loans minus the market interest rate, and the spread on stock of loans is the average interest rate on stock of loans minus market interest rate. *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

The results of the STRs for the spread on new loans and the stock of deposits, as well as the results of the linear regression for the spread on the stock of loans, are presented in Table 5. The results indicate that the relationship between the market interest rate and the spread on the stock of deposits is positive and

35 I analyze only the spread on the stock of deposits because it is close to that of new deposits due to the definition of the average new deposit rate used in this paper (see footnote 18).

significantly higher in a low interest rate environment than in a high interest rate environment (column 1 of Table 5). The results further indicate that the normally negative relationship between the market interest rate and the spread on new loans changes significantly in a very low interest rate environment (column 2 of Table 5). The finding of a strongly positive relationship in the very low interest rate environment seems somewhat counterintuitive; however, the STR model captures a significant increase in the spread on new loans in the very low interest rate environment at the end of the study period when the market interest rate increases slightly. This result also likely reflects expectations of a low interest rate environment over an extended period. The results in column 3 of Table 5 indicate that the linear relationship between the market interest rate and the spread on stock of loans is negative.

In sum, both average loan rates and deposit rates are rigid to changes in market interest rates. This finding supports the idea of interaction between loan and deposit rates that their adjustments to changes in market interest rates are interdependent (see e.g. Berlin and Mester, 1999; Gropp et al., 2007; Rocha, 2012). In a low interest rate environment, the rigidity of deposit rates increases, which is consistent with expectations based on a lower bound for (core) deposit rates. The rigidity of the interest rates on the stock of loans does not change in different interest rate environments, which is natural because they are determined mechanically based mainly on long-term contracts and because the share of new loans of the stock of loans is small. These results explain the increased positive relationship between the market interest rate and the interest rate spread between stocks of loans and deposits in a low interest rate environment. The relationship between the market interest rate and the interest rate on new loans, which reflects current pricing behavior, changes significantly in a low interest rate environment. This result suggests that banks react to decreased deposit spreads in a low interest rate environment by significantly increasing spreads on new loans to maintain or even improve their interest rate spread between new loans and deposits. Such pricing behavior explains the disappearance of the positive relationship between the market interest rate and the interest rate spread between new loans and deposits in a low interest rate environment. ECB (2014, p.33) illustrates that a large increase in the spread on new variable rate loans in tandem with a large decrease in the spread on short-term deposits seems to also apply to the euro area in general.

3.5.2 Profitability and net interest margin

The positive relationship between the market interest rate and the interest rate spread between stocks of loans and deposits and its strengthening in a low interest rate environment suggest significant pressure on retail bank profitability as market interest rates fall to low levels. I examine this profitability implication further using the net interest margin (NIM) as a

dependent variable.[36] The NIM is a broader interest margin measure than the interest rate spread between stocks of loans and deposits, as it is based on total interest revenues and interest expenses on banks' holdings of debt securities, non-deposit funding and hedging instruments in addition to loans and deposits. The NIM is a key element of bank profitability, and for example, Demirgüç-Kunt and Huizinga (1999) find that many factors affect the NIM and total profitability measures similarly.

The results indicate that the market interest rate positively affects the NIM, and this effect is statistically significant (see Appendix 2). The results again reveal a significant effect of the share of current account deposits on the magnitude of this positive effect. Moreover, the result of the STR indicates that the relationship between the market interest rate and the NIM is stronger in a low interest rate environment. The changes in the market interest rate coefficients between high and low interest rate environments are smoother and smaller compared to the estimations with the interest rate spread between stocks of loans and deposits as a dependent variable. These results suggest that adjustments of total interest revenues and/or interest costs to changes in market interest rates do not vary as much or as rapidly as adjustments of loan and deposit rates between different interest rate environments.

The existing body of literature on the effect of market interest rates or monetary policy on bank profitability examines both the level of short-term rates and the slope of the yield curve (e.g. Alessandri and Nelson, 2015). However, this literature focuses mainly on the slope of the yield curve and the short-term effects of the level changes due to typical maturity mismatches on banks' balance sheets (e.g. Flannery, 1983). The results presented in this paper highlight the long-term effects of the level of market interest rates on bank profitability based on the high rigidities of core deposit rates (see Hutchinson and Pennacchi, 1996; Sheehan, 2013). The results also highlight the non-linear effects of market interest rates on interest margins due to the (zero) lower bound for deposit rates in a low interest rate environment. Borio et al. (2015) find a similar non-linear effect based on the same reasoning.[37]

In sum, this paper provides evidence of how decreased market interest rates can weaken retail bank profitability, an effect that is strengthened in a low interest rate environment due to the lower bound on (core) deposit rates. Although the external validity of the results is naturally a relevant question due to the specific micro data, the empirical results support theoretical reasoning behind the effects of market interest rates on profitability. This suggests that the

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36 I measure NIM as interest revenues minus interest expenses divided by interest-bearing assets.

37 They remark that a potential non-linear effect is neglected in the existing empirical literature. In addition, as the slope of the yield curve also flattens when long-term rates are reduced directly through long-term asset purchases, this increases the pressure on net interest income and bank profitability in a low interest rate environment (Lambert and Ueda, 2014). ECB (2015a, p. 65–68) highlights that the main effect of a low interest rate environment on bank profitability may come from a low short-term market interest rate level or a flattened yield curve, depending on the dominance of variable or fixed rate loans.

role of the level of market interest rates should be taken into account in profitability considerations. Even if the mechanisms that drive the effects of a low interest rate environment on profitability are known, the role of the level of market interest rates has not always taken into account (cf., ECB 2015a, p. 65–68 and ECB 2015b).

3.5.3 Retail bank interest rate pass-through

The results show a significantly increased spread on new loans compensating for the restricted deposit spread in a low interest rate environment. This finding suggests impaired pass-through of market interest rates to retail rates and, thus, changes in the functioning of the interest rate channel of monetary policy.

In an auxiliary analysis, I estimate the relationship between the market interest rate and various retail rates in high and low interest rate environments. This is a very tentative analysis without control variables and based on time series of average interest rates on various new loans and deposits in all cooperative banks.[38] The previous results for the relationship between the market interest rate and the interest rate spread between stocks of loans and deposits, as well as the average deposit spread, suggest that the deposit rate rigidity increases when the 3-month Euribor falls below approximately 2%. The previous results for the relationship of the market interest rate with the interest rate spread between new loans and deposits as well as with the average spread on new loans suggest substantial changes in the rigidities of interest rates on new loans below roughly 1% of the 3-month Euribor. Based on these results, I estimate linear regressions of the average loan and deposit rates on the market interest rate, allowing for different effects when the market interest rate falls below 2% of the 3-month Euribor for deposit rates and below 1% of the 3-month Euribor for interest rates on new loans.

The results indicate that the estimates for long-term pass-through in high interest rate environments are in line with those in the previous literature (see Appendix 3).[39] Importantly, the results show that the pass-through of market interest rates to all (new) deposit and loans rates is significantly weaker in low interest rate environments. In the case of deposits, the results support the effect of a lower bound as well as its particular relevance for current account deposits. Below 2% of the 3-month Euribor, the estimated effect of the market interest rate on current account deposit rates is 0.11, compared to 0.39 in the higher interest rate environment. In the case of saving deposit rates, the estimate of the market interest rate in the low interest rate environment is approximately one-half of that in the higher interest rate environment. The rigidity of term deposit

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38 The interest rates on current account and saving deposits are calculated based on total stocks (see footnote 18).

39 See, e.g., De Bondt (2002), Sorensen and Werner (2006), De Graeve et al. (2007) and ECB (2009b). The interest rate pass-through literature examines both completeness, i.e., long-term pass-through, and the speed of adjustment, i.e., short-term pass-through. As I consider the effect of the level of the market interest rate, my analysis is related to the completeness of pass-through.

rates also increases in the low interest rate environment but by much less than in the case of core deposits. Compared to the effect in the higher interest rate environment, the effect of the market interest rate on the interest rates on new business loans and mortgages is approximately one-third below 1% of the 3-month Euribor. The effect of market interest rates on new consumption loans is close to zero in the very low interest rate environment.

Previous empirical studies find that interest rate pass-through to loan rates has weakened during the recent crisis and post-crisis periods that coincided with a low interest rate environment. This impaired pass-through is explained, e.g., by sovereign debt spreads, risk factors, and weaker competition (e.g. Hristov et al. 2012; ECB 2013; Gambacorta et al. 2014). However, scant attention has been paid to the specific characteristics of a low interest rate environment, i.e., to how the (zero) lower bound for deposit rates can affect the transmission of policy rates to retail rates. My paper highlights that increased spreads on new loans are related to restricted deposit spreads in a low interest rate environment in which deposit rates can no longer decrease along with market interest rates (see Darracq-Paries et al., 2014). This explanation relates to Illes et al. (2015), who describe three facts that have ignored in discussions of the weakened pass-through of policy rates to loan rates: differences in the maturities of policy rates and loans, differences between funding costs and policy rates, and increased funding costs during the post-crisis period due to higher risk premiums and the zero lower bound on deposit rates. They find that banks have not changed their loan pricing behaviors if loan rates are compared to a weighted average cost of funds.

In sum, the results suggest that the transmission of policy/market interest rates to interest rates on new loans weakens significantly in a low interest rate environment and that this is strongly associated with weakened pass-through to deposit rates. Although these results are tentative and based on specific micro data, they yield relevant insights into discussions of the pass-through of policy rates to retail rates. The comparison of average interest rates on current account deposits and mortgages between the OP Financial Group and Finland overall suggest similar pricing behaviors among the cooperative banks and other kinds of banks. In addition, the discussion of the Finnish banking sector compared to other euro area banking sectors in section 3.3.1 suggests that this kind of pricing behavior generalizes to retail banks in euro area countries without specific problems in their banking sector.

Moreover, the results raise one more general policy implication. As the results imply some lower bound for bank loan rates, it is relevant to ask whether large firms may benefit more than small firms from very low market interest rates because they can obtain funding directly from capital markets. This hypothesis is supported by the observation that the difference between the average interest rate on small and large loans increased as market interest rates decreased during the crisis (e.g. ECB, 2013).[40]

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[40] A likely for the difference is that banks must compete harder for financing of large firms, which have access to capital markets, than financing of small businesses that

3.6 Conclusion

In this paper, I examine the relationship between market interest rates and interest rate spreads, i.e., the differences between the average loan rates and the average deposit rates, which are essential profit elements in traditional retail banking. I consider both the interest rate spread between stocks of loans and deposits and the interest rate spread between new loans and deposits to provide different perspectives. Importantly, I allow for non-linearities i.e., differences in these relationships by interest rate environment, which highlights particular implications for bank profitability and the interest rate channel of monetary policy in a low interest rate environment.

I find that the level of the market interest rate significantly and positively affects the interest rate spread between both new and stocks of loans and deposits. This effect mainly arises because of the high rigidity of interest rates on current account deposits, which generally play a substantial role in funding for retail banks. Consequently, the effect of market interest rates on the interest rate spreads is heterogeneous across banks, depending on their shares of current account deposits relative to stock of deposits.

I find that the positive relationship between the market interest rate and the interest rate spread between stocks of loans and deposits is much stronger in a low interest rate environment than in a high interest rate environment. This relationship is stronger in a low interest rate environment because of the increased rigidity of deposit rates and flexible interest rates on stock of loans, owing to the predominance of variable rate loans. In particular, interest rates on core deposits, which are generally lower than market interest rates, face a zero or other lower bound as market interest rates decline to low levels. According to the STR estimations, a shift in the relationship between the market interest rate and the interest rate spread between stocks of loans and deposits occurs at approximately 2% of the 3-month Euribor, below which the rigidity of interest rates on deposits significantly increases. As a result, when market interest rates decline further in a low interest rate environment, the rapidly decreasing interest rate spread between stocks of loans and deposits pressures bank profitability.

The positive relationship between the market interest rate and the interest rate spread between new loans and deposits disappears and even becomes negative, as the 3-month Euribor falls below 1% and approaches zero. The result is due to a significant increase in spreads on new loans in a very low interest rate environment, which suggests that banks react to restricted deposit spreads by increasing loan spreads to maintain a sufficient interest rates spread between new loans and deposits. This reaction is also likely affected by the expectations of persistence of a low interest rate environment. An important

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rely more heavily on bank financing. Of course, there may be other reasons for this increased interest rate difference, such as the relative increase in the riskiness of small businesses during the crisis.

implication of such a reaction from banks is that pass-through from policy rates to new loan rates weakens. The results of the auxiliary analysis indicate that when the 3-month Euribor is below 1%, the effect of the market interest rate on various new loan rates is less than one-third of the effect observed when the market interest rate is at a higher level.

REFERENCES

Agarwal, R. & Kimball, M. 2015. Breaking Through the Zero Lower Bound. IMF Working Papers 15/224.

Alessandri, P. & Nelson, B. D. 2015. Simple Banking: Profitability and the Yield Curve. Journal of Money, Credit and Banking 47 (1), 143–175.

Aliaga-Diaz, R. & Olivero, M. P. 2011. The Cyclicality of Price-Cost Margins in Banking: An Empirical Analysis of Its Determinants. Economic Inquiry 49 (1), 26–46.

Angbazo, L. 1997. Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking. Journal of Banking & Finance 21 (1), 55–87.

Beck, T. & Hesse, H. 2009. Why are interest spreads so high in Uganda? Journal of Development Economics, 88 (2), 192–204.

Berger, A. N. & Udell, G. F. 1992. Some Evidence on the Empirical Significance of Credit Rationing. Journal of Political Economy 100 (5), 1047–1077.

Berlin, M. & Mester, L. J. 1999. Deposits and relationship lending. Review of Financial Studies 12 (3), 579–607.

Borio, C., Gambacorta, L. & Hofmann, B. 2015. The influence of monetary policy on bank profitability. BIS Working Papers No. 514.

Borio, C. & Zhu, H. 2012. Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism? Journal of Financial Stability 8 (4), 236–251.

Bos, J. W. B. & Kool, C. J. M. 2006. Bank efficiency: The role of bank strategy and local market conditions. Journal of Banking & Finance 30, 1953–1974.

Brock, P. L. & Rojas Suarez, L. 2000. Understanding the behavior of bank spreads in Latin America. Journal of Development Economics 63 (1), 113–134.

Carbo-Valverde, S., Hannan, T. H. & Rodriguez-Fernandez, F. 2011. Exploiting old customers and attracting new ones: The case of bank deposit pricing. European Economic Review 55 (7), 903–915.

Chiappori, P.-A., Perez-Castrillo, D. & Verdier, T. 1995. Spatial competition in the banking system: Localization, cross subsidies and the regulation of deposit rates. European Economic Review 39 (5), 889–918.

Chiaramonte, L., Poli, F. & Oriani, M. E. 2013. Are cooperative banks a lever for promoting bank stability? Evidence from the recent financial crisis in oecd countries. European Financial Management 21 (3), 491–523.

Cihák, M. & Hesse, H. 2007. Cooperative Banks and Financial Stability. IMF Working Papers 07/2.

Darracq-Paries, M., Moccero, D. N., Krylova, E. & Marchini, C. 2014. The Retail Bank Interest Rate Pass-Through: The Case of the Euro Area During the Financial and Sovereign Debt Crisis. ECB Occasional Paper Series No. 155.

De Bondt, G. 2002. Retail bank interest rate pass-through: New evidence at the euro area level. ECB Working Paper No. 136.

De Graeve, F., De Jonghe, O. & Vander Vennet, R. 2007. Competition, transmission and bank pricing policies: Evidence from Belgian loan and deposit markets. Journal of Banking & Finance 31 (1), 259–278.

Degryse, H. & Ongena, S. 2007. The impact of competition on bank orientation. Journal of Financial Intermediation 16, 399–424.

Demirgüç-Kunt, A. & Huizinga, H. 1999. Determinants of commercial bank interest margins and profitability: some international evidence. The World Bank Economic Review 13 (2), 379–408.

European Association of Cooperative Banks. 2010. European Co-operative Banks in the financial and economic turmoil. Research Paper.

European Central Bank. 2000. EU banks' margins and credit standards. Report

European Central Bank. 2009a. Elasticity of banks' interest income vis-a-vis recent changes in short-term market rates. ECB Financial Stability Review June 2009, 95-101.

European Central Bank. 2009b. Recent Developments in the Retail Bank Interest Rate Pass-Through in the Euro Area. ECB Monthly Bulletin August 2008, 93–105.

European Central Bank. 2010. Sensitivity of euro area banks' interest income to changes in short-term market rates. ECB Financial Stability Review December 2010, 77-79.

European Central Bank. 2013. Assessing the retail bank interest rate pass-through in the euro area at time of financial fragmentation. ECB Monthly Bulletin August 2013, 75–91.

European Central Bank. 2014. ECB Monthly Bulletin August 2014.

European Central Bank. 2015a. Bank profitability challenges in euro area banks: the role of cyclical and structural factors. ECB Financial Stability Review May 2015, 134–145.

European Central Bank. 2015b. ECB Financial Stability Review November 2015.

European Central Bank. 2015c. Report on financial structures 2015.

European Commission 2007. Report on the retail banking sector inquiry. Commission Staff Working Document.

Entrop, O., Memmel, C., Ruprecht, B. & Wilkens, M. 2015. Determinants of Bank Interest Margins: Impact of Maturity Transformation. Journal of Banking & Finance 54, 1–19.

Fiordelisi, F. & Salvatore, D. 2014. Competition and financial stability in European cooperative banks. Journal of International Money and Finance 45, 1–16.

Flannery, M. J. 1983. Interest Rates and Bank Profitability: Additional Evidence: Note. Journal of Money, Credit and Banking 15 (3), 355–362.

Gambacorta, L. 2008. How do banks set interest rates? European Economic Review 52 (5), 792–819.

Gambacorta, L., Illes, A. & Lombardi, M. 2014. Has the transmission of policy rates to lending rates been impaired by the Global Financial Crisis? BIS Working Paper No. 477.

Gonzalez, A., Teräsvirta, T. & Van Dijk, D. 2005. Panel Smooth Transition Regression Models. International Workshop on Financial Econometrics and Statistics 34.

