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JARI-MIKKO MERILÄINEN

Essays on financial stability and bank ownership type

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Reviewers Professor Giovanni Ferri
Lumsa Università
Department of Economic & Political Sciences and of Modern Languages
Via Pompeo Magno, 22
00192 Rome
Italy

Adviser Karlo Kauko
Bank of Finland
PL 160
00101 Helsinki
Finland

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Julkaisun nimike
Esseitä finanssivakaudesta ja pankin omistusrakenteista

Tiivistelmä

Väitöskirja koostuu neljästä esseestä, jotka käsittelevät eri näkökulmista finanssisektorin vakautta ja syklisyyttä. Ensimmäisessä esseessä tutkin pankin omistusmuodon vaikutusta luottokannan kasvuun vuosien 2008–2009 finanssikriisin ja sitä seuranneen Euroopan velkakriisin aikana. Tutkimuksessa pankin omistusmuotoja ovat liikepankit, osuuskuntamuotoiset pankit, yksityiset säästöpankit ja julkisomisteiset säästöpankit. Regressiotulokset osoittavat, että sekä vuosien 2008–2009 finanssikriisi että Euroopan velkakriisi aiheuttivat rajun negatiivisen shokin Länsi-Euroopan pankkien luottokannan kasvuun. Tätä shokkia lievensivät osuuskuntamuotoiset pankit ja säästöpankit, joiden luottokannan kasvu joko hiipui selvästi vähemmän kuin liikepankkien kasvu tai pysyi kriisivuosina kriisiä edeltäneellä tasolla.

Toisessa esseessä tutkin pankin omistusmuodon vaikutusta luottotappiovarausten syklisyyteen ja ajantasaisuuteen. Regressiotulosten mukaan pankkien luottotappiovaraukset sisältävät suhdanteista riippuvaisen, harkintaperusteisen komponentin, joka supistuu nousukausina ja kasvaa taantumissa. Osuuskuntamuotoisten pankkien luottotappiovaraukset ovat selvästi vähemmän riippuvaisia suhdannevaihteluista kuin muiden omistusmuotojen luottotappiovaraukset. Tämän todennäköisesti selittää osuuskuntamuotoisten pankkien oman pääoman rakenne, joka on osin vaihtuvaa. Se luo osuuskuntamuotoisille pankeille kannustimet suojata pääomaansa. Luottotappiovarausten ajantasaisuutta koskevien tulosten perusteella osuuskuntamuotoisten pankkien ja säästöpankkien luottotappiovaraukset ovat enemmän eteenpäin katsovia kuin liikepankkien luottotappiovaraukset.

Kolmannessa esseessä tutkin Espanjan dynaamista luottotappiovarausjärjestelmää. Järjestelmä otettiin käyttöön vuonna 2000 ja sen pääasiallisena tavoitteena on lieventää luottotappiovarausten syklisyyttä. Tutkimustulosten perusteella voi todeta, että Espanjan järjestelmä onnistui pienissä määrin vähentämään luottotappiovarausten riippuvuutta suhdanteeseen. Luottotappioita varten kerätyt reservit olivat kuitenkin liian pienet suhteutettuna Espanjan pankkijärjestelmän tappioihin vuosien 2008–2013 aikana. Sen vuoksi järjestelmä ei lopulta kyennyt vähentämään luottotappiovarausten syklisyyttä niin, että lopputulos poikkeaisi merkitsevästi muista Länsi-Euroopan maista. Espanjan liikepankit eivät olleet länsieurooppalaisia vastineitaan alttiimpia talousvaikeuksille, vaan Espanjan pankkikriisi oli ennen kaikkea säästöpankkikriisi.

Neljännessä esseessä tutkin pankkien rahoitusstrategioita. Erityisinä mielenkiinnon kohteina ovat ns. vakaan rahoituksen lähteet. Tulosten mukaan suuret pankit ovat rahoitusrakenteeltaan epävakaita. Tutkimustulokset osoittavat, että Länsi-Euroopan osuuskuntamuotoisten pankkien ja yksityisten säästöpankkien rahoitus on keskimäärin vakaampaa kuin liikepankkien ja julkisomisteisten säästöpankkien.

Asiasanat
Pankit, finanssikriisi, syklisyys, luottokannan kasvu, luottotappiovaraukset

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Author(s)
Jari-Mikko Meriläinen

Orcid ID
orcid.org/0000-0003-4817-810X

Contact information
University of Vaasa
Faculty of Business Studies
Economics
P.O. Box 700
FI-65101 Vaasa
Finland

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Abstract

This dissertation consists of four empirical essays. Each essay focuses on a distinct aspect of financial stability and cyclicality in the Western European banking sector. The first essay examines the role of bank ownership type in lending growth during the 2008–2009 financial crisis and the 2010–2013 sovereign debt crisis. The bank ownership types considered are commercial banks, cooperative banks, private savings banks and publicly owned savings banks. The regression results suggest that these two crises caused negative shocks to lending growth. These shocks were mitigated by stakeholder banks whose lending growth decreased significantly less than that of commercial banks or remained at pre-crisis levels during the crisis periods.

The second essay considers the role of bank ownership type in the cyclicality of loan loss provisions (LLPs) and in the timeliness of provisioning. Additionally, this study examines the cyclicality of loan impairment. The results suggest that, in general, LLPs have a cyclical discretionary component that decreases during booms and increases during recessions. However, this cyclical component of LLPs is much smaller in cooperative banks than in other bank ownership types. This may be explained by the variable nature of their capital. Moreover, all the stakeholder banks allocate timelier LLPs than do commercial banks. Furthermore, loan impairment is less cyclical for savings banks than for commercial banks and cooperative banks.

The third essay investigates Spain's dynamic loan loss provisioning system. The system was introduced in 2000, and its primary objective is to reduce the cyclicality of LLPs. The results suggest that the Spanish system succeeded, to some extent, in reducing the cyclicality of provisions. However, the dynamic reserves were exhausted within the first crisis year. As a result, the system was ultimately unable to smooth the cyclical pattern of LLPs. Consequently, the system did not improve the solvency of Spanish financial institutions. Spanish savings banks in particular failed during the 2008–2013 crisis period.

The fourth essay examines bank funding strategies. In particular, I examine customer deposits, long-term liabilities and equity, which are sources of stable funding according to the requirements of the net stable funding ratio (NSFR). Moreover, this study examines the funding profiles of Western European stakeholder banks. The results show that bank size is an important determinant of funding stability and that large banks have, on average, less stable funding profiles than do smaller banks. This result is mostly explained by the use of customer deposit funding, the source that is preferred by small banks. Moreover, the funding profiles of cooperative banks and private savings banks are more stable than those of commercial banks and publicly owned savings banks.

Keywords
Banks, financial crisis, cyclicality, lending growth, loan loss provisions

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Vaasa, October 2017

Jari-Mikko Meriläinen

Contents

Abbreviations

IAS	International Accounting Standard
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standards
LCR	Liquidity Coverage Ratio
LLPs	Loan loss provisions
LLRs	Loan loss reserves
NSFR	Net Stable Funding Ratio
OTD	Originate-to-Distribute
OTH	Originate-to-Hold
SHV	Shareholder value
STV	Stakeholder value

Publications

This dissertation consists of an introductory chapter and the following four essays:

1. Meriläinen, Jari-Mikko (2016). Lending growth during the financial crisis and the sovereign debt crisis: the role of bank ownership type. Journal of International Financial Markets, Institutions and Money 41, 168-182.[1]

2. Meriläinen Jari-Mikko (2017). Western European stakeholder banks' loan loss accounting. Journal of Financial Services Research, forthcoming.[2]

3. Meriläinen Jari-Mikko (2017). A comparative study of the Spanish dynamic loan loss provisioning system.

4. Meriläinen Jari-Mikko (2017). Western European bank funding structures and Basel III net stable funding ratio.

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1 INTRODUCTION

The Basel Committee introduced the Basel III regulatory framework as a response to the problems that occurred during the 2008–2009 financial crisis, which triggered trading and credit losses that banks were unable to absorb. The new framework was introduced by the Basel Committee in 2010, and it will replace the Basel II after a transition period from 2013–2019. The framework is designed to improve the resilience of banking sector by strengthening capital and liquidity rules (BIS, 2010a). As a result of the crisis, markets lost confidence in many banking institutions. Weaknesses within the banking sector were quickly transmitted to both the financial system and the real economy, resulting in a contraction in lending growth and liquidity.

The Basel Committee (BIS, 2010b) suggests that a stronger capital and liquidity framework will reduce the probability of banking crises and yield long-term net benefits, i.e., the cost of increased financial stability will be offset by a higher long-term output level. Historically, bank crises occur every 20–25 years, which in theory, equals an annual probability of a bank crisis of 4–5%. A more stable financial sector decreases the probability of a bank crisis and reduces the severity of bank crises. The latter is important because bank crises cause declines in output that persist beyond the crisis year. Tighter capital and liquidity standards are likely to be reflected as a reduction in the magnitude of business cycle volatility.

Consequently, the Basel III framework aims to improve the ability of the financial sector to absorb shocks and to reduce the probability of spillovers into the real economy to prevent the procyclical amplification of financial shocks. Therefore, the new framework introduces several measures to improve the banking sector's resistance to such procyclicality during good times. These measures aim to constrain leverage in the banking sector, dampen excess cyclicality of the minimum capital requirement, promote more forward-looking LLPs, conserve capital to build buffers for stress periods, and protect the banking sector from periods of excess lending growth.

Furthermore, the Basel Committee (BIS, 2014) suggests that many banks faced difficulties during the early "liquidity phase" of the financial crisis because they did not manage their liquidity prudently, despite the fact that these banks had met capital requirements. The importance of liquidity management to the financial system and banking sector was highlighted by the quick change in market conditions during the financial crisis. In response to the liquidity management failures of some banks, the Basel Committee published general guidelines on liquidity management (BIS, 2008). These were strengthened by two liquidity standards: the liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR). The LCR will ensure that banks have adequate funding

liquidity to survive short-term (one month) stressed funding conditions. As for the NSFR, it is a structural liquidity ratio that addresses maturity mismatches between bank assets and liabilities. The time horizon of the NSFR is one year. Therefore, these two ratios have separate yet complementary objectives (BIS, 2010c).

Unlike many banking systems in the world, the Western European banking system is characterized by heterogeneity in bank ownership structure. In addition to commercial shareholder banks, the Western European banking system has a large stakeholder banking sector that consists of cooperative banks and savings banks. These banks are market leaders in retail banking in certain Western European countries. They have several characteristics that distinguish them from shareholder banks. Perhaps the most important is that they are not strictly profit oriented. Moreover, cooperative banks are not owned by generic shareholders; instead, they are owned by their members, who are typically also customers. For savings banks, they are either non-profit organizations or owned by the government. Because cooperative banks and savings banks have large market shares in Western European countries, they shape the banking systems in the countries in which they are domiciled and in Western Europe in general. Stakeholder banks played a major stabilizing role during the financial crisis and subsequent sovereign debt crisis because these banks already met many of the objectives of the Basel III regulatory reform.

In this context, this dissertation presents four essays on financial stability and cyclicality. These essays expand our knowledge on the role of bank heterogeneity in the Western European banking system. Moreover, these essays yield insights into the stability of the Western European banking sector. The first essay studies the role of bank ownership type in the cyclicality of lending growth. This essay examines Western European banks' ability to absorb shocks by investigating whether bank ownership type has an effect on the cyclicality of lending. The second essay examines the role of bank ownership type in the allocation of LLPs. The hypothesis tested is whether stakeholder banks—which are subject to a different set of constraints in their firm value maximization problem—allocate LLPs differently from shareholder banks.

Third, an essay on Spain's dynamic loan loss provisioning system is presented. The objective of the Spanish provisioning system is to decrease the cyclicality of LLPs. The system aims to improve the solvency of Spanish banks during recessions by collecting LLRs during economic booms. This essay compares the Spanish system to the provisioning systems of other Western European countries. In particular, this essay examines cyclicality in LLPs and the probability of failure over the 2008–2013 crisis period. Finally, the fourth essay studies Western European banks' funding strategies. This essay examines the determinants of stable funding in the context of the NSFR: customer deposits, long-term liabilities and equity. Moreover, this study examines the funding

profiles of Western European cooperative banks and savings banks and compares them to those of commercial banks.

This dissertation has the following structure. After this introduction, a literature overview is presented. This is followed by brief summaries of each of the four essays. Then, there is a discussion section. Finally, the four essays included in this dissertation are presented.

2 OVERVIEW OF THE LITERATURE

2.1 Theoretical basis

Unlike commercial banks, cooperative banks and savings banks are stakeholder banks. Typically, stakeholder value (STV) is analyzed in contrast with shareholder value (SHV). Furthermore, the debate between these two paradigms is often referred to as the Friedman vs. Freeman debate (Ferri & Leogrande, 2015). The main difference between STV and SHV is that shareholders make the only deserving stake in SHV. In contrast, STV is about how different groups with a stake in the activities that make up the business interact jointly to create value. These are groups such as customers, employees, financiers, stockholders, suppliers, etc. (Parmar, Freeman, Harrison, Wicks, Purnell and De Colle, 2010).

Parmar et al. (2010) suggest that there are three interconnected problems that are related in business: the problem of value creation and trade, the problem of ethics of capitalism, and the problem of managerial mindset. The stakeholder theory argues that these problems can be addressed more effectively if the relationships between a business and the groups and individuals who can affect it, or who can be affected by it, are adopted as a unit of analysis. Therefore, from the perspective of the stakeholder theory, business can be seen as a set of relationships among groups that have a stake in the activities that make up a business.