Gropp, R., Kok Sørensen, C. & Lichtenberger, J. 2007. The dynamics of bank spreads and financial structure ECB Working Paper Series No. 714.

Hannan, T. & Berger, A. 1991. The rigidity of prices: Evidence from the banking industry. The American Economic Review 81 (4), 938–945.

Hasan, I., Jackowicz, K. & Kowalewski, O. 2014. Bank ownership structure, SME lending and local credit markets. Bank of Finland Research Discussion Papers 22/2014.

Ho, T. S. Y. & Saunders, A. 1981. The Determinants of Bank Interest Margins : Theory and Empirical Evidence. The Journal of Financial and Quantitative Analysis 16 (4), 581–600.

Hristov, N., Hülsewig, O. & Wollmershäuser, T. 2012. Loan supply shocks during the financial crisis: Evidence for the Euro area. Journal of International Money and Finance 31 (3), 569–592.

Hutchinson, D. E. & Pennacchi, G. G. 1996. Measuring Rents and Interest Rate Risk in Imperfect Financial Markets: The Case of Retail Bank Deposits. Journal of Financial and Quantitative Analysis 31 (3), 399–417.

Hutchison, D. E. 1995. Retail bank deposit pricing: An intertemporal asset pricing. Journal of Money, Credit and Banking 27 (1), 217–231.

Hyytinen, A. & Toivanen, O. 2004. Monitoring and market power in credit markets. International Journal of Industrial Organization 22 (2), 269–288.

Illes, A. & Lombardi, M. 2013. Interest rate pass-through since the financial crisis. BIS Quarterly Review September 2013, 57–66.

Illes, A., Lombardi, M. & Mizen, P. 2015. Why did bank lending rates diverge from policy rates after the financial crisis? BIS Working Papers No. 486.

Jiménez, G., Ongena, S., Peydró, J.-L. & Saurina, J. 2012. Credit supply and monetary policy: Identifying the bank balance-sheet channel with loan applications. American Economic Review 102 (5), 2301–2326.

Jimenez, G., Ongena, S., Peydro, J. & Saurina, J. 2014. Hazardous Times for Monetary Policy: What do Twenty-three Million Bank Loans Say About the Effect of Monetary Policy on Credit Risk-Taking? Econometrica 82 (2), 463–505.

Kahn, C., Pennacchi, G. & Sopranzetti, B. 1999. Bank Deposit Rate Clustering : Theory and Empirical Evidence. Journal of Finance 54 (6), 2185–2214.

Köhler, M. 2015. Which banks are more risky? The impact of business models on bank stability. Journal of Financial Stability 16, 195–212.

Laeven, L. & Valencia, F. 2013. Systemic Banking Crises Database. IMF Economic Review 61 (2), 225–270.

Lambert, F. & Ueda, K. 2014. The Effects of Unconventional Monetary Policies on Bank Soundness. IMF Working Papers 14/152.

Lapteacru, I. 2014. Do more competitive banks have less market power? The evidence from Central and Eastern Europe. Journal of International Money and Finance 46, 41–60.

Lepetit, L., Nys, E., Rous, P., & Tarazi, A. 2008. The expansion of services in European banking: Implications for loan pricing and interest margins. Journal of Banking and Finance 32 (11), 2325–2335.

López-Espinosa, G., Moreno, A. & Pérez de Gracia, F. 2011. Banks' Net Interest Margin in the 2000s: A Macro-Accounting international perspective. Journal of International Money and Finance 30 (6), 1214–1233.

Machauer, A. & Weber, M. 1998. Bank behavior based on internal credit ratings of borrowers. Journal of Banking & Finance 22 (10–11), 1355–1383.

Maudos, J. & Fernández de Guevara, J. 2004. Factors explaining the interest margin in the banking sectors of the European Union. Journal of Banking & Finance 28 (9), 2259–2281.

Neumark, D. & Sharpe, S. A. 1992. Market Structure and the Nature of Price Rigidity : Evidence from the Market for Consumer Deposits. The Quarterly Journal of Economics 107 (2), 657–680.

OP Financial Group. 2016. OP Financial Group's Corporate Governance Statement 2015.

Rocha, M. D. 2012. Interest rate pass-through in Portugal: Interactions, asymmetries and heterogeneities. Journal of Policy Modeling 34 (1), 64–80.

Saunders, A. & Schumacher, L. 2000. The determinants of bank interest rate margins: an international study. Journal of International Money and Finance 19 (6), 813–832.

Sheehan, R. G. 2013. Valuing Core Deposits. Journal of Financial Services Research 43 (2), 197–220.

Sorensen, C. K. & Werner, T. 2006. Bank Interest Rate Pass-Through In The Euro Area: A Cross Country Comparison. ECB Working Paper Series No. 580.

Teräsvirta, T. 1994. Specification, Estimation, and Evaluation of Smooth Transition Autoregressive Models. Journal of the American Statistical Association 89, 208–218.

Teräsvirta, T., Tjøstheim, D. & Granger, C. W. J. 2010. Modelling Nonlinear Economic Time Series. Oxford University Press.

Van Dijk, D., Teräsvirta, T. & Franses, P. H. 2000. Smooth Transition Autoregressive Models - A Survey of Recent Developments. Econometric Institute Research Report.

APPENDIX 1

The specification tests are based on the following auxiliary model:

$$\text{Interest rate spread}_{it} = \mu_i + \alpha_0 mr_t + \alpha_1 mr_t^2 + \alpha_2 mr_t^3 + \alpha_3 mr_t^4 + \alpha_4 mr_t^5 + \beta S_{it} + \boldsymbol{\gamma_0} mr_t \text{ x } \mathbf{S_{it}} + \boldsymbol{\gamma_1} mr_t^2 \text{ x } \mathbf{S_{it}} + \boldsymbol{\gamma_2} mr_t^3 \text{ x } S_{it} + \boldsymbol{\gamma_3} mr_t^4 \text{ x } \mathbf{S_{it}} + \boldsymbol{\gamma_4} mr_t^5 \text{ x } \mathbf{S_{it}} + \text{bank}_{it-1} + \text{macro}_t + \varepsilon_{it} \quad (4)$$

Tests of linearity against the STR models are based on the null hypothesis H_0: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \gamma_{1,1} = \gamma_{2,1} = \gamma_{3,1} = \gamma_{4,1} = \gamma_{1,2} = \gamma_{2,2} = \gamma_{3,2} = \gamma_{4,2} = 0$. The rejection of this null hypothesis supports the use of the STR models. The choice between the two- and three-regime models is based on a test of the null hypotheses H_{01}: $\alpha_1 = \alpha_3 = \gamma_{1,1} = \gamma_{1,2} = \gamma_{3,1} = \gamma_{3,2} = 0$ and H_{02}: $\alpha_2 = \alpha_4 = \gamma_{2,1} = \gamma_{2,2} = \gamma_{4,1} = \gamma_{4,1} = 0$. A stronger rejection of H_{01} supports the choice of the LSTR1 and vice versa. The results of the tests are presented below.

The results of the specification tests.

Linearity test:		
H_0:$\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \gamma_{1,1} = \gamma_{2,1} = \gamma_{3,1} = \gamma_{4,1} = \gamma_{1,2} = \gamma_{2,2} = \gamma_{3,2} = \gamma_{4,2} = 0$	F(12,180)	P value
Interest rate spread between new loans and deposits	34.21	0.00
Interest rate spread between stocks of loans and deposits	71.96	0.00
Choosing the model:		
H_{01}: $\alpha_1 = \alpha_3 = \gamma_{1,1} = \gamma_{1,2} = \gamma_{3,1} = \gamma_{3,2} = 0$	F(6,180)	P value
Interest rate spread between new loans and deposits	45.41	0.00
Interest rate spread between stocks of loans and deposits	25.96	0.00
H_{02}: $\alpha_2 = \alpha_4 = \gamma_{2,1} = \gamma_{2,2} = \gamma_{4,1} = \gamma_{4,1} = 0$		
Interest rate spread between new loans and deposits	38.92	0.00
Interest rate spread between stocks of loans and deposits	25.85	0.00

APPENDIX 2

TABLE A2.1 The Results for the Net Interest Margin.

	Linear models			STR
	(1)	(2)	(3)	(4)
3 month Euribor				
β_1 (linear effect/low interest rate environment)	0.36***	0.11**	0.11**	0.46***
	(0.01)	(0.05)	(0.04)	(0.00)
β_2				-0.19***
				(0.02)
$\beta_1 + \beta_2$ (high interest rate environment)				0.27
Constants				
α_1	2.88***	3.20***		2.21***
	(0.64)	(0.64)		(0.16)
α_2				0.40***
				(0.10)
Other variables				
(Current account deposits /total deposits)$_{t-1}$	1.68***	0.67***	1.21***	1.54***
	(0.17)	(0.22)	(0.23)	(0.04)
(Saving deposits/total deposits)$_{t-1}$	0.49***	0.39**	0.60***	0.53***
	(0.14)	(0.19)	(0.21)	(0.03)
3 month Euribor x (Current account deposits/ total deposits)$_{t-1}$		0.48***	0.39***	
		(0.07)	(0.07)	
3 month Euribor x (Saving deposits/total deposits)$_{t-1}$		0.03	-0.04	
		(0.07)	(0.07)	
Transition function parameters				
Location: c				4.08
Smoothness: γ				6.85
Bank specific controls	yes	yes	yes	yes
Macro controls	yes	yes	yes	yes
Bank fixed effects	no	no	yes	no
Time fixed effects	no	no	no	no
Number of observations	19898	19898	19898	19633
R-squared	0.82	0.82	0.85	0.84

This table presents the results from STRs and linear regressions of loan and deposit spreads on the market interest rate (3-month Euribor). The deposit spread is the market interest rate minus the average interest rate on stock of deposits. The spread on new loans is the average interest rate on new loans minus the market interest rate, and the spread on stock of loans is the average interest rate on stock of loans minus market interest rate. *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

APPENDIX 3

TABLE A3.1 The results for interest rate pass-through in different interest rate environments

Panel A			
	Current account deposits	Saving deposits	New term deposits
3-month Euribor	0.39***	0.79***	0.96***
	(0.01)	(0.03)	(0.02)
Low interest rate environment	0.80***	0.71***	0.94***
	(0.06)	(0.13)	(0.07)
3 month Euribor x Low interest rate	-0.28***	-0.34***	-0.21**
environment	(0.02)	(0.09)	(0.07)
Constant	-0.60***	-0.29**	0.02
	(0.05)	(0.12)	(0.05)
Number of observations	110	110	110
R-squared	0.93	0.96	0.98
Panel B			
	New business loans	New mortgages	New consumer loans
3-month Euribor	0.71***	0.74***	0.73***
	(0.01)	(0.02)	(0.01)
Very low interest rate environment	0.49***	0.48***	0.63***
	(0.06)	(0.06)	(0.06)
3-month Euribor x Very low interest rate	-0.53***	-0.47***	-0.74***
environment	(0.09)	(0.08)	(0.09)
Constant	2.45***	1.57***	2.67***
	(0.04)	(0.04)	(0.04)
Number of observations	110	110	110
R-squared	0.98	0.98	0.98

This table presents regressions of different new loan and deposit rates on the market interest rate in different interest rate environments. The indicator variable of *low interest rate environment* takes a value of one when the 3-month Euribor is below 2% and zero otherwise. The indicator variable of *very low interest rate environment* takes a value of one when the 3-month Euribor is below 1% and zero otherwise. *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

4 RELATIONSHIP BANKING AND THE FINANCIAL DIFFICULTIES OF SMES IN THE AFTERMATH OF THE CRISIS*

Abstract

This paper examines the association of bank relationship strength with the performance of SMEs after the onset of the financial crisis in 2008. The first question is how relationship strength, measured by relationship length and the existence of a checking account, is related to the probability of financial difficulties of SMEs during the crisis. The second question is how relationship strength is associated with the future outcome of those SMEs that faced financial difficulties. To address these questions, I employ unique data on the SME customers of Finnish cooperative banks. The results indicate that bank relationship strength reduces the probability that SMEs suffer from financial difficulties and, if those difficulties are faced, helps SMEs to cope with them.

Keywords: relationship banking, firm distress, financial crisis

JEL classification: G01, G21, G33, L14

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4.1 Introduction

The key purpose of relationship banking, i.e., forming close and long-lasting relationships between banks and customers, is to alleviate problems of asymmetric information that are typical in financial intermediation (Boot, 2000). This paper examines the importance of bank relationship strength to small and medium-sized enterprises (SMEs) in the aftermath of the global financial crisis that began in 2008. Relationship banking can have special significance for SMEs during crises: First, increased uncertainty makes asymmetric information problems worse (Beck et al., 2014). Second, difficulties of borrowers can be assumed to be largely due to the exposures to economy-wide crisis instead of idiosyncratic shocks (see, Bolton et al., 2013; Fiordelisi et al., 2014; Gambacorta and Mistrulli, 2014). Third, SMEs are often opaque and the collection of soft information plays a large role (e.g., Agarwal and Hauswald, 2010; Stein, 2002). The previous literature observes how the recent crisis caused funding difficulties particularly for SMEs (see, e.g., Beck et al., 2014; ECB, 2014).

The existing literature finds many benefits of relationship banking in times of crisis. The empirical findings indicate that firms with close bank relationships have better loan availability during crises with higher amounts of loans, lower credit rationing, and better loans terms (e.g., Alexandre et al., 2014; Beck et al., 2014; Cotugno et al., 2013; Dewally and Shao, 2014; Jiangli et al., 2004). However, fewer studies focus on the effects of relationship strength on firms' overall performance and survival during crises. This study attempts to fill this gap by using detailed data on SME -bank relationships and financial difficulties during a economy-wide crisis and post-crisis period.

This paper considers the role of relationship banking during a crisis by examining the occurrence of and survival from financial difficulties of SMEs during the five-year period after the onset of the 2008 financial crisis. The empirical analysis consists of two parts. First, I examine the effect of relationship strength, measured by relationship length and the existence of a checking account, on the probability of SME default and the probability of experiencing less severe financial distress in the two years after the onset of the crisis. There is no consensus in existing theoretical and empirical literature on how relationship banking affects risks and the occurrence of financial distress (e.g., Agarwal and Hauswald, 2010; Foglia et al., 1998; Jiménez and Saurina, 2004; Rajan, 1992). There are studies that find that relationship banking had diminishing effects on firms' defaults during the recent financial crisis (Bolton et al., 2013; Fiordelisi et al., 2014). Neither of the studies focus exclusively on SMEs, but a large share of firms in their samples are SMEs.

Second, I consider SMEs that faced financial difficulties during this two-year crisis period and examine the role of bank relationship strength in how they cope with their problems over a three-year window after the first identification of default or less severe distress. I do this by examining the effects of relationship strength on the probability of alternative outcomes. The four possible outcomes

are bankruptcy, recovery from default/ improvement in the credit rating, still defaulted/distressed, and exit from the data without the indication of bankruptcy. Previous literature suggests that a strong bank relationship has favorable effects on firms' survival from financial distress (Chemmanur and Fulghieri, 1994; Hoshi et al., 1990; Huang et al., 2015; Höwer, 2016; Rosenfeld, 2014; Shimizu, 2012). These previous studies do not focus on economy-wide crisis periods, and empirical analyses of these studies do not focus on SMEs, but the firm samples consist of either large corporates or all firm sizes.

This paper contributes in three ways to the literature concerning the role of relationship banking in firms' difficulties and during crises. First, I examine the role of a bank relationship in firms' difficulties during the economy-wide crisis and post-crisis period. A specific feature of this type of period is that a large share of firms' financial difficulties is likely due to a common macroeconomic shock, and soft information collected in a close and/or long bank relationship can facilitate banks' assessments of firms' future outlook and fundamental condition. While there is literature on the favorable role of bank relationship when borrowers face idiosyncratic shocks, less is known about the issue in an economy-wide crisis. Second, I examine both the occurrence of and survival from financial difficulties in a country where the global financial crisis was mainly an external shock. Third, I focus on SMEs that are often the most vulnerable during crises and for which a bank relationship can be particularly important.

I use proprietary data on the SME customers of local cooperative banks of the Finnish OP Financial Group where relationship banking plays an essential role. I employ the data on the SMEs that were customers before the crisis in August 2008 and examine their financial conditions after the onset of the financial crisis. Recognition of the financial difficulties over time is based on credit rating information, and I use two measures for that. The first measure is default condition which indicates that a firm has serious payment defaults, is under debt restructuring, or is bankrupted. The second measure is a less severe distress condition that is defined as the rating migration to a weak credit rating category. If a firm obtains a weak credit rating, it comes under special scrutiny.

My results indicate that bank relationship strength plays an important role in the financial difficulties of SMEs in the aftermath of the financial crisis. The key findings of the two-part empirical analysis are the following. First, a longer relationship and the existence of a checking account are negatively associated with both the probability of default and the probability of experiencing less severe distress during the two years following the onset of the crisis. The estimated probability of default is one to four percentage points lower, and the estimated probability of less severe distress is three to eight percentage points lower if a SME has a longer-term relationship and a checking account in a bank. Second, a longer relationship is positively associated with the probability of a favorable outcome for the SMEs that became financially distressed during this crisis period. Relationship length has a positive relationship with the probability of recovery from default and improvement in credit rating, and a

negative relationship with the probability of bankruptcy over three years after the identification of financial difficulties.

I also conduct auxiliary analyses in which I consider the role of bank size, as well as availability and terms of new loan, for distressed SMEs. I analyze both the probability of and survival from financial difficulties with two subsamples of SMEs that are based on bank size. This analysis is founded on the argument that soft information plays a major role in small banks (see, e.g., Berger et al., 2005). Most key results hold in both subsamples, and there is no robust evidence that the effects of relationship strength are larger in smaller banks. Regarding lending for distressed firms, I find that the relationship variables are positively related to the probability of new loan contract during the first year after the identification of financial difficulties. However, loan terms are not more favorable for distressed firms with a strong relationship: A longer relationship and the existence of a checking account are negatively related to the maturity of new loans for both defaulted and less severely distressed firms. The relationship between margin of new loans and relationship strength is not significant.