The STV and the SHV theories usually apply to non-financial firms. However, banks can also be managed in the STV or SHV model (Ferri & Leogrande, 2015). When banks maximize STV, such as cooperative banks, they do not create value only for shareholders. Instead, they can aim to reduce borrowers' exclusion based on mutuality concepts and at the same time preserve stability and savings. In so doing, they also serve the general interests of their communities. In contrast, the objective in the SHV maximization model is not the relationship, but rather profit evaluated by the share value.

Coco and Ferri (2010) argue that a shareholder bank has several levels of asymmetric information problems. According to these authors, the most studied agency problem is the one between borrowers and lenders. Both pre- and post-contractual asymmetric information leads to both adverse selection and moral hazard in this relationship. Freixas and Rochet (2008) argue that this is because, for instance, banks have no control over the actions that borrowers take in their investment decisions. Freixas and Rochet (2008) suggest that this is typically a moral hazard setup. Moreover, Stiglitz and Weiss (1980) assume that borrowers differ in their likelihood of repaying their loans. To distinguish between good borrowers and bad borrowers, banks are required to use a variety of screening

methods. Consequently, Coco and Ferri (2010) argue that ex ante-screening and ex-post monitoring are the main reasons for the existence of banks because a bank is the most logical cost-sharing arrangement of these activities.

Second, shareholder banks have an agency conflict between depositors and bank owners (Coco & Ferri, 2010). Because the owners operate mainly with depositors' funds, they do not bear most of the risk of loss. Therefore, they have incentives to increase risk taking. Third, shareholder banks have an agency conflict between owners and managers; managers may be driven by other objectives, such as bank size and perks, while owners are interested in profit maximization. However, Coco and Ferri (2010) note that this conflict can be managed by relatively effective tools. These authors conclude that this is an advantage for profit-oriented banks.

The banking business model that is based on relationships is called relationship banking. Boot (2000) argues that relationship banking is most directly aimed at resolving asymmetric information problems. Moreover, Coco and Ferri (2010) suggest that cooperative banks are more devoted to relationship banking than shareholder banks. Therefore, these authors argue that cooperative banks are better able to reduce the information asymmetries on borrowers, and thereby to curtail the effects of moral hazard and adverse selection. Consequently, agency conflict between lenders and borrowers has less importance in cooperative banks because they are more oriented toward relationship banking. Thus, they are better able to overcome market failures. Similarly, Boot (2008) argues that the proximity between the bank and the borrower facilitates screening and monitoring and can overcome the problems of asymmetric information. According to Boot (2000), these asymmetric information problems may well be the very reason for banks' existence. Moreover, Coco and Ferri (2010) propose that banks have the appropriate incentives to screen and monitor its borrowers within a single relationship. When customers fragment their businesses among various counterparts, the private (soft) information will be lost.

Furthermore, Coco and Ferri (2010) argue that the perils for financial stability stem mostly from bank owners' incentives and thereby from the agency conflict between owners and depositors. These authors suggest that this problem is less severe in cooperative banks where the owner-members are also depositors in the bank. Furthermore, because cooperative banks are not strictly profit oriented, they have fewer incentives to increase risk. As a result, there is less need for prudential regulation of these banks.

Cuevas and Fischer (2006) suggest that there exists a conflict between net borrowers and net savers in a mutual bank. This implies that members who are net borrowers have different interests than members who are net savers. However, Coco and Ferri (2010) argue that some conflicts of interest may be dampened by the fact that the same person is both a borrower and a depositor. Furthermore, a large part of lending must be realized with members. In any case, Cuevas and Fischer (2006) note that it is important for the survival of the

cooperative financial institution to ensure that the board of directors is not controlled by borrowers. Nonetheless, despite the relevance of the net borrower-net lender conflict, these authors argue that it is not as significant as theory may suggest. Furthermore, Coco and Ferri (2010) argue that the membership itself makes the borrower more sensitive to the interests of the borrowers' community because the network of relationships goes beyond a pure lending relationship, i.e., members may be linked by a commercial, family, etc., relationship. This makes opportunistic behavior less likely and facilitates screening and monitoring among members/borrowers.

The downside of the cooperative banking model is that managers are much more difficult to be held accountable on a set of objectives that is much larger and more diverse. Moreover, these objectives are not always as easily quantifiable as those of shareholder banks (Coco & Ferri, 2010). Furthermore, Cuevas and Fischer (2006) argue that the agency conflict between members and managers is relevant in cooperative financial institutions because, for example, if management control is weak, managers are able to extract rent through increased wasteful expenses when the competitiveness in markets falls. Cuevas and Fischer (2006) suggest that the conflict between members and managers is the main source of cooperative financial institution failure. Therefore, these authors emphasize that control of expense preferences should be a central theme in the supervision of cooperative financial institutions. Moreover, Cuevas and Fischer (2006) argue that cooperative financial institutions cannot exploit the alignment of incentives that occurs when managers become co-owners because management participation in their ownership is not possible. However, Coco and Ferri (2010) argue that cooperative banks are better able to pursue long-term objectives because their directors do not change as often as they do in shareholder banks.

Ferri and Leogrande (2015) argue that the differences between STV banks and SHV banks in the ability to develop relationships also affect their credit management models. Banks that apply STV management models develop relationships with stakeholders, such as borrowers, and typically gather soft information on borrowers that is valuable in evaluating their creditworthiness. Ferri and Leogrande (2015) argue that banks that maximize STV typically use Originate-to-Hold (OTH) credit management models. The OTH model implies that these banks fund credit from deposits and get revenue from the interest rate spread holding credit contracts until maturity.

In contrast, SHV banks often favor the use of explicit contracts that are based on statistical analyses of risk. They have reduced opportunities to develop relationships with communities and multi-stakeholders. Therefore, Ferri and Leogrande (2015) suggest that these banks may develop an Originate-to-Distribute (OTD) credit management model. The OTD model implies that banks make profit by selling credit contracts to other parties. Through securitization, this can generate higher returns than the OTD model. Therefore, these banks not

only create credit from deposits but also by selling credit. Coco and Ferri (2010) argue that the invention of the OTD credit management model led to the loss of responsible behavior on the part of banks because banks knew before granting loans that they would sell the loans.

2.2 Bank ownership type and lending growth

In this dissertation, the bank ownership type refers to the shareholder/stakeholder ownership structure. The bank ownership types are commercial banks, cooperative banks, private savings banks and publicly owned savings banks, of which cooperative banks and savings banks are stakeholder banks. Stakeholder banks are concentrated in certain Central European countries where they are market leaders in retail banking. As a consequence, stakeholder bank groups such as the French credit cooperative *Crédit Agricole* and the German publicly owned savings bank group *Sparkasse Finanzgruppe* are among the largest bank groups in the world. Together, Western European stakeholder banks have a market share of 20–25% in terms of total assets. Therefore, commercial banks hold the majority of bank assets in Western Europe. They have large market shares in every Western European country, whereas stakeholder banks are practically absent from some countries, e.g., the United Kingdom.

Cooperative banks differ from commercial banks in several respects (Ayadi et al., 2010). They are not strictly profit oriented, and usually, they do not have profit distributions as do commercial banks. Cooperative banks are not owned by generic shareholders; instead, they are owned by members who are often also customers of the bank. The objective of cooperative banks is neither exclusively nor primarily profit maximization but rather serving their members (Ayadi et al., 2010). Therefore, they face a different set of constraints in their firm value maximization problem than do commercial banks. In a cooperative bank, power is divided by a one member-one vote rule instead of the one share-one vote rule used in shareholder banks. Gutiérrez (2008) argues that the membership structure and the voting rule of cooperative banks decrease management control in cooperative banks. Moreover, Gutiérrez (2008) argues that the voting rule makes hostile takeovers difficult, which may further decrease incentives for management control. Cooperative banks have large market shares in, e.g., France, Italy and Germany.

Savings banks are similar to cooperative banks in many respects; they are stakeholder banks that do not exclusively maximize profit, and they have no profit distribution. However, they differ from cooperative banks in their ownership structure and objectives. Savings banks are not owned by members; instead, they are foundations (non-profit organizations) that offer banking services to their customers. In some countries, e.g., in Germany, savings banks are owned by the government. According to Ayadi et al. (2009), savings banks have a ‘social mission’, which means they have a public mandate and a

commitment to contribute to the general good. Similar to cooperative banks, savings banks have large market shares in the countries in which they are concentrated. In Germany alone, publicly owned savings banks have 50 million customers.

The 2008–2009 financial crisis highlighted the importance of financial stability for the economy. Several studies have shown that the financial crisis caused a decline in lending growth; e.g., Ivashina and Scharfstein (2010) use data on U.S. bank loans from 2000–2008 to show that new lending declined substantially during the financial crisis. Moreover, several studies have examined the role of bank ownership structure in lending growth and in the effect of the financial crisis. Cull and Martinez Pería (2013) show that the financial crisis caused a negative shock to lending growth in Eastern Europe and Latin America. Cull and Martinez Pería (2013) argue that domestic banks in Eastern Europe decreased credit less than foreign banks during the crisis. In addition, the lending of government-owned banks was not procyclical in Latin America.

Furthermore, Micco and Panizza (2006) and Bertay, Demirgüç-Kunt and Huizinga (2015) suggest that lending growth follows business cycles in a procyclical manner. However, Micco and Panizza (2006) and Bertay et al. (2015) argue that the lending of state-owned banks is less procyclical than that of private banks. According to Bertay et al., this result especially holds in countries with good governance, and the lending of state-owned banks may even be countercyclical in high-income countries. Brei and Schclarek (2015) show that the financial crisis of 2008–2009 caused a negative shock to private banks' lending growth using data on banks in 50 countries from 1994–2009. However, these authors argue that government-owned banks increased their lending during the crisis relative to normal times. Furthermore, Coleman and Feler (2015) use data from 2005–2012 to show that Brazil's government-owned banks increased lending after the collapse of Lehman Brothers and mitigated the economic downturn.

By contrast, De Haas, Korniyenko, Pivovarsky and Tsankova (2015) study banks in emerging European countries from 1999–2011 and find only weak evidence that state banks reduced their lending to a lesser degree than did private banks in 2009. Moreover, both foreign and domestic banks curtailed lending during the financial crisis. Puri, Rocholl and Steffen (2011) use data on German savings banks from 2006–2008 to show that the financial crisis had a contractionary effect on the supply of credit in the German retail market. The effect was stronger among savings banks that were exposed to US subprime loans. In particular, the latter result was strong among small savings banks that were liquidity constrained. De Haas and Lelyveld (2006) examine banks in Central and Eastern Europe from 1993–2000, and they suggest that domestic banks decrease credit during economic crises, whereas foreign-owned banks keep their credit base stable.

Since the 2008–2009 financial crisis, studies have suggested that stakeholder banks play a stabilizing role in the banking system. Ferri, Kalmi and Kerola (2014) study banks in the euro area for the period 1999–2011 and suggest that stakeholder banks decrease lending less than commercial banks after a monetary policy contraction. The effect is the strongest among the cooperative banks that smoothed the impact of contractionary monetary policy during the 2008–2011 crisis period. Similar results are obtained by De Santis and Surico (2013), who suggest that cooperative banks and savings banks shield their customers from monetary policy shocks. Furthermore, De Santis and Surico (2013) argue that cooperative banks' lending is less procyclical than that of commercial banks. This study takes a similar approach and fills a gap in the literature by using a large dataset on Western European banks to examine lending growth in shareholder and stakeholder banks during the financial crisis and the sovereign debt crisis.

2.3 Bank ownership type and loan loss provisions

LLPs are an accrual on the income statement that is allocated to loan losses. Western European listed banks are obliged to allocate LLPs strictly for incurred losses. This 'incurred loss model' is described in IAS 39, which was implemented in the EU in 2005. The standard obliges banks to provide objective evidence for the incurred loss. Therefore, banks that have implemented IAS 39 are not allowed to collect general reserves for loan losses. This implies that LLPs have a cyclical pattern because loan losses typically accumulate during recessions. Because impaired loans accumulate during recessions, LLPs cause a negative shock to bank income. Formerly, banks could allocate general provisions to LLRs without identifying the assets in default (Leventis et al., 2011). This practice was restricted in the incurred loss approach, which is designed to limit the creation of reserves that could be used for earnings management (Gaston and Song, 2014).

Several studies have shown that LLPs are negatively related to business cycles. Laeven and Majnoni (2003) suggest that banks postpone LLPs during economic booms. Similarly, Bikker and Metzemakers (2005) argue that LLPs are negatively related to GDP growth. Moreover, Fonseca and Gonzalez (2008) suggest that LLPs have a cyclical pattern, and Albertazzi and Gambacorta (2009) suggest that the GDP growth and bank LLPs of 10 industrialized countries are negatively correlated over the 1981–2003 period. In addition, Bertay, Demirgüç-Kunt and Huizinga (2015) show that the LLPs of banks in 111 countries from 1999–2010 are procyclical. Olszak, Pipień, Kowalska and Roszkowska (2017) suggest that the LLPs of large, listed and commercial banks, as well as of banks reporting consolidated statements, are more procyclical. Furthermore, capital requirements and investor protections decrease the procyclicality of LLPs.