Overall, the results provide evidence of the benefits of relationship banking in crisis periods. The result of the negative relationship between relationship strength and the probability of financial difficulties supports the argument that soft information collected in a long and/or close relationship can improve the quality of lending. In this way, relationship banking can mitigate the financial difficulties of SMEs when a crisis hits. The result of the positive relationship between relationship strength and the probability of favorable outcome of distressed SMEs suggests that relationship banking facilitates SMEs' survival throughout temporarily worse economic conditions. These findings support the valuable role of relationship banking because SMEs are vital for employment and economic development, but, due to their opaqueness, they often have particular funding problems in uncertain times (see, Beck et al., 2014). However, this paper does not consider the question of whether the better short-term survival of SMEs with a strong long-term relationship leads to better long-term outcomes.

4.2 Related literature and hypotheses for the empirical analysis

Relationship banking includes several elements related to its two main characteristics: reducing asymmetric information and investing in long-term relationships through proprietary information and multiple interactions (Boot 2000). In this section, I review relevant theoretical and empirical literature on relationship banking. Based on this, I summarize the predictions and questions examined in the empirical analysis of this paper.

4.2.1 Key characteristics of relationship banking

A primary purpose of building bank-customer relationships is to alleviate the problems of asymmetric information. A close and long relationship can

improve screening and monitoring that are key elements of banking business (Freixas and Rochet, 1997). In relationship banking, banks collect soft information about their customers over time, in addition to hard information that can be verified based on financial variables (Agarwal and Hauswald, 2010). Soft information is produced by an agent, e.g., a bank official, and can include such things as degrees of trust or character assessment (Stein, 2002). In that way, banks learn more about firms' types and future prospects (e.g., Bolton et al. 2013).

Repeated lending allows flexibility and discretion in loan contracting, which may indicate implicit long-term contracting (Boot, 2000; Boot and Thakor, 1994). In long-term relationships, the profitability of customers can be considered over time, which enables temporary lower returns or losses (e.g., Petersen and Rajan, 1995). Renegotiation of loan contracts with banks is typically easier than in the case of capital market financing, and even easier if a bank relationship is exclusive (Chemmanur and Fulghieri, 1994; Ongena and Smith, 1998). These characteristics of relationship banking generally insure loan availability and favorable terms over time (Berger and Udell, 1992; Berlin and Mester, 1999).

The potential negative side of relationship banking relates to holdup problems and soft budget constraint. Holdup costs refer to the possibility of extra rents in a close relationship because collected private information causes asymmetric information related to other banks or financing sources (Sharpe 1990). Soft budget constraint refers to situations where an exclusive relationship can lead to unprofitable lending behavior in order to avoid distressing relationship customers (Dewatripoint and Maskin 1995).

4.2.2 Relationship banking and risk

There are contradictory theoretical arguments about the association between relationship banking and risks. Banks' better screening and monitoring of relationship customers, as well as learning of their business type gained through collection of soft information, can lower the probability of encountering financial distress (Agarwal and Hauswald 2010; Bolton et al. 2013). During crises, monitoring and screening typically increase as default risk increases (Ruckes, 2004). On the other hand, holdup costs can lead to higher lender risk-taking due to inefficient investment choices and compensation for higher default rates (Jiménez and Saurina, 2004; Sharpe, 1990). In addition, borrowers may have incentives for excessive risk-taking if they expect that renegotiation is easier in a close bank relationship (Dewatripont and Maskin, 1995).

When considering the association between relationship strength and risks, it is essential to consider how this relationship reflects the selection of relationship customers versus the effect of bank relationship on risks. Regarding the selection of relationship customers, Elsas (2005) divides potential determinants of relationship banking into three groups: borrower, bank, and market characteristics. In the context of this study, the relevant question is whether the quality of a firm affects the building and continuance of a bank

relationship. There are opposing arguments on this issue. On one hand, high quality lenders may prefer arm's length financing to relationship lending because of the holdup problems (Rajan, 1992). There are also theories according to which the benefits of relationship banking are the highest for low quality customers (Boot and Thakor, 2000). On the other hand, it can be argued that a positive selection process occurs over time (Elsas, 2005). In addition, the theory of von Thadden (2004) suggests that low quality customers switch banks more often than high quality customers.

Existing empirical studies analyze the association between relationship banking and risks mainly by examining the effect of relationship measures on the probability of default. Foglia et al. (1998) use Italian data and identify fragile firms with multivariate statistical procedures instead of with a direct default condition. Their results indicate that the higher number of lenders is associated with higher riskiness of borrowers. Puri et al. (2011a) use a comprehensive dataset of loans of German retail customers. They find that different forms of bank relationships decrease the probability of default, even after controlling internal and external credit ratings. In contrast, Jiménez and Saurina (2004) find that the higher number of lenders decreases the probability of default, which is defined as payments delayed at least three months. They use a very large loan level dataset collected by the Bank of Spain's Credit Register.

Two empirical studies focusing on the recent crisis period find that relationship lending decreases the probability of default. Bolton et al. (2013) use credit register data on Italian firms and examine how the recent financial crisis affected the loan terms and defaults in relationship banks versus transaction banks. They separate relationship and transactional banks based on the distance between headquarters of firms and banks which is a proxy for the cost of producing soft information. The empirical analyses are based on the probit model of defaults during the six quarters after the collapse of Lehman Brothers in September 2008 and on the linear regression model of loan terms in good and bad times. They find that relationship lending is associated with a lower probability of default during the crisis. In addition, while relationship banks charge a higher spread in good times, they provide better lending terms in the midst of the crisis. Fiordelisi et al. (2014) use the credit file data of eight Italian banks and examine the effect of bank relationship on the probability of default from December 2008 to December 2010, using the probit model. They use two bank relationship measures and find that both a higher concentration and a longer relationship decrease the probability of default. In addition, they find that the effects of bank relationship strength are greater for smaller firms.

4.2.3 Relationship banking and the future performance of distressed firms

Relationship banking and soft information can have particular relevance for distressed firms and during crises because asymmetric information, uncertainty, and the need for funding can be expected to be especially great in these situations (Bernanke et al., 1996; Hoshi et al., 1990; Höwer, 2016; Rosenfeld, 2014). A good knowledge of a firms' type, management and future prospects

through soft information enables banks to identify good firms and leads to willingness to help these firms through their temporary difficulties (Hoshi et al. 1990; Bolton et al. 2013; Höwer 2016). In addition, implicit insurance and long-term profitability aspects support the specific role of relationship banking for distressed firms and during crises.

There are two primary ways through which a strong bank relationship can improve the survival probability of a distressed firm. First, a close and/or long-term relationship can ensure continuation of loan availability with favorable terms because banks know their relationship customers well and/or can consider the long-term profitability of these customers. Second, debt restructuring can be easier in a strong relationship. Loans with fewer lenders have smaller free-rider and coordination problems in debt restructurings or renegotiations (Demiroglu and James, 2015; Höwer, 2016; Rajan, 1992). Firms may also prefer to solve their financial problems confidentially with their bank and, thus, avoid damage to their reputation (Degryse and Ongena, 2002). However, continued lending for distressed firms in a close relationship is not always due to the ability to better identify good customers and support them in temporary difficulties. The soft budget constraint refers to situations where investment in a strong bank relationship may reduce the ability to make tough decisions about a distressed firm and where loans are extended in the hope of recovering (Boot, 2000). In addition, banks can have an incentive to continue lending to their existing customers in bad conditions, so-called "zombie" firms, in order to avoid the realization of losses and deterioration of solvency, particularly, if banks are also itself in difficulties (Caballero et al., 2008; Peek and Rosengren, 2005).

Empirical literature examines the role of bank relationship in firms' financial difficulties from various perspectives. Hoshi et al. (1990) find that financially distressed Japanese public firms invest and sell more if they have a close bank relationship. Elsas and Krahnen (1998) use data on medium-sized German firms and find that housebanks provide liquidity assistance for firms whose credit ratings deteriorate.[1] Brunner and Krahnen (2008) find that, for distressed firms in Germany, the probability of coordination problems increases with the number of bank relationships and decreases in the concentration of bank debt. Shimizu (2012) finds that small Japanese banks lend relatively more relationship loans to small firms and decrease their bankruptcy probability by maintaining a higher number of non-performing loans. Significantly, the findings also indicate that these large numbers of non-performing loans do not lead to higher bankruptcy rates in the future. Rosenfeld (2014) examines distressed US public firms and finds that a relationship-backed loan contracted prior to distress identification increases the probability of emergence from distress. Huang et al. (2015) examine Taiwanese public firms in default and find that a strong bank relationship decreases the probability and increases the duration of the decision to file for reorganization. From US data, Demiroglu and James (2015) find that loans from traditional lenders are easier to

[1] Housebanks refer to firms' main banks.

restructure out of court than loans from institutional lenders, and that the probability of restructuring increases if a loan is from a single bank instead of a syndicated loan. Höwer (2016) uses a dataset on German firms and finds that German firms that have recently changed their main bank show a higher probability of closure.

4.2.4 Empirical predictions

The existing theoretical and empirical studies do not provide a consistent prediction of the association between relationship banking and risks, and, thus, the issue is ultimately an empirical one. As one of the key characteristics of relationship banking is better monitoring and screening, their increased role during crises suggests that diminishing effects of relationship banking on risks can be particularly strong in these times. Few empirical studies focusing on the recent crisis period also find that a strong bank relationship is negatively associated with the probability of financial distress. This paper aims to provide additional evidence on this question without a clear a priori empirical prediction.

Regarding the effects of relationship banking on the future performance of distressed firms, existing theoretical and empirical literature suggests that a strong bank relationship improve the probability of favorable outcomes, at least in the short-term. In this paper, I examine the effects of relationship length and the existence of a checking account on the future performance of SMEs that defaulted or experienced a less severe distress condition during the crisis. The empirical prediction is that a strong bank relationship increases the probability of survival from difficulties and decreases the probability of bankruptcy.

4.3 Data and variable definitions

4.3.1 Description of the data

Data are provided by the Finnish OP Financial Group that consists of about 180 member cooperative banks and their central organization, OP Cooperative.[2] The Group plays a significant role in the Finnish banking sector. The local member banks engage in retail banking in their local operating areas, covering whole of Finland. The Group's market share in retail loans in Finland amounted to approximately 30% – 35% during the study period and increased during the crisis. The data are suitable for this study because relationship banking and SME financing are key features of the banks due to the cooperative business model and their local nature.

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2 The number of banks at this moment. For example, at the beginning of the data period in 2008, the number of banks was over 200.

The initial data set consists of complete credit file information on all firm customers of the OP Financial Group from December 2007 to December 2014. Corporate lending of the Group is managed both by the member banks and by the OP Corporate Bank plc, which is a subsidiary of the OP Cooperative. For empirical analysis, I restrict the dataset to the firm customers of the member banks because they focus on SME lending, which is typical for local (cooperative) banks and where relationship banking plays a key role (see, e.g., Hasan et al., 2014).[3] Next, I exclude firms with an annual turnover of over 50 million euros to focus purely on SMEs. Finally, I restrict to firms whose legal form is an incorporated company, limited partnership, partnership, or proprietorship.

My analysis is based on the pool of SMEs that were customers of the member banks in August of 2008, i.e., just before the onset of the global financial crisis. If a firm has credit products from many member banks of the Group, I designate its main bank as that with which it has the largest credit volume. The final set of firms includes those that have a positive amount of credit and complete information on credit rating, the beginning of a customer relationship, deposit amount, location, industry, and legal form in August of 2008. The panel data used in the empirical analyses consist of five-year information on these firms throughout the crisis and post-crisis period.

4.3.2 Financial distress measures

I use two different measures that reflect different degrees of firms' difficulties. Both distress conditions and their timing are identified on the basis of monthly internal credit ratings for SMEs. Thus, I follow many previous studies that identify defaults or worsened financial conditions of firms based on internal or public information on credit ratings and expected probabilities of default (Elsas and Krahnen, 1998; Fiordelisi et al., 2014; Höwer, 2016; Jiménez and Saurina, 2004; Rosenfeld, 2014).

The credit rating scale of firm customers of OP Financial Group is between 1.0 and 12 where ratings between 1.0 and 10 points the expected probabilities of default for non-defaulted firms, and ratings of 11 and 12 indicate a default condition. The credit ratings for non-defaulted firms are based on two different models. The automatic rating model is used with smaller firms, and the share of firms with automatic rating is approximately 96% of my sample. These ratings are based on the external scorings of Asiakastieto, a leading company providing corporate, risk management, and sales and marketing information services in Finland. Asiakastieto provides credit scores in the range between 3 and 99, and the Group calibrates these credit scores to its own rating classes that point a certain expected probability of default for each rating. These ratings are automatically produced every month based solely on hard information

[3] In the member banks, key products for firms are term loans, overdrafts, and various guarantees. OP Corporate Bank plc primarily manages financing of large firms and provides certain products, such as leasing and installment financing, for all firm customers of the Group.

collected by Asiakastieto. The input variables of the automatic ratings depend partly on the type of firm. The common information with the greatest weight in the rating includes the historical payment behavior of both a firm and the persons in charge, as well as other information on persons in charge, such as, their number and links with other firms. Other common firm-specific information is age and legal form. Accounting information is not available for all firms, and the determination of their rating differs somewhat from firms with available accounting information. The remaining 4% of the firms in my sample are rated using the more sophisticated rating model that also includes qualitative assessments and is used for larger firms.

In my empirical analyses, an SME is defined as *defaulted* if its credit rating is 11 or 12. The default criteria include serious payment defaults, debt restructuring, or bankruptcy; these are the same for all SMEs, regardless of the rating model. Default may be determined either according to the Group's internal information on payment behavior or external information on some of the default criteria.

An SME is defined as *distressed* if its credit rating is equal to or greater than 9.0, which is the threshold of weak credit ratings. Thus, the determination of distressed SMEs is based on the outcomes of the rating models, instead of certain triggers that determine the defaulted SMEs.[4] The definition of a distressed SME is based on two factors. First, the probabilities of default of credit ratings equal to or greater than 9.0 correspond to C classes of the main international credit rating agencies. Second, according to OP Financial Group guidelines, a credit rating equal to or greater than 9.0 is one of the criteria that subjects a firm to a special scrutiny.

4.3.3 Bank relationship measures

The measurement of the effects of relationship banking can be divided into two approaches (Boot, 2000). First, an analysis can be based on the importance of the existence of a bank relationship, meaning, e.g., the comparison between old and new customers (e.g., Puri et al., 2011a; Rosenfeld, 2014). Second, an analysis can be based on various measures of relationship strength. In the existing literature, the most common relationship measures are relationship length, the number of relationships, and various distance measures (e.g., Degryse and Cayseele, 2000; Degryse and Ongena, 2005; Elsas, 2005; Jiménez and Saurina, 2004). My analysis is based on the latter approach, and I use two measures of relationship strength: relationship length and the existence of a checking account.

Relationship length is measured on the basis of the beginning date of a firm's customer relationship with the OP Financial Group. There are several reasons why relationship length is a good observable measure for the strength of a bank-firm relationship (see, e.g., Degryse and Cayseele, 2000; Ongena and

[4] In addition, the identification differs between rating models because one model is automatic and updated monthly, whereas in another model a rating requires a decision.

Smith, 1998; Petersen and Rajan, 1994). First, a long relationship generates soft information over time, which increases the banks' knowledge of firms beyond hard information. Second, a long relationship enables flexibility and implicit insurance perspectives in loan contracting as the profitability of a relationship is assessed on a long-term basis. Finally, if a firm has a long relationship with a bank, a potential holdup effect can discourage a switch to another bank. There are also arguments and empirical evidence that the value of relationship decreases over time (Ongena and Smith, 2001).

The existence of a checking account is an indicator variable that indicate whether a firm has a checking account balance of over 100 euros in a bank. The purpose is to identify the existence of a checking account that is used for payment transactions. I tested also other alternatives for this deposit account indicator variable, and the following considerations support the chosen measure. First, a very low balance, i.e., below 100 euros, can indicate a checking account that is not in active use. Second, I examined the correlation between alternative deposit account indicator variables, i.e., the moving average and variation of checking account balances, and the existence of various payment service agreements in a bank. The indicator variables of the existence of payment service agreements would be good relationship measures, but the information on the payment service agreements is available only after 2011. Thus, I estimate the correlations in the period between 2011 and 2014. The correlation of the existence of various payment service agreements is better with the chosen indicator variable than with alternative indicator variables.

The existence of a checking account is a proxy for the scope of bank relationship, which is based on the information produced from payment transactions. The information on cash flow and activities of firms can improve the banks' knowledge about firms and, thus, facilitate monitoring, reduce adverse selection, and lead to an information advantage for lending relative to rival banks (Degryse and Cayseele, 2000; Hetland, 2011; Hyytinen and Toivanen, 2004; Petersen and Rajan, 1994). In particular, account information can improve the detection of potential loan problems (Mester et al., 2007; Norden and Weber, 2010). Empirical findings imply that the existence of a checking account decreases the probability of ending customer relationship and improves the predictions of default probabilities (Hetland, 2011; Norden and Weber, 2010). Relative to the other measures of the scope of relationship, Elsas (2005) find that a firm's higher share of payment transactions in a bank increases the probability that it is considered as a house bank.

4.3.4 Descriptive statistics and control variables

This section presents descriptive statistics of the data samples used in the two parts of the empirical analysis. Figure 1 illustrates how various samples are constructed from the pool of SMEs in August of 2008. The data samples of the first part of the empirical analysis are described in detail in section 4.3.4.1 and the samples of the second part of the empirical analysis in section 4.3.4.2.

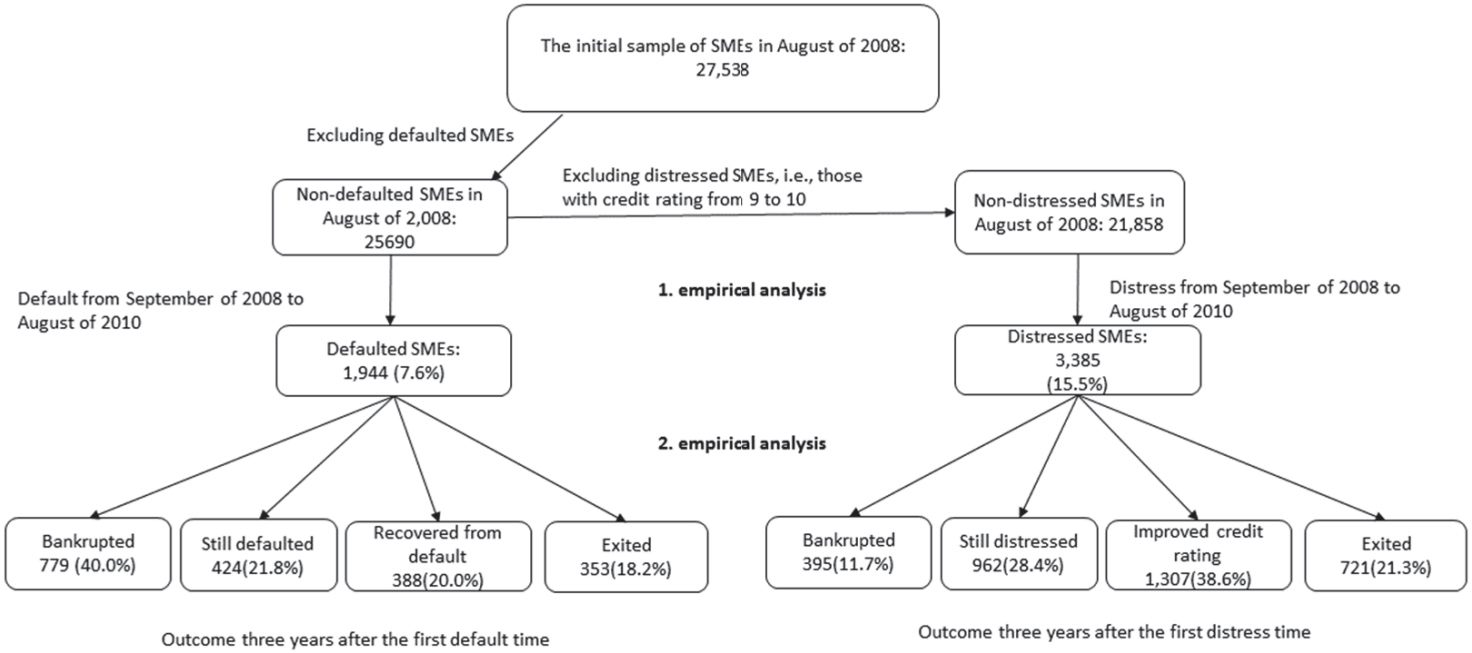

FIGURE 1 Data samples for the empirical analyses

4.3.4.1 Descriptive statistics of the SMEs just before the crisis

Table 1 presents descriptive statistics for two samples of SMEs that are constructed for the empirical analysis with different restrictions. The first sample described in panel A of Table 1 includes SMEs that were not defaulted in August of 2008; the second sample described in panel B includes SMEs that were not distressed, i.e, whose rating was better than 9.0 in August of 2008. The number of SMEs that were not defaulted just before the crisis is 25,690; 21,858 were not distressed. The dependent variables are the indicator variables that an SME defaulted or experienced less severe distress within the two years after the onset of the financial crisis. Panel A shows that 7.68% of the SMEs were defaulted in at least one month during the two-year period. Panel B shows that the corresponding share of distressed SMEs is 15.54%.[5]

Explanatory variables are based on the situation in August of 2008. The main variables of interest are relationship variables. Table 1 shows that the average relationship length among non-defaulted SMEs is 11.48 years, while it is 11.87 years among non-distressed SMEs. These figures for relationship length are close to, for example, those of the SME samples of Degryse and Cayseele (2000) and Santikian (2014). The share of SMEs with the existence of a checking account is 0.89 in the first sample and 0.90 in the second sample. These high shares cause that there is little variance in this relationship measure. As relationship length has its own weaknesses as the measure of relationship strength, it is important to use two different relationship measures. The correlation between these two measures is low in both samples (-0.04).

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5 In Fiordelisi et al. (2014), the share of firms that were non-defaulted at the end of 2008, but defaulted at the end of 2010, was approximately 10%. Bolton et al. (2013) use a shorter period, the six quarters after the collapse of Lehman Brothers; the average default rate was around 1.0%. Both use Italian data, but the large difference reflects periods of different lengths, potential differences in default definitions, and different firm samples.

TABLE 1 Descriptive statistics for default and distress probabilities, relationship variables, and firm characteristics.

Panel A: SMEs that were not defaulted in August of 2008

Variable	Number of observations	Mean	St. Dev.	Min	Max
Default from September of 2008 to August of 2010	25,690	0.0768	0.2662	0	1
Length of relationship (years)	25,690	11.48	9.72	0.00	106.25
Existence of a checking account (0/1)	25,690	0.89	0.32	0	1
Bank size (total business loans in million euros)	25,690	137.64	187.80	0.03	698.95
Credit rating	25,690	7.14	1.41	2.00	10.00
Liabilities in a bank (million euros)	25,690	0.15	0.38	0.00	13.61
Off-balance sheet liabilities in a bank (million euros)	25,690	0.02	0.13	0.00	6.05
Firm age (years)	21,327	13.80	13.34	0.00	107.58
Solvency ratio (%)	17,182	24.03	36.30	-129.70	100.00
Current ratio	16,570	1.45	1.21	0.00	6.40
Net income percentage	16,227	5.49	14.58	-37.70	75.00
Turnover (million euros)	17,395	1.16	3.02	0	49.86

Panel B: SMEs that were not distressed in August of 2008

Variable	Number of observations	Mean	St. Dev.	Min	Max
Distress from September of 2008 to August of 2010	21,858	0.1554	0.3623	0	1
Length of relationship (years)	21,858	11.87	9.89	0.00	106.25
Existence of a checking account (0/1)	21,858	0.90	0.30	0	1
Bank size (total business loans in million euros)	21,858	138.91	188.35	0.03	698.95
Credit rating	21,858	6.72	1.05	2.00	8.50
Liabilities in a bank (million euros)	21,858	0.16	0.41	0.00	13.61
Off-balance sheet liabilities in a bank (million euros)	21,858	0.03	0.14	0.00	6.05
Firm age (years)	18,431	14.25	13.73	0.00	107.58
Solvency ratio (%)	14,914	28.14	33.61	-129.40	100.00
Current ratio	14,121	1.51	1.23	0.00	6.40
Net income percentage	14,012	6.12	14.44	-37.70	75.00
Turnover (million euros)	14,875	1.26	3.20	0	49.86

I use several control variables. The probability of default or distress during the crisis period depends, naturally, on a firm's financial condition at the onset of the crisis, which is controlled by a firm's credit rating in August of 2008. I control a firm's total liabilities in a bank and use separate variables for the amount of on- and off-balance sheet liabilities. These are calculated by summing up the balances of all loans of a firm from a bank. I also control location and type of SMEs, which are not reported in Table 1. SMEs are divided into 11 geographical locations based on the first two numbers of the zip code. The most common legal form is incorporated company (73%), and the remainder are limited partnerships (17%), partnerships (6%), and individual proprietorships (4%). Industrial classification is based on the 19 top levels of the Standard Industrial Classification of Statistics Finland. After a grouping of

closely related industries to ensure a sufficient amount of observations in each group, the final number of industry classes is 14. The largest shares of the SMEs are in wholesale and retail sale (20%), construction (16%) and manufacturing (12%) industries.

The proxy for bank size is the aggregate sum of outstanding corporate loans in a bank.[6] The bank size variable is important because previous literature suggests that the role of soft information is greater in smaller banks (e.g., Höwer, 2016; Stein, 2002). I consider the role of bank size in two ways. First, I use bank size as an explanatory variable in the main analysis. Second, I also make analyses with two separate samples that are divided based on bank size. In this way, I examine whether the effects of relationship strength are heterogeneous in different size banks.

In examining the effect of relationship length, it is important to control firm age (see, e.g., Degryse and Cayseele, 2000). When age is controlled, relationship length more reliably measures the effect of internal information generated within a bank relationship (Petersen and Rajan, 1994). In this way, the inclusion of age control can mitigate the possible endogeneity problem as long relationship and age reflect a firm's ability to avoid or survive from difficulties over time; this is not necessarily fully taken into account in the credit rating. However, there are many missing age observations and relatively more for the SMEs that went bankrupt during the study period, which can cause a sample selection problem. Therefore, I estimate the specifications both with and without firm age control.

Other controlled firm-specific characteristics include the following variables. Turnover is used to measure a firm size. In addition to credit rating, the financial condition of a firm is controlled by solvency ratio, current ratio, and net income percentage. However, the inclusion of these firm-specific variables reduces the sample sizes significantly. For that reason, the estimations are conducted with various samples.

4.3.4.2 Descriptive statistics of SMEs that faced financial difficulties during the crisis

Table 2 presents descriptive statistics of the SMEs that defaulted or experienced less severe distress during the financial crisis. These are the subsets of the SME samples in Table 1. Panel A of Table 2 consists of the SMEs that were in default condition in at least one month from September of 2008 to September of 2010, and that were not defaulted just before the crisis (cf., Panel A of Table 1). Panel B of Table 2 consists of the SMEs that were distressed in at least one month during the crisis period, and that is the subset of the SMEs that were not distressed just before the crisis (cf., Panel A of Table 1).

The dependent variables are the future outcomes of the SMEs after three years of the first identification of default or distress. In the case of the defaulted SMEs, the outcomes are divided into the following four groups. An SME is

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[6] I cannot use other bank-specific information for reasons of data confidentiality.

defined as *bankrupted* if its credit rating drops to the lowest class denoting bankruptcy.[7] An SME is defined as *recovered* if it is no longer defaulted and *still defaulted* if its credit rating is 11, i.e., defaulted but not bankrupted, after three years. The fourth outcome group, *exited*, consists of SMEs that drop out of the data in three years but whose last credit rating is not 12, i.e., the rating indicating bankruptcy. Panel A of Table 2 shows that the number of the defaulted SMEs is 1,944. The future outcomes of these SMEs are divided as follows: 40.0% (779) have gone bankrupt, 21.8% (424) are still defaulted, 20.0% (388) have recovered from the default condition, and the remaining 18.2% (353) have dropped out of the data without the indication of bankruptcy.

The definitions of the outcomes of distressed SMEs differ from those of defaulted SMEs in such a way that an SME is defined as *improved* if its credit rating is better than the threshold of the weak class and, correspondingly, *still distressed* if its credit rating is still among the weak classes three years after the first distress identification. Panel B of Table 2 shows that the number of distressed SMEs is 3,385. The future outcomes of SMEs are divided as follows: 11.7% (395) have gone bankrupt, 28.4% (962) are still distressed, 38.6% (1,307) have improved their credit ratings, and the remaining 21.3% (721) have dropped out of the data without the indication of bankruptcy.

In addition, Table 2 presents the averages of the relationship variables and credit rating by the outcome groups. Panel A of Table 2 shows that the average relationship length is significantly higher among those SMEs that recover from default or are still defaulted than among those SMEs that go bankrupt or exit from the data in the three years after the first identification of default. Panel B of Table 2 shows that the average relationship length is the largest in the outcome group of the improved SMEs and the smallest in the outcome group of the bankrupted SMEs. Based on the average shares in the various outcome groups, the role of the existence of a checking account appears not to be significant for the future outcome of the distressed SMEs.

The average credit ratings at the first identification of default or distress indicate the following. The credit rating is 11 or 12 in default condition, and, thus, the average 11.11 for the all defaulted SMEs indicates that, to some SMEs, the first default condition is bankruptcy. In the case of the distressed SMEs, the average credit rating at the moment of the first identification of distress is clearly higher in the outcome group of the bankrupted SMEs than in the other outcome groups. This indicates that the first distress condition is, on average, more severe among the SMEs that end up bankrupted.

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7 I have excluded the firms whose credit rating in the first identification of default is 12, i.e., denoting bankruptcy, but whose last credit rating in the data is not 12. In these cases, it can be assumed that the rating of 12 is flawed.

TABLE 2 Means of relationship measures and credit ratings of the distressed SMEs with different future outcomes

Panel A: Defaulted SMEs				
	Number of firms	Mean relationship length	Mean credit rating	Share of firms with checking account
Recovered from default	388	11.46	11.00	0.74
Still defaulted	424	10.91	11.00	0.75
Bankrupted	779	7.73	11.28	0.72
Exited	353	9.40	11.00	0.76
Total of all defaulted	1,944	9.47	11.11	0.74
Panel B: Distressed SMEs				
	Number of firms	Mean relationship length	Mean credit rating	Share of firms with checking account
Improved credit rating	1,307	10.60	9.42	0.83
Still distressed	962	9.71	9.63	0.78
Bankrupted	395	7.23	10.03	0.80
Exited	721	9.62	9.59	0.82
Total of all distressed	3,385	9.75	9.59	0.81

This table represents the means of relationship variables and credit ratings at the moment of the first identification of default (panel A) or distress (panel B). Thus, the variables are measured for a firm some time from September of 2008 to September 2010. In panel A, the defaulted SMEs are divided into four groups based on their future outcome three years after the first identification of default. *Bankrupted* means having gone bankrupt, *still defaulted* indicates a firm that is still in default but has not bankrupted, *recovered from default* means no longer in default, and *exited* means having dropped out of the data without the indication of bankruptcy. In panel B, the distressed SMEs are divided in a similar fashion, but the difference is that *still distressed* indicates that a firm still has a weak credit rating but has not bankrupted, and *improved credit rating* means that the credit rating has improved and is no longer ranked among the weaker classes.

4.4 Relationship strength and the probability of financial difficulties

This section presents the empirical method and the results of the empirical analysis regarding the relationship between relationship strength and the probability of financial difficulties during the two years after the onset of the global financial crisis in September of 2008.

4.4.1 Econometric approach

The econometric approach relies on a binomial logit model. The estimations are based on the following equations: [8]

$$\Pr(\text{default}=1)_{i,b} = \frac{\exp(\alpha+\beta*\text{relationship measures}_{i,b}+\gamma*\text{firm characteristics}_{i,b}+\delta*\text{bank size}_{b})}{1+\exp(\alpha+\beta*\text{relationship measures}_{i,b}+\gamma*\text{firm characteristics}_{i,b}+\delta*\text{bank size}_{b})} \quad (1)$$

[8] In robustness checks, I use alternative methods including linear probability, probit and rare event logit models.

and

$$\Pr(\text{distress} = 1)_{i,b} = \frac{\exp(\alpha+\beta*\text{relationship measures}_{i,b}+\gamma*\text{firm characteristics}_{i,b}+\delta*\text{bank size}_b)}{1+\exp(\alpha+\beta*\text{relationship measures}_{i,b}+\gamma*\text{firm characteristics}_{i,b}+\delta*\text{bank size}_b)}. \quad (2)$$

Pr stands for probability and *i* is the firm and *b* is the bank. The dependent variable *default* takes the value of 1 if a firm is defaulted in at least one month between September 2008 and September 2010, and is assigned 0 otherwise. The dependent variable *distress* takes value 1 if a firm's credit rating drops equal to or below 9.0 during this two-year crisis period, and 0 otherwise. All explanatory variables are based on the information in August of 2008, i.e., just prior to the onset of the global financial crisis. The key explanatory variables of interest are the relationship measures. The first relationship variable is relationship length, and I use the natural logarithm of this variable due to a strongly skewed distribution. The use of a logarithm of relationship length can also be justified based on the expectation that the marginal impact decreases along with the length of the relationship (see, e.g., Degryse and Cayseele, 2000). The second relationship variable is a dummy that takes the value of 1 for firm *i* if it has a checking account with a balance of more than 100 euros in a bank, and 0 otherwise.

The models are first estimated by including controls for which information is available for all firms. These include firm characteristics, legal form, location, industry, credit rating, and the natural logarithms of liabilities and off-balance sheet liabilities in a cooperative bank, as well as bank size that is the natural logarithm of total business loans of a bank. Even if this set of firm characteristics, particularly credit rating, controls different risk profiles of the firms just before the crisis, there are potential endogeneity problems. In particular, a long relationship itself reflects the ability to avoid or survive financial distress. The inclusion of the logarithm of firm age as a control variable aims to alleviate this potential endogeneity. However, the weak coverage of age information that is relatively weaker for defaulted customers can cause selection problems.[9] In the final specifications, I also include solvency ratio, current ratio, net income percentage and the natural logarithm of turnover as control variables. These controls are often used to predict financial difficulties, but limited availability of data on these variables reduces the sample by over half and can also cause selection bias.

4.4.2 Results

The results on the relationship between relationship strength and the probability of SMEs' financial difficulties are presented in Table 3. The dependent variable is the occurrence of default in panel A and the occurrence of distress in panel B, and the reported estimates are marginal effects of the logit

[9] The endogeneity problems are discussed more in the interpretation of the results.

regressions.[10] The results provide evidence that relationship strength is negatively related to both the probability of default and the probability of less severe distress.

In the first specification, the marginal effects of both relationship variables are negative and statistically significant on both the probability of default and the probability of distress (the first columns of Table 3). In the second specification, I include firm age as a control variable (the second columns of Table 3). The results indicate that the negative marginal effects of relationship length remain but are somewhat lower, and standard errors nearly doubled compared to the first specification. Consequently, the statistical significance of the marginal effects decreases. However, the inclusion of the age variable essentially changes the estimation samples as the sample sizes decrease approximately by 15%. In addition, the lack of age information is especially significant among the defaulted SMEs as the share of defaulted firms is 6.15% in the sample with age variable, while this share is 7.68% in the sample of the first specification. For this reason, I also estimate the model with this restricted sample without the firm age variable. The results shown in column 3 of panel A indicate that, in this case, the marginal effect of relationship length is not statistically significant in the default analysis. In the distress analysis, the negative marginal effect of relationship length is weaker if firm age is not controlled when the same sample is used for the estimation with and without age control (the second versus third column of panel B). These results suggest that the weakened marginal effects of relationship length after inclusion of firm age control are not only due to the correlation between relationship length and firm age, but the changed sample also has an important effect.