Because cooperative banks are not strictly profit oriented and have no profit distributions, Fonteyne (2007) suggests that cooperative banks have weaker risk-taking incentives than do commercial banks. Furthermore, Ayadi et al. (2009)

argue that banks that are not profit oriented manage intertemporal risk differently from profit-maximizing shareholder banks. Ayadi et al. (2010) argue that shareholder banks that are profit oriented are less likely to collect reserves for future losses than are stakeholder banks. The economy is thus exposed to intertemporal risk because of this lack of reserves even if the socially preferable option is to collect reserves for recessions.

Olszak et al. (2017) show that Western European cooperative banks and savings banks have less cyclical LLPs than their commercial counterparts using data from 27 EU countries from 1996–2011. A similar result is shown by Alessi, di Colli and Lopez (2014), who suggest that the LLPs of Italian cooperative banks are less cyclical than those of Italian commercial banks from 2006–2012. Furthermore, Bertay et al. (2015) show that the LLPs of state-owned banks are less procyclical, i.e., less negatively linked to GDP growth, than those of private banks using a sample of banks from 111 countries from 1999–2010. Bertay et al. (2015) argue that this could be because of less cyclical loan deterioration. An alternative explanation is that state-owned banks' provisioning is more conservative; they do not, for instance, decrease LLPs during booms because of over-optimism. This study examines whether bank LLPs include a discretionary component that decreases during booms and increases during recessions. Furthermore, this study examines the effect of bank ownership type on the discretionary cyclical component of LLPs. Moreover, this study investigates the timeliness of LLPs. Nichols, Wahlen and Wieland (2009) argue that public (listed) banks anticipate future loan losses when allocating LLPs. In this study, this hypothesis is tested in the context of shareholder/stakeholder ownership. Finally, this study examines the cyclicality of non-performing loans by bank ownership type.

2.4 Spanish dynamic loan loss provisioning system

Spain has had a dynamic loan loss provisioning system since 2000. This system differs from the incurred loss model used in other Western European countries such that the timing of LLPs is different; LLRs are partially collected during economic booms and released in recessions. The objective of this system is to reduce the cyclicality of LLPs (Jiménez, Ongena, Peydró & Saurina, 2012). The Spanish system thus aims to dampen the income shock of a recession by collecting LLRs for as yet unidentified future loan losses, thereby strengthening the solvency of Spanish banks (Trucharte & Saurina, 2013). These reserves are used during recessions as a countercyclical tool. As a consequence, the increase in LLPs during recessions is not as steep as that observed in the incurred loss model.

The countercyclical pattern in the overall LLPs of the Spanish system is achieved by using a dynamic (statistical) component of LLPs to complement the specific provisions that are allocated for incurred losses. Briefly, when the specific LLPs are low, the dynamic component is high. Likewise, when loan losses and the

specific LLPs are high, the dynamic component of LLPs is low, i.e., the collected reserves are released. This aims to smooth the cyclical pattern of LLPs. The dynamic component of LLPs is estimated from historical data, and the assets are divided into several categories according to their riskiness. The risk weights are set by the Bank of Spain (Jiménez et al., 2012). Illueca Muñoz, Norden, and Udell (2016) suggest that a drawback of the Spanish dynamic system is that the estimation periods of the risk categories and their coefficients cover only the economic cycle from 1986–1998.

The Spanish system was slightly changed in 2005 to conform to IFRS (Balla & McKenna, 2009). Moreover, Spanish financial institutions complained that the system put them at a competitive disadvantage (Fernández de Lis & Garcia-Herrero, 2010). Furthermore, the collected reserves were thought to be excessive, and the system was accused of favoring earnings smoothing (Fernández de Lis & Garcia-Herrero, 2009). As a result, the upper cap on reserves was lowered, which led to a contraction in reserves (Trucharte & Saurina, 2013).

Agénor and da Silva (2017) suggest that a dynamic provisioning system, such as that of Spain, can be highly effective in reducing the procyclicality of the financial system. A similar conclusion is reached by Agénor and Zilberman (2015). Likewise, Chan-Lau (2012) proposes that the Spanish dynamic provisioning formula would have substantially increased the solvency of Chilean financial institutions. However, Wezel (2010) argues that Spanish banks' dynamic reserves would have declined rapidly during the 2002–2003 economic crisis. Similarly, Fillat and Montoriol-Garriga (2010) suggest that a dynamic provisioning system would have smoothed LLPs in the U.S. during the 2008–2009 financial crisis, but the reserves would have been depleted by the end of 2009.

This study compares the Spanish system to the incurred loss approach of other Western European countries. Namely, this study examines whether the Spanish system succeeded in its primary objective of reducing cyclicality. Moreover, this study investigates the probability of failure during the 2008–2013 crisis period and examines whether dynamic reserves helped Spanish banks prevent failure over that period.

2.5 Western European bank funding structures and Basel III net stable funding ratio

The fourth essay investigates the funding structures of Western European banks. With the exception of bank capital, the literature on bank funding structures is rather scarce. However, the number of studies has recently increased because of the introduction of the NSFR. DeYoung and Jang (2015) have previously shown that large U.S. banks use less customer deposit funding than do smaller banks. Similarly, Demirgüç-Kunt and Huizinga (2010) suggest that large and fast-growing banks tend to use less funding from customer deposits. Moreover, Hong,

Huang and Wu (2014) suggest that large banks generally have lower NSFRs than do small banks using data on U.S. commercial banks from 2001–2011. In addition, King (2013) shows that banks exhibit cross-country differences in the average NSFR.

Gropp and Heider (2010) suggest that large banks have lower equity ratios (i.e., more leverage) than do small banks using data from 1991–2004. Moreover, these authors suggest that banks financed balance sheet growth from non-deposit liabilities from 1991–2004. The share of equity remained almost unchanged during this period. Likewise, Brewer, Kaufman and Wall (2008) use a sample of banks from 12 industrialized countries over the 1992–2005 period to show that large banks have lower equity ratios than do smaller banks. Moreover, profitable banks have higher equity ratios.

Furthermore, López-Espinosa et al. (2012) show that short-term wholesale funding is the most relevant systemic risk factor using data from 18 countries over the 2001–2009 period. They argue that this finding supports the introduction of the NSFR because it limits excessive exposure to liquidity risk. Similarly, López-Espinosa et al. (2013) argue that funding through unstable sources increases individual insolvency risk and the risk of spillover to the financial system. Moreover, Distinguin, Roulet and Tazani (2013) use a sample of U.S. and European listed commercial banks from 2000–2006 to show that banks decrease their regulatory capital ratios when they face higher illiquidity. These authors argue that this behavior highlights the need for minimum liquidity ratios.

In addition, Cornett, McNutt, Strahan, and Tehranian (2011) show that U.S. commercial banks that relied on core deposits, i.e., on stable funding, continued lending relative to banks that were more dependent on wholesale funding from 2006–2009. Likewise, Kapan and Minoui (2014) show that banks that were more reliant on wholesale funding curtailed their supply of lending more than other banks during the 2007–2008 crisis using an international sample of banks and data from 2006–2010. Similarly, Dagher and Kazimov (2015) use a sample of U.S. banks from 1992–2010 to show that banks that relied on wholesale funding curtailed lending by more than retail-funded banks during the 2008–2009 financial crisis. Prior to the crisis, the level of wholesale funding had no significant effect on rejection rates.

Moreover, several studies have examined the NSFR and evaluated its effect on the banking system. For instance, Allen, Chan, Milne and Thomas (2012) suggest that banks need to respond to the regulatory change with some combination of reducing loan assets and/or increasing equity, long-term funding and stable deposits. In doing so, they will increase their NSFRs. Allen et al. (2012) suggest that despite the long adjustment period for the new requirement, banks need to increase the liquidity of their assets and reduce the liquidity of their liabilities well ahead of the end of 2018.

Dietrich, Hess and Gabrielle (2014) use data on Western European banks from 1996–2010 to show that, historically, most banks have not met the minimum NSFR requirements. Furthermore, using data from banks in Luxembourg for 2003–2010, Giordana and Schumacher (2011) show that the median NSFR was above the minimum requirement in 2005 but declined to 80% before the financial crisis. Scalia, Longoni and Rosolin (2013) use a sample of banks from the euro area for 2010–2012 to show that banks with NSFRs below the minimum requirement have attempted to increase their NSFRs. These banks have mainly increased their ratios by increasing their available stable funding.

Chiaramonte and Casu (2016) use data from banks in 28 EU countries for the period 2004–2013 to suggest that the NSFR is a significant determinant of bank failure in Europe. Moreover, the capital ratio complements it in fostering financial stability only for the largest banks. Banks that ran into trouble almost always had low NSFRs, despite capital ratios that were above the required minimum. Furthermore, Vazquez and Federico (2015) argue that U.S. and European banks with high NSFRs were less likely to fail from 2001–2009 than were banks with weaker structural liquidity. Similarly, Hong, Huang and Wu (2014) use U.S. Call Report data from 2001–2011 to show that the NSFR is negatively related to bank failure.

This study examines the determinants of banks that use stable sources of funding, i.e., customer deposits, other long-term liabilities and equity. Furthermore, this study investigates Western European stakeholder banks. This study contributes to the growing literature on bank funding structures and structural liquidity.

3 SUMMARY OF THE ESSAYS

3.1 Lending growth during the financial crisis and the sovereign debt crisis: the role of bank ownership type

This essay examines lending growth in Western European banks from 2004–2013. In particular, this study investigates the effects of the 2008–2009 financial crisis and the 2010–2013 sovereign debt crisis on lending growth. Banks are divided by ownership type into four categories: commercial banks, cooperative banks, private savings banks and publicly owned savings banks. This study examines the role of bank ownership type in the cyclicality of lending growth. The main hypothesis is whether stakeholder banks dampen the negative shock to lending growth during financial crises.

This study uses data from 18 Western European countries from 2004–2013. The dataset consists of unconsolidated data that allows for the examination of lending growth in Western European countries. Previously, Ferri, Kalmi and Kerola (2014) have shown that bank ownership type has an effect on how a bank responds to contractions in monetary policy. A similar result is presented by De Santis and Surico (2013). This study extends this subject and examines how bank ownership type affects lending growth in general during the financial crisis and the subsequent sovereign debt crisis.

The regression results suggest that the financial crisis and the sovereign debt crisis caused a negative shock to Western European banks' lending growth. However, this shock was mitigated by stakeholder banks that either did not decrease lending during the crisis period or decreased it by significantly less than their commercial counterparts. Moreover, stakeholder banks protected the banking sector from excess credit growth in the countries in which they are domiciled. Thus, lending growth was, on average, much less cyclical in these countries than in countries without significant stakeholder banking sectors. These results are especially important because they suggest that a large share of the Western European banking system already meets the shock absorption objectives of the Basel III framework. Moreover, these results are strengthened by the bank-based financial system of Western Europe.

3.2 Western European stakeholder banks' loan loss accounting

This study investigates the role of bank ownership type in the allocation of bank LLPs. In particular, this study examines whether Western European banks have a

discretionary component of their LLPs that is related to GDP growth. Bertay et al. (2015) suggest that banks may decrease LLPs during economic booms because of, e.g., over-optimism. Similarly, banks can exaggerate loan losses during recessions and allocate excessive LLPs. This study uses regression analysis to decompose LLPs and identify the component that is not explained by non-discretionary factors and that is (negatively) correlated with GDP growth. Moreover, this study examines the timeliness of LLPs, i.e., whether banks allocate LLPs for near-future expected loan losses or solely for the losses that have already been incurred. Furthermore, this study examines the cyclicality of loan impairment.

Banks are divided into four groups according to their ownership structure: commercial banks, cooperative banks, private savings banks and publicly owned savings banks. The motive for examining bank ownership type relates to the economic objectives of these banks: commercial banks are strictly profit-maximizing banks that distribute profits to their shareholders. Stakeholder banks typically make no profit distributions; thus, they are more likely to collect reserves for bad times than are commercial banks that are owned by shareholders (Ayadi et al., 2010). Moreover, Gaston and Song (2014) argue that private banks often interpret accounting standards optimistically because they want to maximize share prices.

In this study, the sample consists of consolidated bank group-level data from 18 Western European countries. The study period is from 2004–2015 and therefore includes the economic boom preceding the financial crisis, the 2008–2009 financial crisis and the 2010–2013 sovereign debt crisis. This dataset provides an opportunity to examine the cyclicality and timeliness of Western European banks' LLPs.

The regression results show that, in general, LLPs include a discretionary cyclical component. This component decreases during economic booms and increases during recessions; hence, it amplifies business cycle effects on bank income. However, in cooperative banks, this component of LLPs is much smaller than in the other three bank ownership types. This can be explained by their member-based ownership structure, the different constraints of the firm maximization problem and the variable nature of their capital. The results can be generalized such that the regulation of bank capital plays an important role in ensuring the robustness of LLPs. Banks are inclined to provision for loan losses when they have incentives to protect their capital.

The results for the timeliness of LLPs show that all stakeholder banks allocate LLPs in a forward-looking manner but that commercial banks do not. This is an explanatory factor for the weaker cyclicality of the LLPs of cooperative banks and savings banks, as shown by Olszak et al. (2017). This behavior can be explained by the fact that stakeholder banks are not strictly profit focused. Therefore, they have less interest in income-increasing accounting than do shareholder-owned commercial banks. Furthermore, loan impairment in cooperative banks is equally

cyclical to that in commercial banks. For savings banks, their loan impairment is less cyclical than that of commercial and cooperative banks. This implies that the weaker cyclicality of savings banks' LLPs, as shown by Olszak et al. (2017), results in less cyclical loan impairment. For cooperative banks, their weaker cyclicality can be explained by more conservative provisioning. They do not under- or overestimate their LLPs in different business cycle phases. This result complements that of Olszak et al. (2017).