In the last specification, I also control firms' financial conditions and size, and the results with all controls are reported in Table 3, panels A and B, column 4. The marginal effects of financial condition variables, solvency ratio, current ratio, and net income percentage are logically negative.[11] The marginal effects of relationship variables remain consistent with the previous specifications when all controls are included, but are smaller and not always statistically significant. However, these weaker results likely reflect the fact that the sample sizes are reduced by nearly half when all controls are included. More importantly, the share of defaulted SMEs in this sample decreases to 5.29% from 7.68% in the initial sample. For this reason, I again estimate the model with this restricted sample with the same explanatory variables as in the first specifications (fifth columns of panels A and B of Table 3). In this case, the marginal effect of relationship length is even positive in the default analysis. The share of distressed SMEs does not vary as much among the samples, the marginal effect

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10 Marginal effects are calculated using the average of the sample marginal effects which means that the marginal effect of a variable is the estimated logit coefficient multiplied by the average value of all appropriately transformed predicted values (Fernihough, 2011).

11 These financial condition variables are also taken indirectly into account in specifications 1 and 2 because they are inputs in the credit rating models.

of relationship length changes much less, and this is negative and statistically significant at the 5% level in this robustness check.

The estimates of relationship variables are also economically significant. First, I compare the estimated probability of default among SMEs with long, average, and short bank relationships, as well as between the SMEs which have an active checking account and those who do not. Long, average, and short relationships are defined as the 90th percentile, the median and the 10th percentile, which are 24.08, 9.25, and 1.42 years, respectively. The calculations based on the first specification indicate that, compared to a customer with a short relationship, and *ceteris paribus*, the estimated probability of default is 1.01 percentage points lower for a customer with a median relationship length and 1.64 percentage points lower for a customer with a long relationship.[12] The marginal effects of the existence of a checking account indicate that, *ceteris paribus*, the estimated probability of default is 2.21 percentage points lower for customers that have a checking account in a bank just before the onset of the crisis. These effects of both relationship variables are economically relevant as the share of defaulted SMEs is 7.68%. In the second specification with firm age control, the marginal effects of relationship length are lower, but not so much when these are proportioned to the average share of the defaulted SMEs.[13] In the third specification, the marginal effects are both absolutely and relatively lower.

Second, similar comparisons for experiencing less severe distress based on the first specification show that, *ceteris paribus*, the estimated probability of distress is 3.09 and 4.91 percentage points lower for middle- and long-term customers compared to short-term customers.[14] The marginal effects of the existence of a checking account indicate that the estimated probability of distress is 3.95 percentage points lower for customers that have a checking account in a bank just before the onset of the crisis than for the other customers. The share of the distressed SMEs is 15.54% in the sample of the first specification. When corresponding calculations are conducted based on the other specifications, the magnitude of the effect of relationship is somewhat lower.[15]

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12 The use of a natural logarithm of relationship length takes into account the non-linear effect such that the effect of additional year decreases along with relationship length. The calculations are as follows: (log(1+24.08)-log(1+1.42)) x (-0.007)=0.0164 and (log(1+9.25)-log(1+1.42)) x (-0.007)=0.0101

13 The share of defaulted SMEs is 6.15% in the sample with firm age control. Consequently, even if the corresponding calculations as those without age control generate lower effects of relationship length (1.22 and 0.76 percentage points), these are in relation to the average default shares approximately as large as the effects without age control.

14 The 90th, median and 10th percentile of relationship lengths are 24.67, 9.67, and 1.42 years, respectively. Based on this, the calculations are as follows: (log(1+24.67)-log (1+1.42)) x (-0.0208)=0.0491 and (log(1+9.67)-log(1+1.42)) x (-0.0208)=0.0309.

15 The 90th, median and 10th percentile of relationship lengths in the second and third samples (panel B of Table 3) are 21.17, 8.5, and 1.33 and 20.92, 8.75, and 1.5 years, respectively. Based on this, the estimated probability of distress is 1.5 (sample 2) or 1.0 (sample 3) percentage points lower for the median customers, and 3.9 or 2.8 percentage points lower for the long-term customers compared to the short-lived customers.

TABLE 3 Relationship between bank relationship strength and the probability of SMEs' financial difficulties during the global financial crisis.

Panel A. Probability of default

	Sample 1	Sample 2		Sample 3	
Share of defaulted SMEs	7.68%	6.15%		5.29%	
	(1)	(2)	(3)	(4)	(5)
Log (1 + length of relationship)	-0.0070***	-0.0054*	0.0006	-0.0032	0.0064***
	(0.0018)	(0.0033)	(0.0019)	(0.0038)	(0.0023)
Existence of a checking account	-0.0240***	-0.0198***	-0.0205***	-0.0135**	-0.0200***
	(0.0049)	(0.0051)	(0.0052)	(0.0064)	(0.0068)
Log (1 + bank size)	-0.0011	-0.0022**	-0.0022**	-0.0012	-0.0015
	(0.0011)	(0.0011)	(0.0011)	(0.0013)	(0.0013)
Credit rating	0.0557***	0.0457***	0.0456***	0.0322***	0.0377***
	(0.0018)	(0.0018)	(0.0008)	(0.0020)	(0.0021)
Log (1 + liabilities)	0.0029***	0.0046***	0.0046***	0.0029***	0.0040***
	(0.0007)	(0.0008)	(0.0008)	(0.0009)	(0.0009)
Log (1 + OBS liabilities)	-0.0006	-0.0005	-0.0005	-0.0004	-0,0001
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0001)
Log (1 + firm age)		0.0068**		0.0121***	
		(0.0031)		(0.0038)	
Current ratio				-0.0102***	
				(0.0023)	
Log (1 + turnover)				-0.0007	
				(0.0013)	
Solvency				-0.0003***	
				(0.0001)	
Net income percentage				-0.0010***	
				(0.0002)	
Industry dummies	yes	yes	yes	yes	yes
Legal form dummies	yes	yes	yes	yes	yes
Region dummies	yes	yes	yes	yes	yes
Observations	25,690	21,327	21,327	13,244	13,244
Log likelihood	-5,415.0780	-3,962.8870	-3,965.2330	-2,160.3890	-2,240.6560
McFadden R2	0.2216	0.1960	0.1956	0.2122	0.1829

(continues)

Table 3. continues
Panel B. Probability of distress

	Sample 1	Sample 2		Sample 3	
Share of distressed SMEs	15.54%	15.32%		14.76%	
	(1)	(2)	(3)	(4)	(5)
Log(1 + length of relationship)	-0.0208***	-0.0175***	-0.0151***	-0.0129**	-0.0092**
	(0.0027)	(0.0052)	(0.0030)	(0.0062)	(0.0038)
Existence of a checking account	-0.0424***	-0.0411***	-0.0415***	-0.0116	-0.0347***
	(0.0079)	(0.0088)	(0.0087)	(0.0107)	(0.0118)
Log(1 + bank size)	0.0010	0.0002	0.0002	0.0004	-0.0006
	(0.0016)	(0.0018)	(0.0018)	(0.0021)	(0.0022)
Credit rating	0.1133***	0.1135***	0.1133***	0.0761***	0.1097***
	(0.0036)	(0.0039)	(0.0039)	(0.0043)	(0.0047)
Log(1 + liabilities)	0.0057***	0.0063***	0.0063***	0.0004	0.0052***
	(0.0009)	(0.0010)	(0.0010)	(0.0011)	(0.0011)
Log(1 + OBS liabilities)	0.0037***	0.0040***	0.0040***	0.0022***	0.0044***
	(0.0005)	(0.0006)	(0.0006)	(0.0007)	(0.0007)
Log(1 + firm age)		0.0028		0.0093	
		(0.0050)		(0.0060)	
Current ratio				-0.0151***	
				(0.0032)	
Log (1 + turnover)				0.0056***	
				(0.0021)	
Solvency				-0.0022***	
				(0.0001)	
Net income percentage				-0.0021***	
				(0.0003)	
Industry dummies	yes	yes	yes	yes	yes
Legal form dummies	yes	yes	yes	yes	yes
Region dummies	yes	yes	yes	yes	yes
Observations	21,858	18,431	18,431	11,575	11,575
Log Likelihood	-7,978.4530	-6,711.0560	-6,711,2129	-3,704.0480	-4,083.0059
McFadden R2	0.1550	0.1496	0.1496	0.2357	0.1574

This table presents the marginal effects from logit regression of the probability of SMEs' financial difficulties on relationship variables, bank size, and a set of firm characteristics. The dependent variable in panel A is an indicator variable as to whether a non-defaulted firm just before the crisis in August of 2008 became defaulted from September of 2008 to September of 2010. The dependent variable in panel B is a corresponding indicator variable that a firm became distressed, which is defined as a drop to a weak credit rating class. The relationship and control variables are measured based on the information in August of 2008. Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

The most important control variable is credit rating immediately prior to the crisis. The marginal effects of credit rating are positive and statistically highly significant in all specifications. This result is intuitive because the purpose of credit rating is to assess the probability of default, and the probability of a drop to a weak class can be expected to be greater the closer the credit rating is to the

threshold of the weak classes.[16] The marginal effects of the amount of on- and off-balance sheet liabilities are positive and statistically significant in most cases.

I also conduct the analysis by splitting the sample into two sub-samples based on bank size. In this split, a bank is considered to be small if its total outstanding amount of SME loans is below 50 million.[17] The purpose of this analysis is to examine whether the effect of relationship strength differs between small and large banks. The results are presented in Appendix 1. In the analysis of the probability of default and in the first specification, the marginal effect of relationship length is somewhat larger in the small bank sample. However, the difference disappears in the second specification that includes firm age control, which also decreases the sample sizes. The marginal effects of the existence of a checking account are larger in the small bank samples, but the differences to the marginal effects in the relatively large bank samples are not statistically significant. The analysis for the probability of distress also does not support the hypothesis of larger effects of relationship strength in smaller banks. Thus, the results are not clear for the effect of bank size and the detailed examination of the role of bank size would require some controls for other differences between banks, e.g., due to differences in competitive environment and customer base.

4.4.3 Discussion and robustness checks

The results indicate that longer relationship and the existence of a checking account decrease the probability of SMEs' difficulties during the financial crisis. This supports theoretical arguments that banks' better screening, monitoring and knowledge of their relationship customers lowers the probability to encounter financial distress (Agarwal and Hauswald, 2010; Bolton et al., 2013). The results are also in line with previous empirical studies focusing on the recent crisis period (Bolton et al., 2013; Fiordelisi et al., 2014). However, the results can be sensitive to some assumptions and limitations of the empirical estimation which are addressed next.

First, I consider the sensitivity of the results to the model choice (logit regression) and to the potential rare events bias. I conduct robustness checks using alternative statistical models, including rare events logit, probit and linear probability models (LPM); the results are presented in Appendix 2. When the King-Zeng rare events logit model is used, the results are very similar to those of the basic logit model.[18] This suggests that the logit estimations are not affected by a rare events problem. All results are also in line with the main results when probit model is used. LPM generates consistent results in the

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16 I conducted robustness checks for the first and second specifications so that this rating variable was used as a dummy/categorical variable instead of an interval variable. The results are largely similar and the only significant difference is that the coefficient of relationship length is not statistically significant for the effect of relationship length on the probability of default when firm age is controlled (the second column in panel A).

17 This split generates roughly the same number of SMEs in both samples. The number of small banks is 206, and the number of relatively large banks is 24.

18 See, King and Zeng (2001).

analysis of the probability of less severe distress, but somewhat divergent results in the analysis of the probability of default: In the distress analysis, the coefficient of relationship length is close to the marginal effects of the logit and probit models. In the default analysis, the coefficient of relationship length is small and statistically insignificant. The coefficients of the existence of a checking account are statistically significant and have the same sign as in other specifications.

Second, there is potential endogeneity problem because relationship strength may be related to some firm characteristics that can explain their better quality (e.g., Puri et al., 2011b). In other words, is it a strong relationship that leads to better performance, or do better firms have a strong relationship (Rosenfeld, 2014)? In particular, a long relationship can be endogenous to the firms' quality because it reflects the firm's survival (e.g., Fiordelisi et al., 2014; Santikian, 2014). Controlling firm age treats partly this problem. We can see in the second specifications of Table 3 that, when both relationship length and firm age are controlled, the coefficient of relationship length remains negative and statistically significant. The marginal effect of firm age is positive on the probability of default and non-significant on the probability of distress.[19] I also control the observable quality of a firm just before the crisis by using internal credit rating.[20] However, there may be some unobservable factors that explain the better quality of firms with a long bank relationship. Some previous studies have used instrumental variable methods to address this potential endogeneity. Puri et al. (2011a) use the number of bank branches over population and Herfindahl-Hirschmann Index (HHI) for each region as instrument variables to predict the existence of a checking account. Fiordelisi et al. (2014) employ the density of bank branches at province level as an instrument for the length of bank relationship. The results do not change significantly in these studies when controlling the possibility that relationship measures and unobserved quality of a firm are correlated. My data do not include information on appropriate instruments, and, thus, I cannot formally address the potential endogeneity, but the previous studies suggest that this would not significantly change the results.

Third, I conducted a robustness check by including only the firms whose credit rating is based on the automatic rating models. These firms constitute 96% of all firms but the remaining 4% of firms with different rating model are a potentially selected sample. The results of the effects of relationship variables remain largely similar when compared to the first and second specifications in panels A and B of table 3. Only relevant difference is that the coefficient of relationship length is not statistically significant in the specification corresponding to the second column of panel A.

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19 The correlation between relationship length and firm age is 0.61. Petersen and Rajan (1994) find the corresponding correlation to be 0.41 in their dataset. In their study, the effect of relationship length on the loan rate disappears almost completely after inclusion of age control.

20 Measured in August of 2008, the negative correlation -0.23 between the relationship length and credit rating indicate that the firms with a longer relationship are also less risky at the beginning, which is line with Fiordelisi et al. (2014).

4.5 Relationship strength and the future performance of the distressed firms

This section presents the empirical method and the results of the empirical analysis on the question how relationship strength affects the future performance of the SMEs that became defaulted or experienced less severe distress during the two-year period after the onset of the crisis. This is done by examining the future outcome of these SMEs in the three years after the first identification of default or distress condition, and this empirical approach is close to that of Rosenfeld (2014) and Höwer (2016).

4.5.1 Econometric approach

The analysis of the relationship between relationship strength and the future outcome of the defaulted and distressed SMEs is based on the following multinomial logit model:

$$\Pr(Y_i = \mathrm{j}) = \frac{\exp(\beta_j * \text{relationship variables}_{\mathrm{i,b}} + \theta_j * \text{firm characteristics}_{\mathrm{i,b}} + \delta_j * \text{bank size}_b + \gamma_j t)}{1 + \sum_{k=1}^{4} \exp(\beta_k * \text{relationship variables}_{\mathrm{i,b}} + \theta_k * \text{firm characteristics}_{\mathrm{i,b}} + \delta_k * \text{bank size}_b + \gamma_k t)} . \quad (2)$$

The outcomes j are bankruptcy, recovery from default/improvement in credit rating, still defaulted/distressed and exit from the data. Relationship variables and explanatory variables are defined similarly as in the first analysis, but measured at the time of the first identification of default or distress from September of 2008 to September of 2010. The explanatory variables include legal form, location, industry, credit rating, and the natural logarithms of on- and off-balance sheet liabilities in a cooperative bank, as well as bank size that is the natural logarithm of total business loans of a bank. Credit rating is not included in the estimation of the future of the defaulted SMEs,[21] and other legal forms, expect incorporated company, are combined to one group because of small amount of observations in the separate legal forms. In addition, I include dummies for default/distress times to control common effects of the different default/distress times t. For a certain month, this dummy takes value 1 for those SMEs for which the first identification of default or distress occurs in that month.

I also control firm age to address the endogeneity concern that arises because the better survival probability of long-term customers can reflect the unobserved quality of these firms to deal with their difficulties. However, the inclusion of firm age information decreases the sample size, especially in the case of defaulted firms. This can cause a selection problem because a lack of age information can be related to some firm characteristics. For this reason, I estimate the specification with and without firm age information. In addition,

[21] This is because credit rating of defaulted firms is either 11 (not bankrupted) or 12 (bankrupted). Thus, the inclusion of credit rating would mean perfect prediction of bankruptcy

the determination of the defaulted and distressed SMEs can potentially cause selection problems, which is discussed in the interpretation of the results.

4.5.2 Results

Table 4 presents the results on the relationship between relationship strength and the probabilities of the various future outcomes of defaulted SMEs. In panel A, the estimation is performed on the sample of all defaulted SMEs (1,944). The results indicate that the longer relationship of a defaulted SME is negatively associated with the probability of bankruptcy and positively associated with the probability of recovery from default. The existence of a checking account is also negatively associated with the probability of bankruptcy. In panel B, only those SMEs with firm age information are included, and the sample size decreases to 1,300. The results change significantly regarding the marginal effect of relationship length on the probability of bankruptcy that becomes statistically insignificant. At the same time, the marginal effect of firm age on the probability of bankruptcy is negative and statistically significant. The other key results remain similar.

The marginal effects of the first specification (panel A of Table 4) indicate that an SME with a long relationship (the 90th percentile) has a 28.7 percentage points lower probability to go bankrupt and a 16.8 percentage points higher probability to recover from default compared to an SME with a short relationship (the 10th percentile). These are economically significant results as the average probability of bankruptcy is 40.0% and the average probability of recovery is 20.0% among the defaulted SMEs (see panel A of Table 2). When firm age is controlled, the sample changes significantly as the average probability of bankruptcy is 24.5%, and the average probability of recovery is 26.3%. Thus, the decreased marginal effect of relationship length on the probability of bankruptcy is not only due to controlling firm age, but this also reflects a significant drop in the share of bankrupted firms in this sample. As the marginal effect of the existence of a checking account on the probability of bankruptcy is minus 5.7 percentage points in both specifications, the effect is relatively larger in the second specification with firm age information.