3.3 A comparative study of Spain's dynamic loan loss provisioning system

This essay presents a comparative study of the Spanish dynamic loan loss provisioning system that was implemented in 2000. Namely, this study examines cyclicality in the Spanish system and the probability of failure during the 2008–2013 economic crisis. The Spanish provisioning system is compared to the incurred loss approach that is used in other Western European countries. The objective of the Spanish system is to decrease the cyclicality of LLPs and to improve the solvency of financial institutions. The principal idea is to collect LLRs during economic booms to use them during recessions when loans are impaired. This differs from the incurred loss method described in IAS 39, which obliges banks to allocate LLPs strictly for loan losses. IAS 39 requires banks to collect objective evidence of loan losses, and no general reserves are allowed. This standard is designed to limit earnings smoothing through the use of LLPs.

The original Spanish provisioning system was slightly changed in 2005. The system consists of specific provisions that are allocated for identified losses and of a dynamic (statistical) component that is estimated based on historical data. Briefly, the dynamic component is high when specific provisions (and loan losses) are low. Conversely, when loan losses increase, the collected funds are used to partially cover incurred losses. This decreases the cyclicality of LLPs because LLRs are collected before recessions.

The regression results suggest that the Spanish system achieved countercyclicality to a limited extent. However, countercyclicality in the Spanish system mostly results in a small amount of impaired loans in the lead-up to the financial crisis. When LLPs are measured relative to total assets, the cyclical pattern in the LLPs of Spanish banks does not differ significantly from those of other Western European banks. The collected reserves were too small and were quickly depleted when impaired loans increased rapidly. Moreover, Spanish banks were more likely to fail over the 2008–2013 crisis period. However, this is mainly due to the collapse of the Spanish savings bank sector; Spanish commercial banks were not more or less likely to fail than were commercial banks in other Western European countries. Therefore, the collapse of the Spanish savings bank sector played an important role in the failure of the dynamic provisioning system.

Furthermore, the results suggest that Spanish banks were more likely to fail if their cost-to-income ratio was high in the lead-up to the crisis, i.e., if they were badly managed. In addition, the results show that Spanish banks were more likely to fail than banks in other Western European countries if their asset quality was high from 2004–2007. In contrast, there is no significant difference between Spanish banks and other Western European banks if their asset quality was already poor in the lead-up to the crisis. Moreover, the results concerning profitability suggest that there may have been a small group of Spanish banks with a lower probability of failure during the crisis period than similar banks in other Western European countries. These were the most profitable Spanish banks in the lead-up to the crisis. The dynamic reserves of these banks may have been sufficient for the provisioning system to function as intended. Finally, Spanish banks were more likely to fail during the crisis if their profitability already was low during the pre-crisis period.

3.4 Western European bank funding structures and Basel III net stable funding ratio

A new regulation on bank liquidity was announced at the end of 2009. The NSFR is a key component of this liquidity framework. The ratio obliges banks to acquire stable funding according to stability of their assets. The use of the ratio will improve the stability of bank funding by shifting the emphasis away from short-term wholesale funding and toward more stable funding sources.

This study examines the determinants of Western European banks' funding profiles. Namely, this study investigates the characteristics of banks that use stable sources of funding, customer deposits, other long-term liabilities and equity, and a proxy variable for banks' total stable funding is created. Furthermore, this study examines Western European stakeholder banks' funding profiles.

The dataset consists of consolidated bank group data on Western European banks from 2005–2015. First, this dataset of Western European commercial banks is used to examine the funding structures of Western European banks. Second, Western European stakeholder banks are included in the sample in a separate section. Stakeholder banks are examined in a separate section because the new regulation treats banks somewhat differently according to their ownership structure.

The results suggest that banks that favor customer deposit funding are smaller. Conversely, large banks use more funding from other long-term liabilities. However, this does not cover the gap caused by large banks' lower customer deposit funding ratios. Moreover, large banks have less equity than do small banks. Consequently, small banks have more stable funding profiles than do

large banks. Most of the difference between small and large banks is caused by differences in customer deposit funding.

The results imply that a significant part of the Western European banking sector has an unstable funding profile. Therefore, the new regulation will improve the stability of the Western European banking sector provided that these (large) banks are able to increase their shares of stable funding. Furthermore, there are large cross-national differences in customer deposit funding and in funding stability. For the bank ownership type, the funding profiles of Western European stakeholder banks are, on average, more stable than those of commercial banks. This result is strongest for private savings banks. However, this result does not hold for publicly owned savings banks. Moreover, the result for cooperative banks is dependent on the level of consolidation in the data because some cooperative bank groups use interbank funding from other group members in liquidity management.

4 DISCUSSION

The main contributions of this dissertation relate in the Basel III regulatory framework and bank ownership types. This dissertation widens our understanding of the role of heterogeneity in the Western European banking system. Namely, this dissertation expands the literature on bank ownership type by making a considerable contribution to the emerging awareness of the stabilizing effect of stakeholder banks on the Western European financial system. Given that the Basel III reform aims to decrease the procyclicality of the banking sector and to protect it from excess credit growth, these major contributions are relevant for financial regulators.

The study on lending growth in Western European countries during the 2008–2009 financial crisis and the 2010–2013 sovereign debt crisis shows that stakeholder banks play a stabilizing role in the countries in which they are domiciled. Their lending growth is less cyclical than that of commercial banks. Therefore, their lending pattern does not amplify financial shocks; instead, stakeholder banks serve as shock absorbers within the financial system. Improving the shock absorption ability of the financial system is one of the objectives of Basel III, and the stakeholder banking sector already partially meets the objectives of the new regulations.

The study on the role of bank ownership type in the allocation of LLPs shows that stakeholder banks and commercial banks allocate LLPs differently. Stakeholder banks allocate LLPs for expected near-future losses, whereas commercial banks do not. This behavior can be attributed to the lack of profit maximization in stakeholder banks. Because there is no profit distribution, these banks have stronger incentives to collect reserves for expected losses. This result complements the result on the weaker cyclicality of stakeholder banks' lending growth; Beatty and Liao (2011) show that banks that recognize loan losses earlier reduce their lending by less during recessionary periods. Therefore, one explanatory factor for the weaker cyclicality of stakeholder banks' lending growth is their tendency to allocate earlier LLPs for near-future expected loan losses.

Furthermore, the LLPs of cooperative banks have a much smaller discretionary cyclical component than do the LLPs of the three other bank ownership types; cooperative banks do not decrease LLPs during economic booms and increase them during recessions for subjective reasons, such as over-optimism or exaggeration. Such behavior can be attributed to the variable nature of cooperative capital; these banks have incentives to protect capital because part of it consists of member shares that can be withdrawn. This result has an important implication for the upcoming expected loss model wherein LLPs will be allocated to expected, i.e., anticipated, losses. To ensure that these provisions cover the expected losses and that capital buffers will be sufficient to absorb unexpected losses, banks have to be given incentives to protect their capital.

This dissertation fills a gap in the literature by offering the first academic study using empirical data from the Spanish economic crisis to compare the Spanish dynamic loan loss provisioning system to the incurred loss approach used in other Western European countries. The results suggest that the countercyclicality achieved in the Spanish system results in a small amount of impaired loans in the lead-up to the crisis. When LLPs are measured relative to total assets, the cyclical pattern of Spanish banks' LLPs does not differ significantly from that of commercial banks in other Western European countries. Therefore, even if the incurred loss approach has a drawback of strong cyclicality in LLPs, the outcome of the Spanish dynamic experiment does not differ significantly from it. In Spain, the collected reserves proved inadequate for the system to function as intended.

However, the results concerning the probability of failure suggest that the Spanish bank crisis was, above all, a savings bank crisis. Most likely this is because the Spanish savings banks had large exposures in the housing and real estate sector. The bursting of the housing bubble caused a sharp increase in impaired loans and led to the collapse of the savings bank sector. Contrary to expectations, Spanish commercial banks were not more likely to fail during the economic crises of 2008–2013 than were commercial banks in other Western European countries. Further research should focus on the collapse of the Spanish savings bank sector.

The essay on bank funding structures examines the use of stable sources of bank funding. Customer deposits are by far the largest source of stable liabilities according to the NSFR. The results suggest that customer deposit funding is mainly utilized in smaller banks. Moreover, large banks have less equity than do small banks. Therefore, even if large banks use more funding from other long-term liabilities, large banks have, on average, less stable funding profiles. Thus, the new regulation will have major effects on the stability of Western European bank funding because banks with unstable funding profiles are large and systemically important banks.

Furthermore, the results concerning bank ownership type show that Western European stakeholder banks utilize more customer deposits in their funding than do commercial banks. These results have an important implication because studies such as Cornett et al. (2011) and Dagher and Kazimov (2015) show that banks that relied on core deposits, i.e., on stable funding, curtailed lending during the 2008–2009 financial crisis by less than banks that relied on wholesale funding. Therefore, the results of this study suggest that one explanatory factor for the less cyclical lending pattern of stakeholder banks is their deposit-oriented funding profile.

Many of the results presented in this dissertation are related to one another. First, the observed result of the lesser cyclicality in stakeholder banks' lending pattern is related to the results that concern stakeholder banks' loan loss accounting. This is because studies such as Beatty and Liao (2011) show that banks that have smaller delays in expected loss recognition reduce their lending

during recessions less than banks with larger delays. Furthermore, the study that concerns bank funding structures is also related to the study on lending growth. Several studies, such as Cornett et al. (2011), show that banks curtail lending during recessions less if they rely on customer deposit funding. Our results suggest that stakeholder banks use more funding from customer deposits than do commercial banks.

Therefore, a question that arises concerns what part of the lesser cyclicality in stakeholder banks' lending pattern is caused by the different provisioning policy and what part is derived from the more stable liabilities. First, the result for the less cyclical lending growth is the strongest for cooperative banks. Moreover, the results on the role of bank ownership type in loan loss accounting show that cooperative banks do not have a cyclical discretionary component in LLPs as do commercial banks and savings banks. This suggests that the difference in the cyclicality of lending growth between cooperative banks and private and publicly owned savings banks is partly caused by this non-discretionary component in LLPs. Furthermore, the regression results on the timeliness of loan loss recognition show that cooperative banks allocate the largest LLPs for the expected near-future losses. However, the difference to private savings banks is minimal. In any case, this suggests that one explaining factor for cooperative banks' least cyclical lending pattern relates to their provisioning policies. Similarly, the difference between savings banks and commercial banks can be partially explained by provisioning policies.

In addition, bank ownership types also have differences in their funding structures, which is also an explaining factor for the differences in their lending patterns. Cornett et al. (2014) argue that banks that held more illiquid assets in their balance sheets reduced lending more and increased their asset liquidity more than other banks during the financial crisis. According to their results, the marginal effect of core deposits-to-total liabilities ratio on lending growth is negative. However, when the core deposit funding ratio is interacted with the TED spread (spread between interbank rate and treasury rate), the marginal effect is positive. Therefore, cooperative banks and private and publicly owned savings banks are better able to continue lending in the event of a shock in the interbank money markets because their funding structures are more deposit-oriented.

Furthermore, Kapan and Minoui (2014) show that non-deposit funding is a significant determinant of the supply of credit. They use data on 800 banks from 2006–2010 to estimate that a one percentage point increase in non-deposit funding (liabilities) causes a -0.6% (-0.7%) decrease in the growth of lending between the periods over 2006Q1–2007Q2 and 2008Q3–2010Q1. Moreover, the results in the fourth essay of this thesis show that cooperative banks have about a 3.5 percentage points higher level of customer deposit funding ratio than do commercial banks. In addition, the regression results on lending growth over the 2008–2013 period shown in the first study of this thesis suggest that cooperative

banks reduced their lending growth 2.5–5% less than commercial banks did during this period.

Taken together, these estimates suggest that cooperative banks' higher customer deposit funding ratio explains many of the differences between commercial banks' and cooperative banks' lending growth during the 2008–2013 crisis period. Similarly, this also applies to private and publicly owned savings banks because their liabilities are more customer deposit-oriented than those of commercial banks. However, despite the fact that the literature contains estimates that provide some information on the determinants behind the observed result of stakeholder banks' less cyclical pattern in lending, these determinants are a good subject for further study. In other words, whether the lesser cyclicality in stakeholder banks' lending growth is a result of their provisioning policies or their funding structures requires more research.

To conclude, stakeholder banks already meet many of the objectives of the Basel III framework. Their lending patterns are not procyclical, and their funding profiles are stable. Moreover, their LLPs are less cyclical than those of commercial banks because they allocate LLPs for near-future losses. The Western European banking sector and the real economy benefited from the presence of stakeholder banks during the 2008–2009 financial crisis and the 2010–2013 sovereign debt crisis. Therefore, stakeholder banks are a source of financial stability.

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Lending growth during the financial crisis and the sovereign debt crisis: The role of bank ownership type

Jari-Mikko Meriläinen*

University of Vaasa, Wolffintie 34, 65200 Vaasa, Finland

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ABSTRACT

This study examines lending growth in Western European banks over the 2004–2013 period. Using a panel of 18 Western European countries, the study investigates how lending growth was affected by the 2008–2009 financial crisis and the subsequent sovereign debt crisis. Banks are classified into four groups based on ownership type: commercial banks, cooperative banks, private savings banks and publicly owned savings banks. The results suggest that both the financial crisis and the sovereign debt crisis caused a negative shock in Western European lending growth. The shock was weakened by stakeholder banks whose lending growth either did not decrease during the two crises or decreased substantially less than that of commercial banks. Additionally, the results are particularly strong for cooperative banks. Furthermore, stakeholder banks did not contribute to excess credit growth in the lead-up to the two crises. Given their large market shares, stakeholder banks diminish the procyclicality of the banking sector.

1. Introduction

The Basel Committee considers the banking system's tendency to amplify financial shocks in a procyclical manner to be one of the most destabilizing elements of the financial crisis of 2008–2009. Therefore, the Basel III regulatory framework aims to improve the banking sector's ability to absorb shocks "arising from financial and economic stress, whatever the source" (BIS, 2010). By raising the quality of the capital base, setting a leverage ratio requirement and enhancing risk coverage, the new framework aims to ensure that the banking sector serves as a shock absorber, rather than transmitting shocks to the financial system and again to the real economy, and to protect the banking sector from periods of excess credit growth. This study investigates whether the banks in Western Europe absorbed or amplified the shocks caused by the two crises.

The financial crisis occurred from 2008 to 2009. In 2009, credit growth in eurozone declined to its lowest level since the introduction of the Economic and Monetary Union (EMU) (ECB, 2010). This credit growth decline was accompanied by a 4% decline in real GDP. In addition, lending growth decreased in the Western European countries outside the eurozone, e.g., in the United Kingdom (BOE, 2010) and Norway (Finanstilsynet, 2010).

According to European Central Bank, the eurozone's short economic recovery in 2010 was stronger than expected (ECB, 2011). As a result, loans in the private sector increased moderately in 2010. Tensions in financial markets intensified anew in 2011 because of concerns about public finances (ECB, 2012). Accordingly, since 2010, there has been a sovereign debt crisis (known as the eurozone crisis). Together with the idling global economy, GDP declined in the latter half of 2011

* Tel.: +358 29 449 8499.
E-mail address: jari-mikko.merilainen@uva.fi

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(ECB, 2012). Therefore, lending growth was negative in 2012 (EBF, 2013). In certain Western European countries, the shock of the sovereign debt crisis on lending growth was substantial, e.g., in Ireland the decline in banks' total loan stock was 19.7%.

The financial crisis of 2008–2009 has been shown to cause a negative shock in lending growth in Eastern Europe and Latin America (Cull and Pería, 2013). Cull and Pería argue that domestic banks in Eastern Europe decreased credit less than foreign banks during the crisis. In addition, the lending of government-owned banks was not procyclical in Latin America. Similarly, using data on banks in 50 countries from 1994 to 2009, Brei and Schclarek (2013) showed that the financial crisis of 2008–2009 caused a negative shock in private banks' lending growth, but government-owned banks increased their lending during the crisis relative to their lending during normal times. Moreover, Coleman and Feler (2015) studied Brazilian banks from 2005 to 2012 and showed that Brazil's government-owned banks increased their lending after the collapse of Lehman Brothers and mitigated the economic downturn. By contrast, De Haas et al. (2015) studied banks in emerging European countries from 1999 to 2011 and found only weak evidence of state banks reducing their lending to a lesser degree than private banks in 2009. Moreover, both foreign and domestic banks curtailed lending during the financial crisis. Ivashina and Scharfstein (2010) showed that new lending declined substantially during the financial crisis. They suggest that the crisis could have had both demand and supply effects on lending growth. Puri et al. (2011) used data on German savings banks from 2006 to 2008 and showed that the financial crisis had a contractive effect on credit supply in German retail markets. The effect was stronger in the savings banks that were exposed to subprime loans in the US. The latter result was particularly strong in smaller and more liquidity-constrained savings banks. De Haas and van Lelyveld (2006) examined banks in Central and Eastern Europe in 1993–2000, and they suggested that domestic banks decreased credit during economic crises, whereas foreign-owned banks kept their credit base stable. Furthermore, Micco and Panizza (2006) and Bertay et al. (2015) suggest that lending growth procyclically follows business cycles. Micco and Panizza and Bertay et al. argue that the lending of state-owned banks is less procyclical than the lending of private banks. According to Bertay et al., the result holds especially true in the countries where governance is good, and the lending of state-owned banks may even be countercyclical in high-income countries.

This study takes a similar approach to these studies and examines the role of the bank ownership type in lending growth during the financial crisis of 2008–2009 and the sovereign debt crisis of 2010–2013. In particular, stakeholder banks are distinguished from shareholder banks: the bank ownership groups defined in the study are commercial banks, cooperative banks, private savings banks and publicly owned savings banks.[1] In brief, stakeholder banks are not strictly profit-oriented; hence, their financial objectives are different from those of shareholder banks. In addition, their ownership structures are distinct from those of shareholder banks. The characteristics of the bank ownership types are described in detail in the following chapter.

Ferri et al. (2014a) argue that the bank ownership type has an effect on banks' lending policies. According to their results, stakeholder banks in the eurozone decreased their loan supply to a lesser degree than shareholder banks did after the monetary policy contractions in 1999–2011. Moreover, cooperative banks continued to soften the impact of tighter monetary policy on lending during the crisis period of 2008–2011, whereas savings banks did not. This study uses a similar setting and examines the two crises' effects on the lending growth of different bank ownership types. Instead of analyzing monetary policy shocks, the study examines the supply reaction of these bank ownership types to the negative financial shocks that these two crises triggered.

The panel dataset includes banks from 18 Western European countries from 2004 to 2013. Therefore, this study contributes to the literature in several ways. The study includes both the financial crisis of 2008–2009 and the sovereign debt crisis of 2010–2013, hence offering information on the impacts of the two crises on lending growth and on the ways in which the banking system was able to absorb the financial shocks caused by the crises. Furthermore, the role of stakeholder/shareholder ownership in the effects of the financial crisis and the sovereign debt crisis has not been studied. This study thereby offers information on how the heterogeneity of the Western European banking sector should be taken into account in the regulation of the financial sector.

The results suggest that both the financial crisis and the sovereign debt crisis caused a negative shock to lending growth in Western Europe. The shocks were partially absorbed by cooperative and publicly owned savings banks, whose lending growth did not slow down during the two crises. Consequently, cooperative and publicly owned savings banks form a stabilizing element in the financial system of Western Europe because they do not amplify financial shocks. The reasons for this non-cyclical behavior likely stem from their ownership structures. Furthermore, the excess credit growth during the pre-crisis years was mainly fueled by commercial and private savings banks, whose lending growth was, on average, considerably higher than that of cooperative and publicly owned savings banks. Therefore, the lending of cooperative and publicly owned savings banks reduces the procyclicality of the banking system.

The paper is structured as follows: after the introduction, summaries of the characteristics of the bank ownership types are presented. These summaries are followed by a brief description of relationship banking. Descriptions of data and econometric specifications are then presented. These descriptions are followed by summary statistics, regression results, the discussion section, and conclusions.

[1] "Publicly owned" refers to government ownership.

2. Commercial, cooperative and savings banks

2.1. Characteristics of the bank ownership types

The 4000 cooperative banks in Europe have over 200 million customers in their 70,000 branches (EACB, 2014). Most cooperative banks are concentrated in a few countries in Western Europe, although some are located in Eastern Europe. Savings banks have 50,000 branches in Western Europe, and they have 50 million customers in Germany alone (ESBG, 2013). Savings banks can be found in almost every country in Western Europe, but they are especially prominent in large Central European countries and in Scandinavia. Before the financial crisis, they were a major component in the Spanish banking sector. Because of their high concentration, cooperative and publicly owned savings banks have market leadership positions in certain countries, e.g., the German *Sparkasse*, a publicly owned savings bank group, and the French *Crédit Agricole*, a cooperative bank group, are both market leaders in retail banking in their countries and are among the largest bank groups in the world. The map (Fig. 1) shows the countries in which cooperative banks (vertical pattern) and savings banks (horizontal pattern) have lending market shares of greater than 10% (in 2012). The market shares are calculated from Bankscope data.

Savings banks also have stable positions in Denmark and Iceland, but their market shares in net loans are not large because of the presence of large commercial banks. Table 1 shows the lending market shares by bank ownership type and the number of these bank types in the sample countries in 2012.

In addition to the large volumes and market shares, ownership types are included in the study because De Santis and Surico (2013) and Ferri et al. (2014a) have suggested that the bank ownership type has an effect on how banks adjust their lending to contractive monetary policies. Ferri et al. (2014b) also suggest that cooperative and savings banks were more resilient in the financial crisis of 2008–2009. As for commercial banks, they have large market shares in every country in Western Europe. Commercial banks dominate the banking systems of the United Kingdom and Ireland, where cooperative and savings banks are almost absent. Moreover, the banking sector of the United Kingdom is the largest (by total assets) in Western Europe (at 9.6 TEUR in 2012) (EBF, 2013).

Commercial banks are typically profit-oriented and distribute profits to shareholders, whereas cooperative and savings banks are stakeholder banks that have no profit distribution and thus are not strictly profit-oriented. Therefore, Fonteyne (2007) argues that cooperative banks have less incentive to take risks, which implies they are less willing to extend credit to

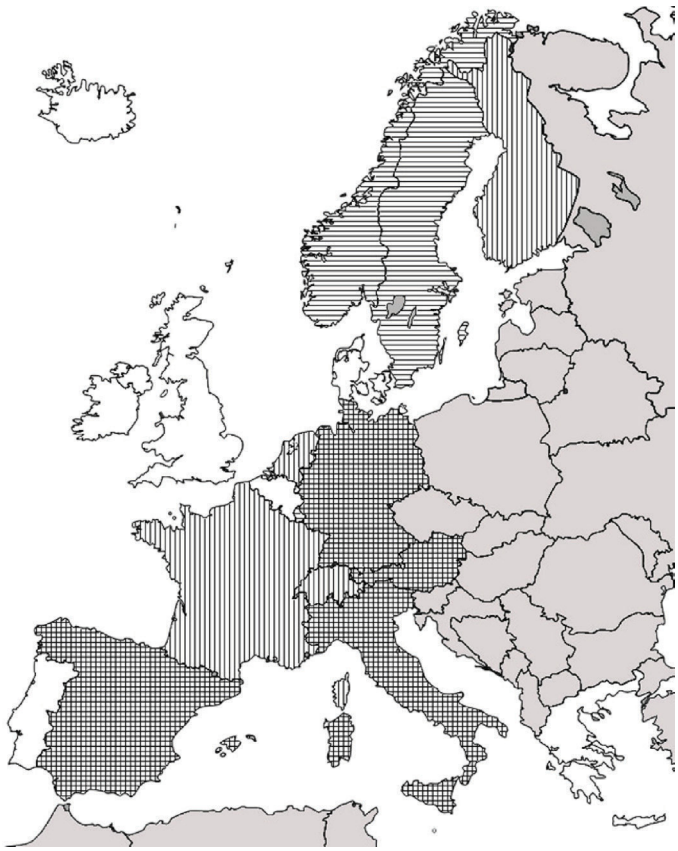

Fig. 1. Map showing Western European countries with cooperative banks (vertical pattern) and savings banks (horizontal pattern).

Table 1
Market shares in net loans (%) and number of banks (#) in the sample countries in 2012.

	Commercial banks		Cooperative banks		Priv. savings banks		Publ. savings banks		
	%	#	%	#	%	#	%	#	#
GR	99.15	15	0.85	1	0	0	0	0	16
IS	98.98	4	0	0	1.02	22	0	0	26
GB	98.82	75	1.17	1	0.01	2	0	0	78
IE	97.89	9	2.11	1	0	0	0	1	11
DK	97.41	48	0.06	9	2.53	57	0	0	114
BE	96.01	28	3.32	11	0.67	9	0	0	48
FR	44.56	60	51.67	153	3.73	11	0.04	12	236
AT	19.53	21	39.06	176	0.05	5	41.36	74	276
IT	55.59	71	34.37	622	10.03	69	0	0	762
DE	39.63	85	25.91	1468	0	0	34.46	573	2126
NL	79.31	22	20.69	1	0	0	0	0	23
ES	72.15	37	17.36	86	10.48	58	0	0	181
FI	82.29	7	14.22	6	3.49	6	0	0	19
CH	87.50	62	11.90	241	0.32	8	0.29	11	322
NO	50.85	10	0.68	2	48.48	131	0	0	143
LU	59.77	25	7.75	11	22.51	3	9.97	7	46
SE	89.30	13	0.09	1	10.60	91	0	0	105
PT	88.09	15	3.34	6	8.57	2	0	0	23
Total	68.68	607	20.52	2796	4.55	474	6.26	678	4555

The countries are ordered such that the groups include countries (1) with no cooperative or savings banks, (2) with cooperative banks, and (3) with savings banks. Spain and Italy have both cooperative and private savings banks, and Austria and Germany have both cooperative and publicly owned savings banks. The figures are based on Bankscope data.

customers with a high probability of default. Cooperative banks are not owned by shareholders; instead, they are owned by members, who often are also customers of the banks of which they are members. Instead of strictly maximizing returns of capital, cooperatives seek to serve their members and non-member clients (Ayadi et al., 2010). Membership in a cooperative is usually open to everyone, although there may be a (nominal) membership fee. The power is divided between members according to the "one vote-one member" rule, instead of the "one vote-one share" rule. Gutiérrez (2008) argues that the membership structure of cooperative banks and their voting rules limit shareholders' control over management because the weak incentive to exert management control may exacerbate agency problems. Second, unlike shareholder banks, cooperative banks are not under serious threat of takeover. This characteristic may further limit management control in cooperative banks. Membership in a cooperative bank is not tradable; hence, there are no secondary markets for membership stakes. In most cases, the ownership exists at a local or regional level (Ayadi et al., 2010). Birchall and Ketilson (2009) argue that cooperatives are more risk averse because they are member-owned and that they tend to retain profits and take fewer risks because they are unable to obtain new equity from investors. Ayadi et al. (2010) suggest that risk-averse banks highly value managing intertemporal risks.