TABLE 4 Relationship between bank relationship strength and future outcome of defaulted SMEs

Panel A: All defaulted SMEs							
	Multinomial logit estimates: Base category: still defaulted			Marginal effects			
	bankruptcy	exit	recovery	bankruptcy	exit	recovery	still defaulted
Log(1 + length of relationship)	-0.5994***	-0.1745	0.2720***	-0.1209***	0.0074	0.0809***	0.0326***
	(0.0988)	(0.1122)	(0.1088)	(0.0141)	(0.0122)	(0.0125)	(0.0127)
Existence of a checking account	-0.2763*	-0.0017	0.0625	-0.0573**	0.0165	0.0257	0.0152
	(0.1603)	(0.1841)	(0.1759)	(0.0237)	(0.0205)	(0.0205)	(0.0215)
Log(1 + bank size)	0.0214	0.1421**	-0.0588	-0.0020	0.0203***	-0.0145**	-0.0038
	(0.0481)	(0.0555)	(0.0527)	(0.0072)	(0.0062)	(0.0061)	(0.0064)
Log(1 + liabilities)	-0.4035***	-0.3205***	-0.0881*	-0.0512***	-0.0141***	0.0226***	0.0427***
	(0.0467)	(0.0493)	(0.0531)	(0.0051)	(0.0040)	(0.0057)	(0.0064)
Log(1 + OBS liabilities)	-0.0401**	-0.0367*	0.0167	-0.0063**	-0.0029	0.0060***	0.0032
	(0.0174)	(0.0199)	(0.0186)	(0.0026)	(0.0023)	(0.0022)	(0.0023)
Constant	6.1164***	0.8511	1.5939				
	(1.1751)	(1.3422)	(1.2707)				
Default time dummies	yes						
Industry dummies	yes						
Legal form dummies	yes						
Region dummies	yes						
Observations	1,944						
R2	0.1297						
Log likelihood	-2,250.294						
LR test	670.48*** (df = 150)						

(continues)

Table 4 continues

Panel B: Defaulted SMEs with age information

	Multinomial logit estimates: Base category: still defaulted			Marginal effects			
	bank-ruptcy	exit	recovery	bank-ruptcy	exit	recovery	still defaulted
Log(1+length of	-0.1712	-0.1989	0.4694**	-0.0409	-0.0441*	0.1006***	-0.01559
relationship	(0.2202)	(0.2044)	(0.2037)	(0.0296)	(0.0260)	(0.0304)	(0.0294)
Existence of a	-0.3127	0.0832	0.0851	-0.0575**	0.0241	0.0269	0.0064
checking account	(0.2090)	(0.2195)	(0.1945)	(0.0272)	(0.0278)	(0.0286)	(0.0296)
Log(1+bank size)	0.0509	0.1512**	-0.0198	0.0014	0.02109***	-0.0135	-0.0090
	(0.0509)	(0.0630)	(0.0579)	(0.0080)	(0.0079)	(0.0085)	(0.0086)
Log(1 + liabilities)	-0.4071***	-0.3356***	-0.1214**	-0.0405***	-0.0239***	0.0161**	0.0483***
	(0.0569)	(0.0573)	(0.0579)	(0.0057)	(0.0056)	(0.0076)	(0.0086)
Log(1 + OBS liabili-	-0.0367*	-0.0479**	0.0223	-0.0045	-0.0064**	0.0081***	0.0028
ties)	(0.0223)	(0.0231)	(0.0204)	(0.0029)	(0.0029)	(0.0030)	(0.0031)
Log(1+firm age)	-0.6190***	-0.0670	-0.1871	-0.0838***	0.0303	0.0024	0.0511*
	(0.2052)	(0.1885)	(0.1931)	(0.0272)	(0.0236)	(0.0287)	(0.0278)
Constant	5.4751***	0.5422	1.2194				
	(1.4823)	(1.5252)	(1.3912)				
Distress time dum-	yes						
Industry dummies	yes						
Legal form dummies	yes						
Region dummies	yes						
Observations	1,300						
R2	0.1229						
Log likelihood	-1,573.11						
LR test	440.95***(df=153)						

This table presents the multinomial logit regression of the probability of the future outcome of the defaulted SMEs on relationship variables, bank size and a set of firm characteristics. Panels A and B present the results for the specifications with and without firm age information. The relationship and control variables are measured at the time of the first identification of default from September of 2008 to September of 2010, and the future outcome is identified three years after that. The table shows both multinomial logit regression coefficients, where the base category is the outcome of still defaulted and the marginal effects. Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Table 5 presents the results on the relationship between relationship strength and the probabilities of the various future outcomes of SMEs that experience less severe distress during the financial crisis. In panel A, the estimation is based on all 3,385 of the distressed SMEs. The results indicate that the longer relationship of a distressed SME is negatively associated with the probability of bankruptcy and positively associated with the probability of improvement in credit ratings. Regarding the existence of a checking account, the only statistically significant marginal effect is a positive effect on the probability of improvement in credit ratings. In panel B, the sample consists only of those distressed SMEs for which age information is available. After including age information, the sample size does not decrease relatively as much as in the case of defaulted SMEs, and the key marginal effects are close to those of the first specification.

TABLE 5 Relationship between bank relationship strength and future outcome of distressed SMEs

Panel A: All distressed SMEs

	Multinomial logit estimates: Base category: still distressed			Marginal effects			
	bank-ruptcy	exit	impro-vement	bank-ruptcy	exit	impro-vement	still distressed
Log(1 + length of	-0.5003***	0.1086	0.2671***	-0.05661***	0.0089	0.0659***	-0.0183*
relationship)	(0.0856)	(0.0678)	(0.0576)	(0.0070)	(0.0087)	(0.0102)	(0.0098)
Existence of a	-0.0268	-0.0495	0.2844**	-0.0106	-0.0282	0.0658***	-0.0269
checking account	(0.1662)	(0.1374)	(0.1164)	(0.0138)	(0.0185)	(0.0217)	(0.0198)
Credit rating	0.8180***	-0.0837	-0.4800***	0.0917***	0.0030	-0.1241***	0.0294***
	(0.0866)	(0.0778)	(0.0701)	(0.007)	(0.0098)	(0.0123)	(0.0110)
Log(1 + bank	0.0150	0.1431***	-0.0667**	0.0001	0.0266***	-0.0256***	-0.0012
size)	(0.0459)	(0.0384)	(0.0320)	(0.0037)	(0.0050)	(0.0058)	(0.0055)
Log(1 + liabilities)	-0.1489***	-0.2334***	-0.0499**	-0.0060***	-0.0285***	0.0117***	0.0229***
	(0.0278)	(0.0236)	(0.0230)	(0.0020)	(0.0025)	(0.0037)	(0.0039)
Log(1 + OBS	-0.0298***	-0.0959***	-0.0153	-0.0002	-0.0129***	0.0049**	0.0078***
bilities)	(0.0155)	(0.0133)	(0.0104)	(0.0013)	(0.0018)	(0.0019)	(0.0018)
Constant	-7.5775***	-0.4661	6.0366***				
	(1.3966)	(1.2015)	(1.0195)				
Default time dummies	yes						
Industry	yes						
Legal form dummies	yes						
Region dummies	yes						
Observations	3,385						
R2	0.0940						
Log likelihood	-4,002,2810						
LR test	830.65***(df=153)						

(continues)

TABLE 5 (continues)

Panel B: Distressed SMEs with age information

	Multinomial logit estimates: Base category: still distressed			Marginal effects			
	bank-ruptcy	exit	impro-vement	bank-ruptcy	exit	impro-vement	still distressed
Log(1 + length of	-0.4524**	0.2057	0.3151***	-0.0421***	0.0143	0.0656***	-0.0378*
relationship)	(0.1796)	(0.1389)	(0.1142)	(0.0115)	(0.0178)	(0.0218)	(0.0205)
Existence of a	-0.1192	-0.0485	0.2456**	-0.0135	-0.0231	0.0605**	-0.0239
checking account	(0.2031)	(0.1556)	(0.1255)	(0.0130)	(0.0203)	(0.0244)	(0.023)
Credit rating	0.5601***	-0.0222	-0.4945***	0.0510***	0.0237**	-0.1212***	0.0465***
	(0.1125)	(0.0872)	(0.0756)	(0.0072)	(0.0109)	(0.0139)	(0.0129)
Log(1 + bank size)	0.0063	00.1597***	-0.0611*	-0.0007	00.0276***	-0.0253***	-0.0017
	(0.0560)	(0.0425)	(0.0339)	(0.0035)	(0.0054)	(0.0042)	(0.0062)
Log(1 + liabilities)	-0.0969***	-0.2201***	-0.0376*	-0.0020	-0.0277***	0.0103**	0.0193***
	(0.0351)	(0.0253)	(0.0243)	(0.0021)	(0.0027)	(0.0042)	(0.0043)
Log(1 + OBS	-0.0232	-0.0952***	-0.0189*	-0.0005	-0.0121***	0.0034	0.0082***
liabilities	(0.0191)	(0.01470)	(0.0111)	(0.0012)	(0.0019)	(0.0021)	(0.0020)
Log(1+firm age)	-0.0742	-0.1069	-0.0121	-0.0030	-0.0134	0.0094	0.0070
	(0.1616)	(0.1286)	(0.1069)	(0.010)	(0.0165)	(0.0192)	(0.0206)
Constant	-5.8309***	-2.0286	6.0452***				
	(1.7644)	(1.3695)	(1.0198)				
Distress time dummies	yes						
Industry dummies	yes						
Legal form dummies	yes						
Region dummies	yes						
Observations	2,815						
R2	0.0868						
Log likelihood	-3,218.50						
LR test	611.72***(df=156)						

This table presents the multinomial logit regression of the probability of the future outcome of distressed firms on relationship variables, bank size, and a set of firm characteristics. Panels A and B present the results for the specifications with and without firm age information. The relationship and control variables are measured at the time of the first identification of distress from September of 2008 to September 2010, and the future outcome is identified three years after that. The table shows both multinomial logit regression coefficients, where the base category is the outcome of still distressed and the marginal effects. Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

The calculations based on the marginal effects of the first specification (panel A of Table 5) indicate that, *ceteris paribus*, the estimated probability of bankruptcy is 10.7 percentage points lower and the estimated probability of improvement in credit ratings is 15.3 percentage points higher for a distressed SME with a long relationship, compared to a distressed SME with a short relationship. The average shares of the bankrupted (11.7%) and improved (38.6%) SMEs indicate that the estimated effect of relationship length is particularly relevant on the probability of bankruptcy. When firm age is controlled in the second specification (panel B of Table 5), the average shares of the bankrupted and improved SMEs do not change as much as in the case of defaulted firms. The

share of bankrupted SMEs is 8.0%, and the share of improved SMEs is 41.3%. This is compatible with the small changes in the marginal effects.

Tables 4 and 5 also provide the estimated effects of other explanatory variables on the probability of various outcomes of the defaulted and distressed SMEs. Regarding the distressed SMEs, credit rating has a positive relationship with the probability of bankruptcy and a negative relationship with the probability of improvement in credit rating. This result is intuitive and indicates that a more severe first distress condition increases the probability of an unfavorable outcome in the future.[22] Bank size has a positive marginal effect on the probability of exit among both the defaulted and distressed SMEs. This result suggests that the SMEs with financial difficulties end their bank relationship more easily with larger banks. A possible explanation is that distressed firms concentrate all their transactions in one bank. If the SME customers of larger banks have more bank relationships, it can be more likely that they end their relationship with a cooperative bank.[23] The marginal effects of the total amount of SME's on- and off-balance sheet liabilities in a bank are positive on the probability of still defaulted or distressed outcomes. In the case of the defaulted SMEs, the total amount of liabilities also has a significant negative relationship with the probability of bankruptcy. In the case of the distressed SMEs, the amount of liabilities, in turn, has a negative relationship with the probability of exit. These results are intuitive as they suggest that a larger amount of liabilities increases banks' incentives to maintain a relationship with a distressed SME and to avoid bankruptcy.

4.5.3 Results by bank size

I also conduct the empirical analysis on the future outcome of defaulted and distressed SMEs by splitting the sample into two sub-samples based on bank size.[24] The results for defaulted SMEs are in Table 6 and for distressed SMEs in Table 7.

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22 I also estimated the model by using rating variable as a dummy/categorial variable instead of an interval variable. The results for relationship variables do not change significantly.

23 This is based on the idea that larger cooperative banks locate in operating environments where there are a greater number of other banks.

24 A bank is considered to be small if its total outstanding amount of SME loans is below 50 million.

TABLE 6 Relationship between bank relationship strength and the future outcome of defaulted SMEs when the sample is divided according to bank size.

Panel A: Small banks	Multinomial logit estimates:			Marginal effects			
	bank-ruptcy	exit	reco-very	bank-ruptcy	exit	reco-very	still defaulted
Log(1 + length of relationship)	-0.4917*** (0.1448)	-0.2706 (0.1779)	0.3486** (0.1549)	-0.1004*** (0.0207)	-0.0158 (0.01643)	0.0932*** (0.0190)	0.0230 (0.0192)
Existence of a checking account	-0.5202** (0.239)	-0.1042 (0.3024)	-0.1153 (0.2572)	-0.0844** (0.0347)	0.01877 (0.0285)	0.0192 (0.0321)	0.0464 (0.0332)
Firm and bank controls	yes						
Default time dummies	yes						
Industry dummies	yes						
Legal form dummies	yes						
Region dummies	yes						
Observations	896						
R2	0.1649						
Log likelihood	-997.64						
LR test	393.85***(df=150)						

Panel B: Large banks	Multinomial logit estimates:			Marginal effects			
	bank-ruptcy	exit	reco-very	bank-ruptcy	exit	reco-very	still defaulted
Log(1 + length of relationship)	-0.7666*** (0.1460)	-0.1724 (0.1562)	0.1693 (0.1677)	-0.1369*** (0.0187)	0.0254 (0.0177)	0.0676*** (0.0166)	0.0438*** (0.0167)
Existence of a checking account	-0.1293 (0.2356)	0.0132 (0.2529)	0.1870 (0.2627)	-0.0346 (0.0321)	0.0052 (0.0294)	0.0298 (0.0265)	-0.0003 (0.0282)
Firm and bank controls	yes						
Default time dummies	yes						
Industry dummies	yes						
Legal form dummies	yes						
Region dummies	yes						
Observations	1048						
R2	0.1675						
Log likelihood	-1,148.90						
LR test	462.45***(df=150)						

This table presents the same multinomial logit regressions as in panel A of Table 4, but the sample is divided into two subsamples based on bank size. The explanatory variables are exactly the same as in panel A of Table 4, but the coefficients of bank and firm controls are not reported. Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Table 6 indicates that the marginal effects of relationship length on the probability of bankruptcy and on the probability of recovery from default are similar in both sub-samples with those of in the whole sample. The negative marginal effect on the probability of bankruptcy is larger in the sample of larger banks, and the positive effect on the recovery from default is larger in the sample of smaller banks.[25] The only statistically significant marginal effect of the existence of a checking account is on the probability of bankruptcy in the sample of the smaller banks. However, none of these differences in the key marginal effects between the subsamples are statistically significant. In addition, I conduct this
analysis of the future outcome of defaulted SMEs with these subsamples and including firm age information; the results are reported in Appendix 3. In this specification, the key marginal effects in the sample of smaller banks are consistent with those of in the sample of all banks, but the corresponding marginal effects are not statistically significant in the sample of larger banks. The marginal effects of relationship length on the recovery from default and the existence of a checking account on bankruptcy are also statistically significantly larger in the sample of smaller banks. Thus, these results suggest that, if anything, the positive effects of strong bank relationship are larger in smaller banks. However, these are only tentative results and the detailed examination of the role of bank size would require controlling for possible differences, e.g., in customer base, between larger and smaller banks.

Table 7 indicates that the marginal effects of relationship length and the existence of a checking account on the probability of bankruptcy and on the probability of improvement in credit rating are largely similar in the sub-samples of SMEs of smaller and larger banks as in the whole sample of distressed SMEs. However, the marginal effect of relationship length on the probability of improvement in credit rating is considerably larger in the sample of smaller banks than in the sample of larger banks, and the difference is also statistically significant at the 10% level. The average share of improved SMEs is also larger in the smaller banks, where it is 42.1% compared to 36.0% in the larger banks.[26] Again, I also conduct the analysis by including firm age information, and the results are reported in Appendix 4. The marginal effect of relationship length on the probability of bankruptcy is not statistically significant in the sample of smaller banks, but otherwise results remain similar.

4.5.4 Discussion and robustness checks

The results indicate that a longer relationship and the existence of a checking account improve the probability of a favorable future outcome for the SMEs that became distressed during the financial crisis. These results support the theoretical arguments which state that a close and/or long relationship can

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25 The average shares of bankrupted and recovered SMEs are 41.9% and 17.6% among the larger banks, and 37.9% and 22.8% among the smaller banks, respectively.

26 The shares of bankrupted SMEs are 10.8% and 12.3% among small and large banks, respectively.

improve survival rates from difficulties due to a continuation of loan availability with favorable terms and/or due to a favorable loan restructurings (e.g., Berger and Udell, 1992; Berlin and Mester, 1999; Chemmanur and Fulghieri, 1994; Demiroglu and James, 2015). The results are also consistent with previous empirical studies focusing on the effect of a bank relationship on the future outcome of a distressed firm (e.g., Höwer, 2016; Rosenfeld, 2014). The contribution of this paper to these previous empirical studies is that it provides evidence of the relationship strength's role in the future outcome of SMEs that faced difficulties during the economy-wide crisis. In the rest of this section, I discuss potential estimation bias due to sample selection and conduct robustness checks to examine the sensitivity of the results to various modifications in the estimation.

TABLE 7 Relationship between bank relationship strength and future outcome of defaulted SMEs when the sample is divided according to bank size.