Because of the extensive branch network, cooperative banks often have disproportionate market shares in rural areas (Fonteyne, 2007). Gutiérrez (2008) argues that entry into regional markets with strong customer relations requires a takeover, which, in the case of cooperative banks, is not possible because of the voting rule. Gutiérrez suggests that Italian cooperative banks had more monopoly power than commercial banks during the period 2000–2006. Furthermore, earlier studies have shown a bank's domesticity to affect lending. Cull and Pería (2013) argue that the lending of domestic private banks fell by less than the lending of foreign banks in Eastern Europe during the financial crisis of 2008–2009. De Haas and van Lelyveld (2006) show that greenfield banks under foreign ownership played a stabilizing role during crisis periods in Central and Eastern Europe (1993–2000), while domestic banks decreased their credit. The conditions in the parent company's country affected lending behaviors.

Savings banks are stakeholder banks and are similar to cooperative banks in many of the ways described above. However, they differ from cooperative banks in terms of ownership structure and objectives. Savings banks are not owned by members; they are instead foundations that offer banking services. Savings banks are either non-profit organizations or government-owned. According to Ayadi et al. (2009), savings banks have a "social mission", a regional commitment and a mandate to contribute to the common good. Ayadi et al. argue that savings banks need to balance their financial and social objectives because institutional survival is a precondition for providing socially relevant services. The relative weight on the financial objective depends on the competitive pressure. However, the impact that savings banks have in their customers' lives is their primary long-term goal. Because savings banks have a social objective alongside the financial one, Ayadi et al. (2009) argue that savings banks improve access to credit for those who are rationed out. Second, they may correct market failures caused by negative externalities. In addition, Ayadi et al. argue that savings banks can foster regional economic development because they operate within a narrowly defined region.

This study further separates savings banks into privately and publicly owned savings banks because state-owned savings banks have large market shares in German-speaking Europe. Furthermore, as stated in the introduction, several studies have suggested that government-owned banks smoothed lending over the business cycle or decreased lending during the financial

crisis to a lesser degree than private banks did. Moreover, Dinç (2005) and Micco et al. (2007) argue that government-owned banks increase lending in election years. Therefore, this study examines whether the lending patterns of publicly owned savings banks differ from privately owned savings banks.

2.2. Relationship banking

Banks that are oriented toward long-term relationships rather than one-off transactions are called relationship banks. Ferri et al. (2014a) argue that stakeholder banks are generally more likely than shareholder banks to be relationship-oriented. Ferri et al. suggest that cooperative banks attempt to smooth the financial conditions for their customers by conducting less cyclical loan supply. In doing so, they aim to maintain longer borrower-lender relationships. Moreover, Bartoli et al. (2013) suggest that, from 2004 to 2006, Italian local banks (mutual, cooperative and savings banks) used fewer transactional lending technologies and thus preferred more relationship lending technologies than other banks did.

Boot (2000) argues that relationships help resolve problems involving asymmetric information because borrowers do not need to worry about the disclosed information spilling over to competitors. Using data on small companies in the US from 1988 to 1989, Berger and Udell (1995) showed that borrowers with longer relationships pay lower interest rates and are less likely to pledge collateral. Berger and Udell (2002) suggests that the loan officer, who typically establishes most of the important relationships in the firm, is a repository of soft information, which creates an agency problem between the loan officer and bank management. Berger and Udell argue that small banks with a limited number of organizational layers are better able to solve the contraction problems between the loan officer and bank managers.

Furthermore, Petersen and Rajan (1994) suggest that long-term relationships increase the availability of financing for financially constrained borrowers. Bolton et al. (2013) suggest that banks building long-term relationships charged a higher intermediation spread before the financial crisis of 2008–2009; however, during the financial crisis, they offered more favorable continuation-lending terms than transaction banks did. The number of defaults in relationship banks was smaller. Naturally, shareholder banks can also form long-term relationships. Angelini et al. (1998) suggest that Italian non-cooperative banks increased their interest rates as the duration of relationship increased. Cooperative banks only increased interest rates for non-member clients, whereas the interests charged on member-owners were independent of duration.

Boot (2000) argues that there are two primary costs in relationship banking: soft-budget problems and hold-up problems. A soft-budget problem arises when banks cannot deny additional financing to a borrower who they already have financed. A transaction bank will reject the same borrower because they have no previous loans to the borrower to recover. Sharpe (1990) proposes that banks gain an informational advantage on their competitors from the information they gather from their relationships with their old customers, which leads to ex-post monopoly power even if banks are ex-ante competitive. This hold-up problem occurs when a bank has proprietary information on a well-performing firm and the firm has difficulties in conveying this information to other banks. Banks can use this advantage to charge ex-post high interest rates to gain rents. This threat of "bank capture" might make the borrower reluctant to borrow, and investment opportunities may be lost, which leads to loss in welfare. However, Sharpe (1990) shows that this inefficiency is reduced if lenders are able and incentivized to develop their reputations. Furthermore, the results of Agarwal and Hauswald (2010) suggest that banks strategically use private (soft) information to cause adverse-selection problems for competitors, to carve out captive markets and to protect their core business from the competition.

3. Data and econometric specifications

3.1. Data

Bankscope, a widely used database in banking research (e.g., Cull and Pería, 2013; Bertay et al., 2015, and several others), is the source for all the bank-specific variables used in this study. Bureau van Dijk provides the database, which consists of bank-level income statements and balance sheet data. Annual data are used in the study, and the sample period is from 2004 to 2013. Hence, the dataset includes the economic upswing preceding the two crises, the financial crisis of 2008–2009 and the sovereign debt crisis of 2010 onwards. Therefore, the dataset offers an excellent opportunity to study the cyclicality and resiliency of Western European banks. The sample countries include the EU15 and Western European countries outside the EU (Norway, Switzerland and Iceland). The microstates of Western Europe are not included. Moreover, the transition economies of Eastern Europe are not included—even if they were members of the EU and the EMU—to keep the sample countries more homogeneous.

The data are unconsolidated, if only to avoid possible consistency problems caused by any data consolidated from foreign subsidiaries.[2] Stakeholder banks typically operate in domestic markets, whereas major commercial banks have activities

[2] This point does not necessarily exclude all bank activity outside the sample countries. For example, for Barclays Bank PLC, the reported unconsolidated figures are the annual report figures for "The Bank", which refers to the parent company, Barclays PLC Group (Barclays Bank, 2011). The "Barclays Bank PLC" in the dataset is therefore the parent company of the subgroup Barclays Bank PLC Group and thus is the main arm of the banking division of the Barclays PLC Group. The parent (the bank) company of Barclays Bank Group as well as other bank groups' parent companies (main arms) may well have activity outside the country of origin. However, using unconsolidated data excludes the foreign subsidiaries, e.g., in the case of Barclays Bank PLC, "Barclays Bank

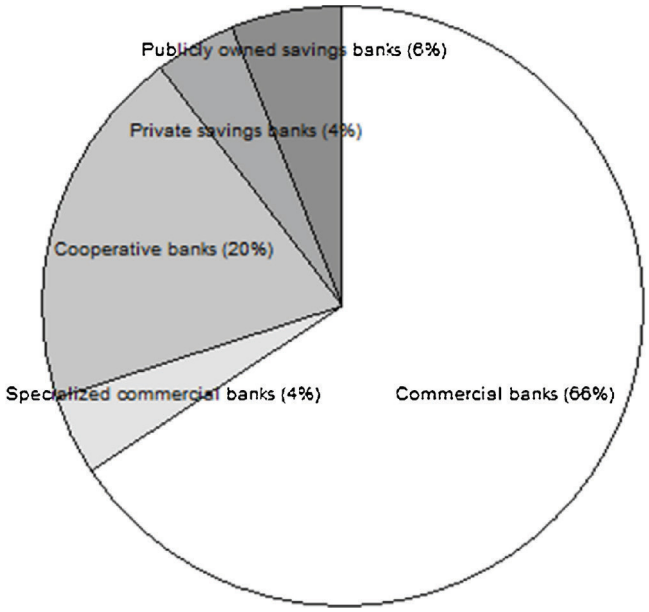

Fig. 2. Market shares in lending by bank ownership type (2012).
Source: Bankscope.

Table 2
Summary statistics for annual net lending growth (%) with outliers included.

	Mean	S.D.	Min	Max	Median	Skewness	Variance	*n*
Net loans growth (%)	64.81	7606	−30,107	1,260,371	3.52	158.15	57,800,000	29,199

on several continents, e.g., the Deutsche Bank group consists of 2171 consolidated entities (DB, 2014). Therefore, using unconsolidated data seems appropriate because it provides more accurate information on how lending growth developed in the sample countries.

Consistency is further improved by dividing commercial banks into retail-oriented and specialized commercial banks (as in Ferri et al., 2014b). The latter group includes banks within specific fields of finance, such as asset management companies, real estate banks, or banks financing export companies, and these banks are excluded from the dataset to ensure that commercial banks are more comparable with cooperative and savings banks, which mostly specialize in retail banking. The business field was identified by visiting bank websites. With respect to certain dissolved banks, corporate directories (BusinessWeek) were used. Banks with unidentifiable specializations were excluded from the dataset.

In some cases, Bankscope's ownership classifications[3] needed to be corrected. Some cooperative banks had subsidiaries that were classified as commercial banks, but these were reclassified as cooperative banks. The subsidiaries were sometimes asset management or specialized finance companies owned by cooperative banks, and, in such cases, they were removed from the dataset. In total, the dataset included 642 banks whose classifications were changed.[4] Furthermore, the dataset included banks that operated outside Western Europe (e.g., in the Caribbean Islands), but these banks were listed in Western Europe because their parent companies were European. These banks were also removed from the dataset. At this point, the dataset should consist of banks that are located and operate in Western Europe; the commercial banks in the sample should be universal banks, and the same should be true for the cooperative and savings banks. In total, 4043 banks in the dataset are included in the study. Four hundred eighty-four specialized commercial banks were excluded. Fig. 2 depicts the market shares in net loans by bank ownership type and shows that commercial banks make the vast majority of loans.

The ratios calculated according to the data included some observations that could only have been reporting errors. Table 2 shows that the highest annual percent growth in net loans is over 1,200,000%. As such, the variation and skewness are high.

of Zimbabwe Limited", "Barclays Group US, Inc." and several others. The banking division's subsidiaries located in the sample countries are included, e.g., "Barclays Bank S.A." in Spain.

[3] The downloaded dataset includes observations for commercial banks, cooperative banks, savings banks and bank holding companies. The last group was included because observations for some banks are available only as bank holding companies. Their specializations were checked manually when possible.

[4] Some of the "Raiffeisen" cooperative banks were classified as savings banks by Bankscope, and some of the German publicly owned savings banks (Sparkasse) were classified as cooperative banks. All these issues were corrected.

Table 3
Variable definitions.

d2004,d2005,. . .d2013	Year dummies that take a value of 1 according to the year
Profits	Pre-tax profits-to-total assets ratio (%)
Liquidity ratio	Liquid assets-to-total assets ratio (%)
Net loans	Net loans-to-total assets ratio (%)
Deposits	Customer deposits-to-total liabilities ratio (%)
Equity ratio	Total equity-to-total assets ratio (%)
log(total assets)	Natural logarithm of total assets
Net loans growth	Percentage growth of net loans p.a.
Cooperative bank	A dummy that takes a value of 1 if bank is a cooperative bank
Priv. savings bank	A dummy that takes a value of 1 if bank is a private savings bank
Publ. savings bank	A dummy that takes a value of 1 if bank is a publicly owned savings bank
GDP growth	Annual percent growth of GDP (source: the World Bank)
Share prices	Share price index, 2010 = 100 (source: OECD)

Extreme outliers can also be found in the independent variables. Outliers bias both the regression coefficients and the test statistics; therefore, the data are trimmed by removing the outliers from the sample. Cull and Pería (2013) removed the outliers from the dependent variable by dropping all observations above the 95th percentile and below the 1st percentile. This study uses a similar approach, and the values below the 1st and above the 99th percentiles for the dependent variable are removed. Alternatively, the removed observations could have been replaced by the values of the corresponding percentiles. However, because the outliers are attributed to reporting errors rather than to anomalies, they are excluded from the sample altogether. The outliers of the dependent variable did not typically change the main results (signs), but they did make some coefficients insignificant.

This procedure is applied to all the independent variables that are ratios. The results were generally not dependent on the outliers of the independent variables, but the coefficients changed slightly. This study aims to have a clear rationale for removing the outliers; hence, the values below the 1st and above the 99th percentiles are systematically dropped from every ratio. In the equity, liquidity and customer deposits-to-total assets ratios, the outliers were rather reasonable. Therefore, dropping them had practically no effect on the regression results. Nonetheless, the 1st and the 99th percentiles were dropped to simplify the study's reading. The natural logarithm of the total assets was left intact because it is not a ratio. The description of the bank variables used in the study can be found in the appendix (Table 3).

The summary statistics for the independent variables (Table 4) show that cooperative banks have the most observations in the dataset. On average, commercial banks are the largest banks (by far), whereas cooperative banks are the smallest. The average size of a cooperative bank is approximately one-twentieth the average size of a commercial bank. This difference is partially explained by the network structure of cooperative banks. Commercial banks have the highest standard deviation for profitability, which suggests volatile returns. Private savings banks are, on average, the most profitable. Moreover, the different ownership types have different equity ratios. On average, private savings banks have over 11% of their liabilities as equity, whereas the same figure is below 7% for publicly owned savings banks. All the stakeholder banks have almost equal deposit funding ratios (near 67%), whereas the same measure is 56% in commercial banks. The ratio decreases further to 52% if specialized commercial banks are included. This result suggests that cooperative and savings banks are more focused on retail banking; hence, including only retail-oriented commercial banks in the analysis is appropriate. With respect to the composition of assets, the liquidity ratio is significantly higher in commercial banks than in any of the stakeholder banks. The average ratio (24%) is more than twice as high in commercial banks as it is in private savings banks, and its difference with the average ratio of the bank type that ranked second in terms of liquidity, i.e., cooperative banks, is 9 percentage points.

3.2. Summary statistics and econometric specifications

During the sample period, commercial banks have the highest—and publicly owned savings banks have the lowest—average lending growth. The average lending growth of commercial banks is almost five times that of publicly owned savings banks. However, the median is highest for private savings banks. The standard deviation of publicly owned savings banks is high relative to the mean because of their slow lending growth in the pre-crisis period. The standard deviations of all the ownership types are fairly constant throughout the sample period (Table 5).

Figure 3 shows visible differences in the lending growth patterns of the ownership types. The high averages of commercial and private savings banks result from rapid lending growth in the pre-crisis period. In 2008, their averages plunge, and they are then closer to the averages of cooperative and publicly owned savings banks, which are more stable over the entire sample period. The average of publicly owned savings banks increases during the crisis period. Hence, on average, cooperative and publicly owned savings banks did not partake in the excess credit growth. The rapid—yet short—economic recovery in 2010 is as visible as the steep decrease preceding it. The GDP growth averages are not weighted, and they only consist of the averages of the GDP growth rates of the sample countries.

The methodology builds on Cull and Pería (2013), who examined the effect of the financial crisis of 2008–2009 on lending growth and the role that foreign and government ownership played in this growth. Thus, this study is similar to that of Cull

Table 4
Summary statistics for the independent variables (2004–2013).

	Commercial banks	Cooperative banks	Priv. savings banks	Publ. savings banks	Total
Profits					
Mean	0.66	0.56	0.89	0.40	0.58
S.D.	0.95	0.47	0.82	0.32	0.59
Min	−2.83	−2.84	−2.85	−2.77	−2.85
Max	3.47	3.45	3.47	3.23	3.47
Median	0.55	0.50	0.90	0.39	0.50
n	3637	19,196	3025	4856	30,714
Liquidity ratio					
Mean	23.85	14.84	11.60	13.65	15.40
S.D.	18.90	10.55	11.47	8.83	12.15
Min	1.07	1.09	1.07	1.08	1.07
Max	79.66	79.12	78.86	78.69	79.66
Median	17.76	12.25	7.87	11.93	12.17
n	3635	19,142	2984	4867	30,628
Equity ratio					
Mean	9.82	7.88	11.26	6.57	8.25
S.D.	8.87	3.77	5.94	3.96	5.11
Min	1.19	1.14	1.23	1.17	1.14
Max	65.85	65.11	65.87	63.38	65.87
Median	7.49	7.29	9.84	5.87	7.22
n	3738	19,089	3093	4867	30,787
Deposits					
Mean	56.22	67.32	68.34	67.77	66.23
S.D.	20.84	15.63	14.14	11.90	16.07
Min	5.07	5.04	5.80	5.39	5.04
Max	91.24	91.28	91.29	91.01	91.29
Median	58.20	71.52	69.63	69.33	70.04
n	3456	19,041	3027	4829	30,353
Total assets					
Mean	45,523.01	2333.13	4122.29	2496.16	8077.98
S.D.	166,275.50	18,028.93	15,739.36	5183.41	63,097.42
Min	0.96	2.20	0.31	4.79	0.31
Max	2,246,381	571,003	269,757.30	91,505.70	2,246,381
Median	1672.54	317.50	373.77	1345.30	467.25
n	4030	19,338	3151	4899	31,418

The values below the 1st and above the 99th percentiles are removed from all the variables, except total assets. All the variables, except total assets, are ratios to total assets, which are expressed as percentages. *n* = the number of observations.

Table 5
Summary statistics for the growth in net loans (%) by bank ownership type (2004–2013).

	Mean	S.D.	Min	Max	Median	*n*
Commercial banks	9.46	17.86	−26.30	85.49	5.94	3231
Cooperative banks	5.27	9.20	−25.83	86.19	3.73	17,831
Private savings banks	8.54	13.27	−24.25	82.28	7.61	2779
Publicly owned savings banks	2.00	6.00	−26.04	81.13	1.52	4776
Full sample	5.51	10.79	−26.30	86.19	3.52	28,617

Values below the 1st and above the 99th percentiles are removed.

and Pería, which makes their work a good benchmark for ours. The significant periods for this study are 2008–2009 and 2010–2013. Consequently, year dummies are used to indicate the years from 2008 to 2013. These dummies are the variables of primary interest. Additionally, to control for other factors that are likely to affect lending, there are control variables for profitability, liquidity, deposit funding, the equity ratio and bank size. Finally, to control for shocks in lending demand, most of the regressions include GDP growth (as in De Haas et al., 2015).

$$\begin{aligned}\Delta(\text{Net loans})_{it} = {} & \alpha + \beta_1 d2008_{it} + \beta_{2-4} Ownership_{it} \times \text{d2008}_{it} + \beta_5 \text{d2009}_{it} + \beta_{6-8} Ownership_{it} \times \text{d2009}_{it} + \beta_9 \text{d2010}_{it} \\ & + \beta_{10-12} Ownership_{it} \times \text{d2010}_{it} + \beta_{13} \text{d2011}_{it} + \beta_{14-16} Ownership_{it} \times \text{d2011}_{it} + \beta_{17} \text{d2012}_{it} \\ & + \beta_{18-20} Ownership_{it} \times \text{d2012}_{it} + \beta_{21} \text{d2013}_{it} + \beta_{22-24} Ownership_{it} \times \text{d2013}_{it} + \beta_{25} Profits_{i(t-1)} \\ & + \beta_{26} Liquidity\ ratio_{i(t-1)} + \beta_{27} Deposits_{i(t-1)} + \beta_{28} Equity\ ratio_{i(t-1)} + \beta_{29} \log(Total\ assets)_{i(t-1)} \\ & + GDP\ growth_{i(t-1)} + \varepsilon_{it}\end{aligned}$$

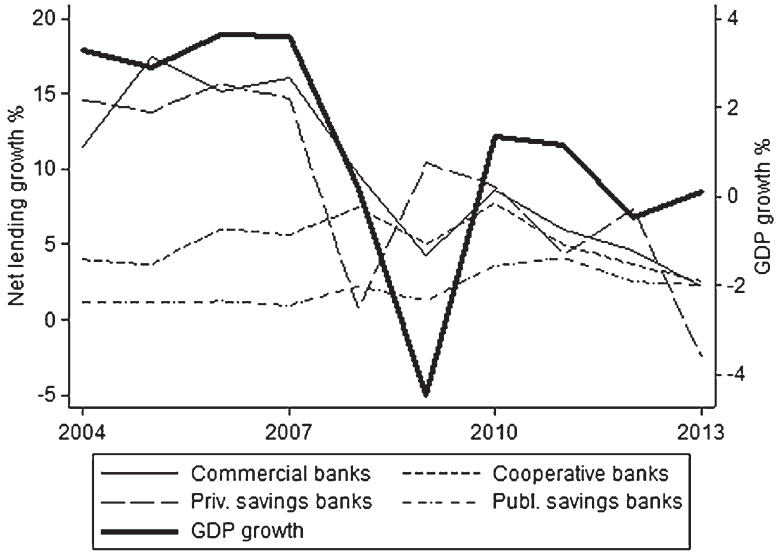

Fig. 3. Lending growth by bank ownership type (2004–2013).

The dependent variable is the percent growth in net lending. The year dummies interact with the dummies for ownership type. Hence, four variables exist for every crisis year. The comparison group is commercial banks. First, the regression is run with fixed country effects. This regression lacks the lagged GDP growth, and it is meant to be a descriptive regression. Second, the regression is run with fixed bank effects, including the GDP growth variable, which controls the loan demand. Third, country-year interactions are included in the bank fixed effects regression to remove the time-variant, country-specific effects that are common within countries but not common across the entire sample. Analytically, the second and the third regressions are the more important ones, and the interpretation of the results is based on these two regressions. The third regression is then repeated with a sample including only countries that had a systemic banking crisis in the crisis years. This regression aims to investigate whether the results are similar in the crisis countries. Here, we use the classification[5] of Laeven and Valencia (2012).

Furthermore, specifications without the interaction terms are used to run separate regressions for the ownership types as robustness checks and to examine whether the results are conditional on the shared coefficients. Moreover, these steps aim to investigate whether the bank ownership types with less cyclical lending growth actually contributed less to the credit boom or increased their lending in the crisis years. Finally, robustness is checked with consolidated data. The error terms are robust in all the specifications, and the control variables are lagged by one period.

4. Results

4.1. Regression results

As Fig. 3 suggests, the lending growth by ownership type reveals different cyclical patterns. According to the regression results, both the financial crisis and the sovereign debt crisis caused a negative shock in the lending growth of retail-oriented commercial banks. Lending growth for this type of bank is below pre-crisis levels in all the crisis years. Cooperative banks typically have positive results. The summed main effects and interactions are above or near zero in most crisis years.[6] Like cooperative banks, publicly owned savings banks have results above zero in every crisis year (Table 6).

Private savings banks have a unique lending pattern. Their result for 2009 is close to zero, whereas their result for 2008 is negative with a large magnitude. The result for private savings banks in 2008 is partially explained by Norway, where the above-average net lending growth of private savings banks dipped below average in 2008. Excluding Norway from the regression renders the interaction term for private savings banks insignificant in 2008 (and in 2013). Finally, the dummy

[5] According to the classification of Laeven and Valencia (2012), the countries experiencing a systemic banking crisis are Austria, Belgium, Denmark, Germany, Greece, Iceland, Ireland, Luxembourg, Spain and the United Kingdom.

[6] This result is different from that of De Santis and Surico (2013), who suggest that the lending of cooperative banks is procyclical but less than the lending of commercial banks. However, their study focuses primarily on the transmission of monetary policy; it has a different dataset and methodology; and the cyclical (control) variable is GDP growth. This study examines the effects of the financial crisis and the sovereign debt crisis on lending growth. Thus, we argue that these results support each other.

Table 6
Explaining lending growth from 2004 to 2013.

	(1)	(2)	(3)	(4)
d2008	−5.57 (0.000)	−3.00 (0.006)	1.12 (0.358)	1.72 (0.324)
coop × d2008	7.47 (0.000)	4.76 (0.000)	3.77 (0.000)	3.07 (0.068)
privsavi × d2008	−6.99 (0.000)	−5.91 (0.000)	3.48 (0.030)	2.86 (0.112)
statesavi × d2008	6.79 (0.000)	2.52 (0.025)	2.91 (0.011)	2.31 (0.180)
d2009	−9.07 (0.000)	−2.03 (0.067)	−1.09 (0.457)	−2.69 (0.205)
coop × d2009	9.29 (0.000)	5.76 (0.000)	4.36 (0.001)	6.27 (0.002)
privsavi × d2009	8.38 (0.000)	8.62 (0.000)	3.54 (0.020)	4.35 (0.020)
statesavi × d2009	9.70 (0.000)	3.77 (0.001)	2.32 (0.086)	4.11 (0.045)
d2010	−4.84 (0.000)	7.02 (0.000)	2.05 (0.145)	2.96 (0.117)
coop × d2010	7.71 (0.000)	5.73 (0.000)	5.02 (0.000)	5.14 (0.002)
privsavi × d2010	0.74 (0.553)	1.24 (0.393)	2.20 (0.126)	0.99 (0.555)
statesavi × d2010	7.53 (0.000)	3.24 (0.008)	3.43 (0.004)	3.62 (0.035)
d2011	−6.55 (0.000)	−1.09 (0.355)	0.96 (0.485)	−0.17 (0.928)
coop × d2011	6.96 (0.000)	4.32 (0.000)	2.61 (0.020)	4.04 (0.013)
privsavi × d2011	−1.85 (0.125)	0.40 (0.754)	3.07 (0.037)	3.47 (0.058)
statesavi × d2011	9.50 (0.000)	2.77 (0.018)	0.84 (0.479)	2.33 (0.164)
d2012	−8.85 (0.000)	−2.03 (0.114)	−1.15 (0.413)	−3.20 (0.105)
coop × d2012	8.04 (0.000)	5.37 (0.000)	3.51 (0.006)	5.63 (0.003)
privsavi × d2012	3.39 (0.009)	5.55 (0.000)	5.20 (0.001)	5.25 (0.009)
statesavi × d2012	10.34 (0.000)	2.80 (0.027)	0.69 (0.599)	2.87 (0.134)
d2013	−10.81 (0.000)	−2.19 (0.075)	−2.72 (0.116)	−5.97 (0.004)
coop × d2013	8.77 (0.000)	7.73 (0.000)	4.67 (0.000)	8.63 (0.000)
privsavi × d2013	−4.16 (0.001)	−2.58 (0.070)	2.99 (0.071)	3.89 (0.077)
statesavi × d2013	12.07 (0.000)	5.49 (0.000)	1.17 (0.356)	5.08 (0.002)
L.Profits	2.67 (0.000)	3.15 (0.000)	1.58 (0.000)	1.33 (0.000)
L.Liquidity ratio	0.06 (0.000)	0.17 (0.000)	0.13 (0.000)	0.12 (0.000)
L.Deposits	0.02 (0.011)	0.09 (0.000)	0.04 (0.094)	0.02 (0.340)
L.Equity ratio	−0.02 (0.653)	0.18 (0.061)	0.02 (0.853)	−0.09 (0.439)
L.log(total assets)	0.03 (0.564)	−13.74 (0.000)	−12.78 (0.000)	−13.31 (0.000)
Cooperative bank	−6.71 (0.000)			
Private savings bank	−1.27 (0.089)			
Publ. savings bank	−8.63 (0.000)			
L.GDPGrowth		1.02 (0.000)	0.27 (0.000)	0.42 (0.000)
Constant	7.90 (0.000)	77.20 (0.000)	79.52 (0.000)	83.94 (0.000)
Observations	27,134	27,134	27,134	21,851
Banks	3812	3812	3812	3084
R^2	0.15	0.18	0.30	0.24
Fixed country effects	Yes	No	No	No
Fixed bank effects	No	Yes	Yes	Yes
Country-year interactions	No	No	Yes	Yes