Panel A: Small banks							
	Multinomial logit estimates: Base category: still distressed			Marginal effects			
	bank-ruptcy	exit	impro-vement	bank-ruptcy	exit	impro-vement	still distressed
Log(1 + length of	-0.5140***	0.0514	0.3897**	-0.0573***	-0.0086	0.0974***	-0.0315**
relationship)	(0.1343)	(0.1097)	(0.0864)	(0.0104)	(0.0229)	(0.0152)	(0.0150)
Existence of a	-0.0679	0.176	0.4476**	-0.0239	-0.0042	0.0870***	-0.0589*
checking account	(0.2606)	(0.229)	(0.1770)	(0.0204)	(0.0261)	(0.0333)	(0.0310)
Firm and bank controls	yes						
Distress time dummies	yes						
Industry dummies	yes						
Legal form dummies	yes						
Region dummies	yes						
Observations	1,458						
R2	0.1147						
Log likelihood	-1,637.58						
LR test	424.52***(df=153)						

(continues)

Panel B: Large banks

	Multinomial logit estimates: Base category: still			Marginal effects			
	bank-ruptcy	exit	impro-vement	bank-ruptcy	exit	impro-vement	still distressed
Log(1 + length	-0.5128***	0.1254	0.1751**	-0.0559***	0.0214*	0.0424***	-0.0079
relationship)	(0.1152)	(0.0897	(0.1389)	(0.0094)	(0.0124)	(0.0137)	(0.0129)
Existence of a	-0.0439	-0.1712	0.1389	-0.0035	-0.0392	0.0445	-0.0017
checking	(0.2252)	(0.1798	(0.1609)	(0.0188)	(0.0261)	(0.0286)	(0.0258)
Firm and bank controls	yes						
Default time dummies	yes						
Industry	yes						
Legal form dummies	yes						
Region	yes						
Observations	1,927						
R2	0.1080						
Log likelihood	-2,276.24						
LR test	551.18***(df=150)						

This table presents the same multinomial logit regressions as in panel A of Table 5, but the sample is divided into two subsamples based on bank size. The explanatory variables are exactly the same as in panel A of Table 5, but the coefficients of bank and firm controls and the marginal effects are not reported. Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

The potential selection bias refers to the problem that some unobserved factors are correlated both with the probability of default or distress and with the main explanatory variables, i.e., with the relationship measures. Höwer (2016) formally analyses this type of selection problem by using the Heckman model. His definition of a distressed firm is based on the change in the firm's payment status made by the credit bureau (Creditreform). The exclusion restrictions required for Heckman modelling are based on the quality measure or investigation time of a regional branch of Creditreform. Most results remain stable compared to those of the basic probit model. I do not have data for good exclusion restrictions and, thus, I cannot employ this type of model identification. Even if the results of Höwer (2016) suggest that this type of selection problem does not significantly bias the estimates, the lack of formal analysis weakens the reliability of the results of this paper.

Next, I conduct robustness checks related to the fact that exact outcomes of exited SMEs are unclear because possible cases are, at least, a switch to another bank, bankruptcy that is not observed in the data, or a voluntary closure of a firm. First, I treat exited and bankrupted SMEs as one combined outcome group. Second, I exclude exited SMEs altogether. The results of these robustness checks are reported in Appendix 5 and shows that the effects of relationship strength remain consistent with the main results, but are not so robust regarding the

probability of the combined outcome. Thus, these results support, on the one hand, the main results and, on the other hand, the use of separate outcome groups for exited and bankrupted SMEs in the main analysis.

I conduct also a robustness check where immediately bankrupted SMEs are excluded. In the main analysis, I include all defaulted SMEs, and it is appropriate to test whether the results change if immediately bankrupted SMEs are not taken into account. In this way, the analysis is based only on the SMEs that have, at least in principle, the possibility to avoid bankruptcy.[27] The results of this robustness check are presented in Appendix 6. In the case of the defaulted SMEs, this treatment removes quite a significant number of observations as the number of observations decreases from 1,944 to 1,724. In the case of the distressed SMEs, the treatment removes only 35 firms. The results indicate that the effects of relationship length remain statistically significant and in line with the results of the main analysis.

The next robustness check considers the sensitivity of the result to the length of follow-up period. I do that by using a two-year follow-up period instead of a three-year follow-up period in the main analysis. In the previous studies, Rosenfeld (2014) uses a three-year follow-up period whereas Höwer (2016) uses a two-year follow-up period. The results of this robustness check are presented in Appendix 7 and are very similar with the main results.

The last robustness check uses the sample that consist only of the automatically rated firms because the firms rated with another rating model can be a selected sample. The results for the relationship variables are consistent with those in tables 4 and 5. There are only minor differences in the coefficients of relationship length and the existence of a checking account.

4.5.5 Lending to distressed SMEs

In this section, I tentatively examine how relationship strength affects the amounts and terms of new loans for defaulted and less severely distressed SMEs. In this way, I explore one of the two main mechanisms, better loan availability and favorable loan restructuring, through which a strong bank relationship can improve the future outcome of financially distressed firms. The results are reported in Appendix 8.

In the two first regressions, the dependent variables are the change in an SME's liabilities in a bank and the probability of new term loan within one year after the identification of financial difficulties. The results are more robust for the probability of new loan and indicate that a longer relationship and the existence of a checking account increase this probability among both the defaulted and distressed SMEs, even though the coefficients of relationship length are not statistically significant at the 10% level. In the two other regressions, I use contract level data for new loans of SMEs that are granted during the period when an SME is still in defaulted/distressed condition. The

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27 Some of the rating drops directly to bankrupted class can be also be due to data errors and so this robustness check also excludes these cases.

dependent variables are the loan margin and maturity of new term loans. The results indicate that loan terms are not looser for the SMEs with a stronger relationship. In the case of loan margin, the coefficients of relationship variables are not statistically significant, except for the positive coefficient of the existence of a checking account in the sample of distressed SMEs. Instead, the results are more robust in the case of loan maturity and indicate that the maturities of new loans are, on average, shorter for the SMEs that have a longer relationship and a checking account in a bank. In sum, the results indicate that loan availability and terms do not, at least significantly, explain the relatively better future outcomes of the defaulted and distressed SMEs that have a stronger bank relationship.

4.6 Conclusion

In this paper, I examine how the bank relationship strength of SMEs is related, first, to the probability of financial distress after the onset of the crisis and, second, to the future outcome of the distressed SMEs. I use detailed data on SME customers of Finnish cooperative banks in August of 2008, and the analyses are based on the development of distress conditions of these customers over the following five-year period. Bank relationship strength is measured by the relationship length and the existence of a checking account. I employ two firm distress conditions, default and the less severe distress condition that is identified as a weak credit rating.

I find that a stronger bank relationship, i.e., longer relationship and the existence of a checking account, is negatively associated with the probability of SMEs distress during the two-year period after the onset of the financial crisis. The second main finding is that stronger bank relationships improve the probability of a favorable outcome for the SMEs that defaulted or experienced less severe distress during the crisis. The results indicate that relationship length and the existence of a checking account are positively related to the probability of recovery from default and improvement in credit rating and negatively related to the probability of bankruptcy in the three years after the first identification of distress.

Overall, the results indicate that a close and long bank relationship has favorable effects on SMEs in crisis and post-crisis times. A unique dataset and a focus on survival from financial difficulties provide new evidence of the benefits of relationship banking during crises. Generalization of the results for other kind of banks and other countries would require more research. However, this paper supports the findings of the previous empirical studies indicating the important role of bank relationship during crisis periods (e.g., Beck et al., 2014; Jiangli et al., 2004).

REFERENCES

Agarwal, S. & Hauswald, R. 2010. Distance and Private Information in Lending. Review of Financial Studies 23 (7), 2757–2788.

Alexandre, H., Bouaiss, K. & Refait-Alexandre, C. 2014. Banking Relationships and Syndicated Loans during the 2008 Financial Crisis. Journal of Financial Services Research 46 (1), 99–113.

Beck, T., Degryse, H., De Haas, R., & Van Horen, N. (2014). When Arm ' s Length Is Too Far. Relationship Banking over the Business Cycle. BOFIT Discussion Papers 14/2014.

Berger, A. N., Miller, N. H., Petersen, M. A., Rajan, R. G. & Stein, J. C. 2005. Does function follow organizational form? Evidence from the lending practices of large and small banks. Journal of Financial Economics 76 (2), 237–269.

Berger, A. N. & Udell, G. F. 1992. Some Evidence on the Empirical Significance of Credit Rationing. Journal of Political Economy 100 (5), 1047–1077.

Berlin, M. & Mester, L. J. 1999. Deposits and relationship lending. Review of Financial Studies 12 (3), 579–607.

Bernanke, B. S., Gertler, M. & Gilchrist, S. 1996. The financial accelerator and the flight to quality. The Review of Economics and Statistics 78 (1), 1–15.

Bolton, P., Freixas, X., Gambacorta, L. & Mistrulli, P. E. 2013. Relationship and Transaction Lending in a Crisis. BIS Working Papers No. 417.

Boot, A. W. A. 2000. Relationship Banking: What Do We Know? Journal of Financial Intermediation 9 (1), 7–25.

Boot, A. W. A. & Thakor, A. V. 1994. Moral Hazard and Secured Lending in an Infinitely Repeated Credit Market Game. International Economic Review 35 (4), 899–920.

Boot, A. W. A. & Thakor, A. V. 2000. Can Relationship Banking Survive Competition? The Journal of Finance 55 (2), 679–713.

Brunner, A. & Krahnen, J. P. 2008. Multiple Lenders and Corporate Distress: Evidence on Debt Restructuring. The Review of Economic Studies 75 (2), 415–442.

Caballero, R. J., Hoshi, T. & Kashyap, A. K. 2008. Zombie lending and depressed restructuring in Japan. American Economic Review 98 (5), 1943–1977.

Chemmanur, T. J. & Fulghieri, P. 1994. Reputation, Renogotiation, and the Choise between Bank Loans and Publicly Traded Debt. The Review of Financial Studies 7 (3), 475–506.

Cotugno, M., Monferrà, S. & Sampagnaro, G. 2013. Relationship lending, hierarchical distance and credit tightening: Evidence from the financial crisis. Journal of Banking & Finance 37 (5), 1372–1385.

Degryse, H. & Cayseele, P. Van. 2000. Relationship lending within a bank-based system: Evidence from European small business data. Journal of Financial Intermediation 9, 90–109.

Degryse, H. & Ongena, S. 2002. Bank-Firm Relationships and International Banking Markets. International Journal of the Economics of Business 9 (3), 401–417.

Degryse, H. & Ongena, S. 2005. Distance, Lending Relationships, and Competition. The Journal of Finance 60 (1), 231–266.

Demiroglu, C. & James, C. 2015. Bank loans and troubled debt restructurings. Journal of Financial Economics 118 (1), 192–210.

Dewally, M. & Shao, Y. 2014. Liquidity crisis, relationship lending and corporate finance. Journal of Banking & Finance 39 (1), 223–239.

Dewatripont, M. & Maskin, E. 1995. Credit and Efficiency in Centralized and Decentralized Economies. The Review of Economic Studies 62 (4), 541–555.

Elsas, R. 2005. Empirical determinants of relationship lending. Journal of Financial Intermediation 14 (1), 32–57.

Elsas, R. & Krahnen, J. P. 1998. Is relationship lending special? Evidence from credit-file data in Germany. Journal of Banking & Finance 22 (10-11), 1283–1316.

European Central Bank. 2014. SME access to finance in the euro area: barriers and potential policy remedies. ECB Monthly Bulletin July 2014, 79–98.

Fernihough, A. 2011. Simple logit and probit marginal effects in R. UCD Centre for Economic Research Working Paper Series No. 11/22.

Fiordelisi, F., Monferra, S. & Sampagnaro, G. 2014. Relationship Lending and Credit Quality. Journal of Financial Services Research 46 (3), 295–315.

Foglia, A., Laviola, S. & Marullo Reedtz, P. 1998. Multiple banking relationships and the fragility of corporate borrowers. Journal of Banking & Finance 22 (10–11), 1441–1456.

Freixas, X. & Rochet, J.-C. 1997. Microeconomics of Banking. Cambridge: MIT Press.

Gambacorta, L. & Mistrulli, P. E. 2014. Bank Heterogeneity and Interest Rate Setting: What Lessons Have We Learned since Lehman Brothers? Journal of Money, Credit and Banking 46 (4), 753–778.

Hasan, I., Jackowicz, K. & Kowalewski, O. 2014. Bank ownership structure, SME lending and local credit markets. Bank of Finland Research Discussion Papers No. 22/2014.

Hetland, O. R. 2011. Bank Deposits and Relationship Lending. Working Paper. Available at: http://www.efmaefm.org/0EFMAMEETINGS/EFMA%20ANNUAL%20MEETINGS/2011-Braga/papers/0383_update.pdf.

Hoshi, T., Kashyap, A. K. & Scharfstein, D. 1990. The Role of Banks in Reducing the Costs of Financial Distress in Japan. Journal of Financial Economics 27 (1), 67–88.

Huang, J.-C., Huang, C.-S. & You, C.-F. 2015. Bank relationships and the likelihood of filing for reorganization. International Review of Economics & Finance 35 (123), 278–291.

Hyytinen, A. & Toivanen, O. 2004. Monitoring and market power in credit markets. International Journal of Industrial Organization 22 (2), 269–288.

Höwer, D. 2016. The role of bank relationships when firms are financially distressed. Journal of Banking & Finance 65, 59–75.

Jiangli, W., Unal, H. & Yom, C. 2004. Relationship lending, accounting disclosure, and credit availability during the Asian financial crisis. Journal of Money, Credit and Banking 40 (1), 25–35.

Jiménez, G. & Saurina, J. 2004. Collateral, type of lender and relationship banking as determinants of credit risk. Journal of Banking and Finance 28 (9), 2191–2212.

King, G. & Zeng, L. 2001. Logistic Regression in Rare Events Data. Political Analysis 9 (2), 137–163.

Mester, L. J., Nakamura, L. I. & Renault, M. 2007. Transactions accounts and loan monitoring. Review of Financial Studies 20 (3), 528–556.

Norden, L. & Weber, M. 2010. Credit line usage, checking account activity, and default risk of bank borrowers. Review of Financial Studies 23 (10), 3665–3699.

Ongena, S. & Smith, D. C. 1998. Bank Relationships: A Review. In: Harker, P., Zenios, S. A. (Eds.) The Performance of Financial Institutions. Cambridge University Press

Ongena, S. & Smith, D. C. 2001. The duration of bank relationships. Journal of Financial Economics 61 (3), 449–475.

Peek, J. & Rosengren, E. S. 2005. Unnatural selection: Perverse incentives and the misallocation of credit in Japan. American Economic Review 95 (4), 1144–1166.

Petersen, M. A. & Rajan, R. G. 1994. The Benefits of Lending Relationships: Evidence from Small Business Data. Journal of Finance 49 (1), 3–37.

Petersen, M. A. & Rajan, R. G. 1995. The Effect of Credit Market Competition on Lending Relationships. The Quarterly Journal of Economics 110 (2), 407–443.

Puri, M., Rocholl, J. & Steffen, S. 2011a. Global retail lending in the aftermath of the US financial crisis: Distinguishing between supply and demand effects. Journal of Financial Economics 100 (3), 556–578.

Puri, M., Rocholl, J. & Steffen, S. 2011b. On the Importance of Prior Relationships in Bank Loans to Retail Customers. ECB Working Paper Series No. 1395.

Rajan, R. G. 1992. Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt. The Journal of Finance 47 (4), 1367–1400.

Rosenfeld, C. M. 2014. The effect of banking relationships on the future of financially distressed firms. Journal of Corporate Finance 25, 403–418.

Ruckes, M. 2004. Bank competition and credit standards. Review of Financial Studies 17 (4), 1073–1101.

Santikian, L. 2014. The ties that bind: Bank relationships and small business lending. Journal of Financial Intermediation 23 (2), 177–213.

Sharpe, S. A. 1990. Asymmetric Information, Bank Lending and Implicit Contracts: A Stylized Model of Customer Relationships. The Journal of Finance 45 (4), 1069–1087.

Shimizu, K. 2012. Bankruptcies of small firms and lending relationship. Journal of Banking & Finance 36 (3), 857–870.

Stein, J. C. 2002. Information Production and Capital Allocation: Decentralized versus Hierarchical Firms. The Journal of Finance 57 (5), 1891–1921.

von Thadden, E. L. 2004. Asymmetric information, bank lending and implicit contracts: The winner's curse. Finance Research Letters 1 (1), 11–23.

APPENDIX 1

TABLE A1.1 Relationship between bank relationship strength and the probability of SMEs' financial difficulties during the global financial crisis when the sample is divided according to bank size.

Panel A. Probability of default				
	Small banks		Large banks	
Share of defaulted SMEs	8.01%	6.68%	7.39%	5.71%
	(1)	(2)	(1)	(2)
Log(1 + length of relationship)	-0.0088***	-0.0054	-0.0056**	-0.0059
	(0.003)	(0.0052)	(0.0024)	(0.0042)
Existence of a checking account	-0.0259***	-0.0210***	-0.0229***	-0.0192***
	(0.0073)	(0.0079)	(0.0065)	(0.0068)
Firm age control	no	yes	no	yes
Firm and bank controls	yes	yes	yes	yes
Industry, legal form and region dummies	yes	yes	yes	yes
Observations	11,871	9,812	13,819	11,515
Log likelihood	-2,564.574	-1,923.797	-2,832.715	-2,020.002
McFadden/adjusted R^2	0.2258	0.2003	0.2223	0.1982
Panel B. Probability of distress				
	Small banks		Large banks	
Share of distressed SMEs	15.35%	15.20%	15.70%	15.41%
	(1)	(2)	(1)	(2)
Log(1 + length of relationship)	-0.0206***	-0.0103	-0.0210***	-0.0231***
	(0.0038)	(0.0081)	(0.0037)	(0.0069)
Existence of a checking account	-0.0509***	-0.0542***	-0.0375***	-0.0319***
	(0.0120)	(0.0134)	(0.0106)	(0.0116)
Firm age control	no	yes	no	yes
Firm and bank controls	yes	yes	yes	yes
Industry, legal form and region dummies	yes	yes	yes	yes
Observations	10,046	8,427	11,812	10,004
Log likelihood	-3,260.703	-3,025.867	-4,337.588	-3,665,318
McFadden/adjusted R^2	0.1593	0.1575	0.1553	0.1476

This table presents the same logit regressions as in columns 1 and 2 of Table 3, but the sample is divided into two subsamples based on bank size. The explanatory variables are exactly the same as in corresponding models 1 and 2 of Table 3, but the coefficients of bank and firm controls are not reported. Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

APPENDIX 2

TABLE A2.1 Relationship between bank relationship strength and the probability of SMEs financial difficulties during the global financial crisis with different econometric models

Panel A: Probability of default			
	Rare events logit	Marginal effects of probit regression	LPM
Log(1 + length of relationship)	-0.1177***	-0.0066***	0.0031
	(0.0301)	(0.0018)	(0.0019)
Existence of a checking account	-0.3711***	-0.0239***	-0.0316***
	(0.0697)	(0.0040)	(0.0051)
Firm and bank controls	yes	yes	yes
Industry, legal form and region dummies	yes	yes	yes
Observations	25,690	25,690	25,690
Log likelihood	-5,415.0780	-5,446.9180	
McFadden/adjusted R^2	0.2216	0.2170	0.1183
Panel B: Probability of distress			
	Rare events logit	Marginal effects of probit regression	LPM
Log(1 + length of relationship)	-0.1851***	-0.0222***	-0.0212***
	(0.0223)	(0.0026)	(0.0028)
Existence of a checking account	-0.3514***	-0.0418***	-0.0515***
	(0.0615)	(0.0075)	(0.0080)
Firm and bank controls	yes	yes	yes
Industry, legal form and region dummies	yes	yes	yes
Observations	21,858	21,858	21,858
Log likelihood	-7,978.4530	-7,987.9160	
McFadden/adjusted R^2	0.1550	0.1540	0.1166

Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

APPENDIX 3

TABLE A3.1 Relationship between bank relationship strength and future outcome of the defaulted SMEs when the sample is divided according to bank size and firm age is controlled.

Panel A: Small banks

	Multinomial logit estimates: Base category: still defaulted			Marginal effects			
	bankruptcy	exit	recovery	bankruptcy	exit	recovery	still defaulted
Log(1 + length of	0.0122	-0.0533	01.1454***	-0.0533	-0.0537	0.1999***	-0.0924**
of relatioship)	(0.3308)	(0.3405)	(0.3439)	(0.0413)	(0.0354)	(0.0526)	(0.0439)
Existence of a	-0.8323**	-0.0538	-0.0901	-0.1093***	0.0270	0.0280	0.0543
checking account	(0.3240)	(0.3777)	(0.2941)	(0.0378)	(0.0383)	(0.0430)	(0.0442)
Log(1 + firm age)	-0.7533**	-0.4935	-0.9243***	-0.0413	0.0075	-0.1019*	0.1357***
	(0.3149)	(0.3164)	(0.3366)	(0.0392)	(0.0330)	(0.0521)	(0.0426)
Firm controls	yes						
Defaul time dummies: yes							
Industry, legal form and region dummies: yes							
Observations	623						
R2	0.1974						
Log likelihood	-680.14						
LR test	334.58***(df=153)						

Panel B: Large banks

	Multinomial logit estimates:			Marginal effects			
	bankruptcy	exit	recovery	bankruptcy	exit	recovery	still defaulted
Log(1 + length of	-0.4443	-0.4302	-0.0705	-0.0398	-0.0429	0.0324	0.0502
relationship)	(0.342)	(0.3027)	(0.3055)	(0.0424)	(0.0389)	(0.0377)	(0.0428)
Existence of a	0.0530	0.1604	0.2475	-0.0127	0.0107	0.0282	-0.0262
checking account	(0.3118)	(0.3041)	(0.2963)	(0.0388)	(0.0414)	(0.0383)	(0.0406)
Log(1 + firm age)	-0.5030	0.2929	0.3705	-0.1107***	0.0582*	0.0667**	-0.0141
	(0.3131)	(0.2729)	(0.2752)	(0.0384)	(0.0346)	(0.0336)	(0.0384)
Firm controls	yes						
Defaul time dummies: yes							
Industry, legal form and region dummies: yes							
Observations	677						
R2	0.1552						
Log likelihood	-792.65						
LR test	291.23***(df=153)						

This table presents the corresponding analysis to Table 6, expect that firm age is controlled. Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

APPENDIX 4

TABLE A4.1 Relationship between bank relationship strength and future outcome of the distressed SMEs when the sample is divided according to bank size and firm age is controlled.

Panel A: Small banks

	Multinomial logit estimates: Base category: still distressed			Marginal effects			
	bank-ruptcy	exit	impro-vement	bank-ruptcy	exit	impro-vement	still defaulted
Log(1 + length of	-0.1973	0.0921	0.4218**	-0.0242	-0.0112	0.0900***	-0.0546*
relationship)	(0.3308)	(0.2252	(0.1770)	(0.0200)	(0.0236	(0.0338)	(0.0324)
Existence of a	-0.2577	0.1081	0.4538**	-0.0290	-0.0105	0.0974***	-0.0580
checking account	(0.3293)	(0.2654	(0.1951)	(0.0197)	(0.0281	(0.0375)	(0.0357)
Log(1 + firm age)	-0.3805	-0.1026	0.0065	-0.0230	-0.0078	-0.0525*	0.0139
	(0.3805)	(0.2133	(0.1683)	(0.0187)	(0.0225	(0.0327)	(0.0308)
Firm controls	yes						
Defaul time dummies: yes							
Industry, legal form and region dummies: yes							
Observations	1,212						
R2	0.1204						
Log Likelihood	-1,291.69						
LR Test	353.50***(df=156)						

Panel B: Large banks

	Multinomial logit estimates: Base category: still distressed			Marginal effects			
	bank-ruptcy	exit	impro-vement	bank-ruptcy	exit	impro-vement	still distressed
Log(1 + length of	-0.4509*	0.2723	0.2788*	-0.0430***	0.0299	0.0485*	-0.0354
relatioship)	(0.2324)	(0.1836)	(0.1568)	(0.0148)	(0.0258)	(0.0288)	(0.0266)
Existence of a	-0.1035	-0.0984	0.0718	-0.0069	-0.0200	0.0262	0.0007
checking account	(0.2743)	(0.2027)	(0.1725)	(0.0176)	(0.0289)	(0.0323)	(0.0294)
Log(1 + firm age)	-0.0422	-0.1338	-0.0640	0.0013	-0.0156	-0.0016	0.0160
	(0.2062)	(0.1680)	(0.1441)	(0.0130)	(0.0263)	(0.0267)	(0.0245)
Firm controls	yes						
Defaul time dummies: yes							
Industry, legal form and region dummies: yes							
Observations	1,603						
R2	0.0994						
Log Likelihood	-1838.84						
LR Test	405.91***(df=156)						

This table presents the corresponding analysis to Table 7, expect that firm age is controlled. Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

APPENDIX 5

TABLE A5.1 Relationship between bank relationship strength and future outcome of the defaulted and distressed SMEs with various outcome groups

Panel A: Defaulted SMEs				
	exited SMEs excluded		exited and bankrupted together	
	bankruptcy	recovery	bankruptcy/exited	recovery
Log(1 + length of relationship)	-0.5764***	0.2620**	-0.4489***	0.2731**
	(0.0998)	(0.1091)	(0.0913)	(0.1086)
Existence of a checking account	-0.2853*	0.0448	-0.1769	0.0639
	(0.1642)	(0.1784)	(0.1500)	(0.1758)
Firm and bank controls	yes	yes	yes	yes
Defaul time dummies	yes	yes	yes	yes
Industry, legal form and region dummies	yes	yes	yes	yes
Observations	1591		1944	
R^2	0.1622		0.1332	
LR test (df=102)	539.8207***		501.6110***	
Panel B: Distressed SMEs				
	exited SMEs deleted		exited and bankrupted together	
	bankruptcy improvement		bankruptcy/exited improvement	
Log(1+length of relationship)	-0.4319***	0.2630***	-0.0856	0.2572***
	(0.0831)	(0.0578)	(0.0599)	(0.0571)
Existence of a checking account	-0.0801	0.2901**	-0.0504	0.2995***
	(0.1638)	(0.1160)	(0.1202)	(0.1154)
Firm and bank controls	yes	yes	yes	yes
Defaul time dummies	yes	yes	yes	yes
Industry, legal form and region dummies	yes	yes	yes	yes
Observations	2,664		3,385	
R^2	0.0632		0,0600	
LR test (df=102)	336.7505***		442,8276***	

Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

APPENDIX 6

TABLE A6.1 Relationship between bank relationship strength and future outcome of the defaulted and distressed SMEs when immediately bankrupted SMEs are excluded

	Defaulted SMEs			Distressed SMEs		
	bankruptcy	exit	recovery	bankruptcy	exit	improvement
Log(1 + length of relationship)	-0.6141***	-0.1955	0.2872***	-0.4544***	0.1054	0.2616***
	(0.1049)	(0.1139)	(0.1106)	(0.0846)	(0.0678)	(0.0573)
Existence of a checking account	-0.1792	-0.0248	0.0674	-0.0490	-0.0484	0.2976***
	(0.1698)	(0.1858)	(0.1763)	(0.1678)	(0.1375)	(0.1156)
Firm and bank controls	yes	yes	yes	yes	yes	yes
Defaul time dummies	yes	yes	yes	yes	yes	yes
Industry, legal form and region dummies	yes	yes	yes	yes	yes	yes
Observations	1,724			3,350		
R^2	0.1142			0.0675		
LR Test (df = 153)	539.6705***			586.1394***		

Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

APPENDIX 7

TABLE A7.1 Relationship between bank relationship strength and future outcome of the defaulted and distressed SMEs using a two-year follow up period

	Defaulted SMEs			Distressed SMEs		
	bank-ruptcy	exit	reco-very	bank-ruptcy	exit	impro-vement
Log(1 + length of relationship)	-0.4629***	-0.0785	0.3402***	-0.2001**	0.1215*	0.3135***
	(0.0935)	(0.1124)	(0.1011)	(0.0900)	(0.0727)	(0.0533)
Existence of a checking account	-0.3018**	0.0780	0.0734	-0.0461	0.0673	0.2938***
	(0.1497)	(0.1859)	(0.1646)	(0.1823)	(0.1520)	(0.1077)
Firm and bank controls	yes	yes	yes	yes	yes	yes
Defaul time dummies	yes	yes	yes	yes	yes	yes
Industry, legal form and region dummies	yes	yes	yes	yes	yes	yes
Observations	1,944			3,385		
R^2	0.1332			0.0672		
LR test (df = 153)	695.6323***			556.9048***		

Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

APPENDIX 8

TABLE A8.1 Relationship between bank relationship strength and the amounts and terms of new loans for defaulted and less severely distressed SMEs

Panel A: Defaulted SMEs

	Change in liabilities	Probability of new loan	Interest margin	Maturity
Log(1 + length of relationship)	0.1840	0.1686	0.1035	-0.1297***
	(2.0181)	(0.1070)	(0.0682)	(0.0488)
Existence of a checking account	1.0091	0.7370***	-0.0988	-0.2443***
	(3.2596)	(0.1952)	(0.1299)	(0.0930)
Log(1 + bank size)	-3.5252***	-0.2529***	0.0515*	-0.0473*
	(0.9809)	(0.0534)	(0.0367)	(0.0263)
Log(1 + liabilities)	-1.0347	0.3023***	-0.0544	-0.1455***
	(0.7827)	(0.0534)	(0.0542)	(0.0388)
Log(1 + OBS liabilities)	-0.4249	0.0556***	0.0073	-0.0123*
	(0.3468)	(0.0180)	(0.0104)	(0.0074)
Log(1 + loan size)			-0.0925**	0.3913***
			(0.0470)	(0.0336)
Constant	55.8082**	-2.1456	0.3452	-0.6093
	(22.8937)	(1.3149)	(0.9011)	(0.6451)
Industry, legal form and region dummies	yes	yes	yes	yes
Observations	1,405	1,740	369	369
Adjusted R^2	0.0137		0.4192	0.4174
F-Statistic	1.6749**		5.5802***	1.9078***
Log likelihood		-620.6518		

(continues)

TABLE A8.1 continues

Panel B. Distressed SMEs

	Change in liabilities	Probability of new loan	Interest margin	Maturity
Log(1 + length of relationship)	-1.6737	0.0885	-0.0277	-0.0735***
	(1.1220)	(0.0548)	(0.0298)	(0.0236)
Existence of a checking account	-1.8497	0.3216***	0.1203**	-0.1501***
	(2.2988)	(0.1165)	(0.0580)	(0.0460)
Credit rating	-2.5909*	-0.1453**	0.1739***	0.0049
	(1.3511)	(0.0684)	(0.0329)	(0.0261)
Log(1 + bank size)	-2.7272***	-0.1814***	0.0570***	-0.0223*
	(0.6347)	(0.0304)	(0.0168)	(0.0134)
Log(1 + liabilities)	0.0419	0.1993***	-0.0153	-0.1339***
	(0.3987)	(0.0221)	(0.0226)	(0.0179)
Log(1 + OBS liabilities)	0.1442	0.0446***	0.0136***	-0.0197***
	(0.2085)	(0.0099)	(0.0048)	(0.0038)
Log(1 + loan size)			-0.1107***	0.3310***
			(0.0227)	(0.0180)
Constant	55.8082**	-2.1456	0.3452	-0.6093
	(22.8937)	(1.3149)	(0.9011)	(0.6451)
Industry, legal form and region dummies	yes	yes	yes	yes
Observations	2,878	3,469	1,365	1,365
Adjusted R^2	0.0107		0.3350	0.3648
F-Statistic	2.0340***		12.6476***	14.2800***
Log Likelihood		-1.720,4640		

Standard errors are reported in parentheses, and *, **, and *** denote that the coefficients are statistically significantly different from zero at the 10%, 5%, and 1% levels, respectively.

SUMMARY IN FINNISH (YHTEENVETO)

Vähittäispankkitoiminta finanssikriisin jälkeen

Väitöskirja tarkastelee finanssikriisin vaikutuksia pankkien toimintaympäristöön ja pankkien käyttäytymistä kriisin aikaisessa ja sen jälkeisessä toimintaympäristössä. Väitöskirja keskittyy vähittäispankkitoimintaan, joka tarkoittaa yksityishenkilöihin ja pk-yrityksiin kohdistuvaa pankkitoimintaa, erityisesti lainanantoa ja talletusten vastaanottoa. Väitöskirja koostuu johdantoluvusta ja kolmesta empiirisestä artikkelista, joissa käytetään tutkimusaineistoina suomalaisten osuuspankkien pankki- ja sopimuskohtaisia tietoja. Artikkelit käsittelevät kilpailuympäristön, matalan korkoympäristön ja suhdepankkitoiminnan merkitystä varsinaisen kriisin aikana ja sen jälkeisellä periodilla. Johdantoluku taustoittaa tutkimusta ja esittää yleiskatsauksen koko väitöskirjaan. Lisäksi johdantoluvussa tarkastellaan kriisin vaikutuksia vähittäispankkitoimintaan laajemmasta näkökulmasta.

Ensimmäinen artikkeli tarkastelee kriisiä edeltäneen paikallisen kilpailuympäristön vaikutuksia pk-yritysten luotonannossa tapahtuneisiin muutoksiin finanssikriisin puhkeamisen jälkeen. Tulosten mukaan lainamarginaalit nousivat ja uusien lainojen määrät laskivat enemmän niissä pankeissa, jotka toimivat kilpailullisemmilla paikallisilla pankkimarkkinoilla ennen kriisiä. Lisäanalyysit tukevat tulkintaa, että suuremmat muutokset kilpailullisemmilla markkinoilla johtuivat siitä, että pankkikilpailun ero paikallisten markkinoiden välillä kapeni kriisin puhkeamisen jälkeen.

Toinen artikkeli tarkastelee markkinakorkotason ja pankin korkomarginaalin — laina- ja talletuskoron erotuksen — suhdetta. Epälineaarinen estimointimenetelmä mahdollistaa erilaisen suhteen eri korkoympäristöissä, minkä avulla voidaan tarkastella matalan korkoympäristön erityisvaikutuksia johtuen nollakorkorajasta talletuskoroille. Tulosten mukaan markkinakorolla on yleensä positiivinen vaikutus pankkien korkomarginaaleihin, mikä johtuu erityisesti käyttötalletuskorkojen jäykkyydestä. Matalassa korkoympäristössä koko luottoja talletuskannan korkomarginaalin ja markkinakoron suhde voimistuu, mikä rasittaa pankkien kannattavuutta. Sen sijaan uusien luottojen ja talletusten korkomarginaalin ja markkinakoron positiivinen suhde häviää tai muuttuu jopa negatiiviseksi hyvin matalassa korkoympäristössä. Tämä tulos heijastaa pankkien pyrkimystä korottaa lainamarginaaleja tilanteessa, jossa talletuskorot eivät voi enää laskea. Tällainen reaktio kannattavuuden ylläpitämiseksi heikentää rahapolitiikan korkokanavan toimintaa matalassa korkoympäristössä.

Kolmas artikkeli tarkastelee pankkisuhteen vahvuuden ja pk-yritysten menestymisen yhteyttä finanssikriisin puhkeamisen jälkeen. Artikkelissa tarkastellaan pankkisuhteen vahvuuden yhteyttä sekä yritysten taloudellisten vaikeuksien todennäköisyyteen että taloudellisiin vaikeuksiin joutuneiden yritysten selviämiseen. Pankkisuhteen vahvuutta mitataan pankkisuhteen pituudella sekä käyttötilin olemassaololla. Taloudellisten vaikeuksien määrittämiseen käytetään sekä maksukyvyttömyyttä että heikkoa luottoluokkaa. Tulosten mukaan

vahva pankkisuhde vähentää taloudellisten vaikeuksien todennäköisyyttä kahden vuoden aikana vuonna 2008 puhjenneen finanssikriisin jälkeen. Toinen keskeinen tulos on, että pidempi pankkisuhde vähentää konkurssin todennäköisyyttä ja lisää taloudellisista vaikeuksista selviämisen todennäköisyyttä niiden yritysten kohdalla, jotka joutuivat taloudellisiin vaikeuksiin 2008–2010