All the bank-specific variables except log(Total assets) have had values below the 1st and above the 99th percentiles removed. All the variables, except dummies and log(total assets), are ratios to total assets, which are shown as percentages. × = interaction term, and L = lagged by one period. The results for the country dummies and country-year interactions are omitted. *P*-values are given in parentheses.

variables for all the ownership types are significantly negative. As expected, the magnitudes are largest for cooperative and publicly owned savings banks.

The second regression with fixed bank effects and GDP growth gives similar results to those in the first regression. When demand shocks are controlled, the lending growth of cooperative banks and publicly owned savings banks was above the lending growth of commercial banks and generally above that of private savings banks. The third regression with fixed bank effects and country-year interactions confirms the results for cooperative banks. The results also suggest that the lending growth of private savings banks was faster than that of commercial banks in every crisis year except 2010. Moreover, the result is always positive. This observation suggests that the steep decrease in the lending growth of private savings banks was mainly the result of country-related factors that were common to all the banks in the country. The ownership structure affected lending in such a way that lending expanded during the crisis years when the macroeconomic shocks were taken into account. The same holds true for publicly owned savings banks during the 2008–2010 period.

To conclude, the result is the most robust for cooperative banks. Moreover, all the stakeholder banks had higher lending growth than the commercial banks during the 2008–2009 financial crisis. This was an external crisis, whereas the sovereign debt crisis was an internal crisis for Europe. The insignificant coefficients for publicly owned savings banks during the sovereign debt crisis suggest that they are better able to absorb external shocks; however, internal shocks have an effect on their lending growth. Finally, the fourth regression includes the countries that had a systemic banking crisis. The results generally resemble those of the third regression (Table 7).

The separate regressions lead to similar results. The more descriptive regressions with fixed country effects and without GDP growth show that the lending growth of commercial banks and private savings banks was below the pre-crisis level

Table 7
Separate regressions for the bank ownership types with fixed country effects.

	(5)	(6)	(7)	(8)
d2008	−5.43 (0.000)	1.97 (0.000)	−12.57 (0.000)	1.51 (0.000)
d2009	−8.57 (0.000)	0.35 (0.135)	−1.15 (0.177)	1.02 (0.002)
d2010	−4.63 (0.000)	2.93 (0.000)	−4.44 (0.000)	2.84 (0.000)
d2011	−6.41 (0.000)	0.40 (0.056)	−8.69 (0.000)	3.07 (0.000)
d2012	−8.44 (0.000)	−0.79 (0.000)	−5.91 (0.000)	1.45 (0.000)
d2013	−9.93 (0.000)	−2.24 (0.000)	−15.46 (0.000)	1.16 (0.019)
L.Profits	2.80 (0.000)	2.92 (0.000)	2.17 (0.000)	3.02 (0.000)
L.Liquidity ratio	0.17 (0.000)	0.02 (0.010)	0.06 (0.095)	0.01 (0.622)
L.Deposits	−0.03 (0.153)	0.05 (0.000)	0.05 (0.116)	−0.01 (0.230)
L.Equity ratio	0.02 (0.795)	−0.07 (0.129)	−0.01 (0.875)	0.13 (0.148)
L.log(total assets)	−0.88 (0.000)	0.32 (0.000)	0.46 (0.037)	0.07 (0.475)
Constant	15.83 (0.000)	−1.60 (0.051)	−1.23 (0.775)	1.27 (0.233)
Observations	2669	17,244	2507	4714
Banks	453	2391	407	561
R^2	0.15	0.10	0.24	0.08

The groups are (5) commercial banks, (6) cooperative banks, (7) private savings banks and (8) publicly owned savings banks. L = lagged by one period. The results for the country dummies are omitted. *P*-values are given in parentheses.

in the crisis years. Typically, the lending growth of cooperative banks was above the pre-crisis level, was near it, or did not differ from it significantly. Publicly owned savings banks show positive results for every crisis year. Regarding the control variables, bank size decreases lending growth in commercial banks, but the result is the opposite for cooperative banks and private savings banks. Profitability increases lending growth for all ownership types. Deposit funding slightly boosts lending in cooperative banks. The results for the liquidity ratio are significant for commercial banks, cooperative banks and private savings banks, but the magnitude is the highest for commercial banks (Table 8).

The separate regressions that control for GDP growth (loan demand) give similar results. When the demand is held constant, the lending growth in cooperative banks and publicly owned savings banks is higher in the crisis years. The coefficients for commercial banks are typically insignificant or negative, with the exception of 2010. Private savings banks show both positive and negative results. The results suggest that cooperative banks and publicly owned savings banks increased their lending during the crisis years, whereas commercial banks curtailed their lending or adjusted it according to shocks in demand. The results for private savings banks are similar to the earlier results from the full sample regression with bank fixed effects. Thus, as the descriptive statistics suggest, the lending patterns of commercial banks and private savings banks resulted in the lending boom in the pre-crisis era and in the strong contraction in lending growth during the financial crisis. The collapse brought their average lending growth closer to those of cooperative banks and publicly owned savings banks. In the meantime, cooperative banks and publicly owned savings banks increased their lending during the crisis years. Robustness checks using consolidated data confirm these results. The results can be found in the appendix.

Table 8
Separate regressions with fixed bank effects and lagged GDP growth for the bank ownership types.

	(9)	(10)	(11)	(12)
d2008	−4.32 (0.001)	1.65 (0.000)	−8.37 (0.000)	1.24 (0.000)
d2009	0.56 (0.717)	4.07 (0.000)	3.26 (0.002)	1.59 (0.000)
d2010	15.62 (0.000)	13.87 (0.000)	0.71 (0.667)	5.14 (0.000)
d2011	−0.87 (0.603)	3.11 (0.000)	0.01 (0.996)	3.42 (0.000)
d2012	−1.20 (0.516)	3.38 (0.000)	3.24 (0.030)	1.83 (0.009)
d2013	0.73 (0.736)	5.92 (0.000)	−5.62 (0.001)	2.15 (0.026)
L.Profits	3.48 (0.000)	2.96 (0.000)	2.41 (0.000)	2.54 (0.000)
L.Liquidity ratio	0.30 (0.000)	0.11 (0.000)	0.29 (0.000)	0.06 (0.037)
L.Deposits	0.08 (0.156)	0.11 (0.000)	0.08 (0.180)	−0.02 (0.717)
L.Equity ratio	−0.14 (0.476)	0.35 (0.011)	0.58 (0.005)	0.41 (0.074)
L.log(total assets)	−12.41 (0.000)	−14.55 (0.000)	−16.23 (0.000)	−9.77 (0.000)
L.GDP growth	2.37 (0.000)	1.17 (0.000)	−0.31 (0.092)	0.23 (0.034)
Constant	90.89 (0.000)	73.11 (0.000)	92.74 (0.000)	66.91 (0.001)
Observations	2669	17,244	2507	4714
Banks	453	2391	407	561
R^2	0.22	0.15	0.29	0.10

The groups are (9) commercial banks, (10) cooperative banks, (11) private savings banks and (12) publicly owned savings banks. L = lagged by one period. The results for the country dummies are omitted. *P*-values are given in parentheses.

Table 9
The difference in lending growth (%) in the crisis years and the pre-crisis period of 2004–2007.

	2008	2009	2010	2011	2012	2013	Average
Countries with stakeholder banks							
FR	−3.32	−8.63	−6.8	−6.26	−8.35	−9.13	−7.08
AT	1.68	−2.84	−0.38	−2.46	−4.37	−4.27	−2.11
IT	−1.78	−4.97	−4.7	−8.77	−10.87	−14.65	−7.62
DE	0.45	0.68	2.12	2.86	2.16	2.25	1.75
NL	−15.69	−6.59	−10.46	−0.73	−17.69	−19.46	−11.77
ES	−11.07	−17.57	−18.16	−19.69	−20.75	−23.81	−18.51
FI	5.98	−3.59	−5.58	−3.38	−2.87	−4.14	−2.26
CH	13.74	2.34	21.54	4.45	0.59	−1.49	6.86
LU	−5.42	−16.24	−10.64	−6.88	−13.23	−21.12	−12.26
NO	−23.83	4.45	−5.09	−10.05	−4.29	−21.56	−10.06
SE	−12.78	3.33	8	−7.71	−4.83	−8.48	−3.75
PT	−2.13	−13.26	−10.48	−15.74	−24.39	−23.26	−14.88
Average	−4.62	−4.93	−3.08	−6.19	−9.14	−12.73	−6.78
Countries without stakeholder banks							
GR	−7.49	−24.03	−26.63	−37.91	−31.08	−13.71	−23.48
IS	−35.45	−25.42	−5.26	−17.34	−17.13	1.57	−16.51
GB	−18.67	−12.74	−10.85	−14.47	−6.64	−13.85	−12.87
IE	−17.25	−32.05	−30.57	−38.26	−29.62	−35.11	−30.48
DK	−18.86	−28.39	−26.61	−24.83	−27.4	−27.12	−25.54
BE	−3.16	−8.75	−2.66	−12.55	−12.96	−9.39	−8.25
Average	−16.81	−21.90	−17.10	−24.23	−20.81	−16.27	−19.52

These figures show the difference in the average lending growth from 2004 to 2007 and the annual lending growth in the crisis years. Therefore, these figures are similar to production gaps. The unit is percentages; hence, the interpretation is "percent unit gap in the average lending growth in pre-crisis period and in each crisis year". A negative figure means that lending growth is below the average pre-crisis level. The numbers are calculated from Bankscope data.

4.2. Discussion

Because Basel III emphasizes reducing the cycle-amplifying features of the banking system, the regression results offer some important implications for discussion. Table 9 shows the difference in the average lending growth from 2004 to 2007 and the lending growth during the crisis years (i.e., the "lending gap"). A negative figure shows how many percentage points the lending growth in a given year fell below the average lending growth during the pre-crisis period. On average, lending growth declined particularly rapidly in Ireland, Denmark and Greece during the crisis years. In the table, the first group includes countries where stakeholder banks have a combined lending market share that is larger than 10%. The averages show that, during the crisis years, lending growth decreased much less in the countries in which stakeholder banks had a firm foothold. The average gap is roughly one-third of the gap of the other countries. The two groups' differences in yearly averages are high from 2008 to 2011, but they decrease in the later crisis years. These observations fit the regression results well.

Fig. 4 shows the lending growth averages of countries in which stakeholder banks have a combined lending market share that is greater than 10%. Lending growth is not nearly as cyclical in countries with stakeholder banks as in the other sample countries. Based on the regression results, we argue that this difference is linked to the lending policies of stakeholder banks. In these countries, the average pre-crisis growth is less than one-third of the average growth of countries with mainly commercial banks. Moreover, lending growth during the sovereign debt crisis is faster.

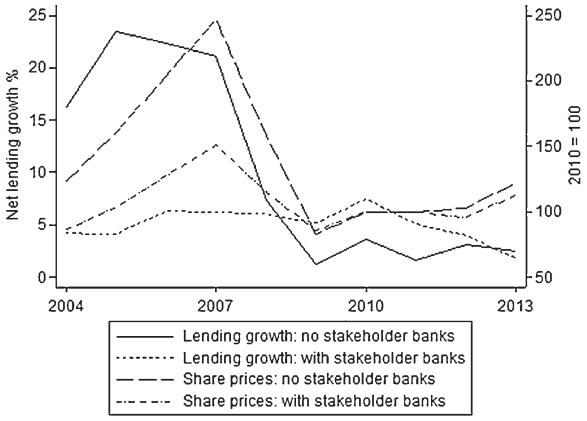

Fig. 4. Lending growth and share price growth in countries with/without cooperative and publicly owned savings banks (2004–2013).

Fig. 4 also shows the average share price indices. Share prices grew much faster in 2004–2007 in the countries without stakeholder banks. Therefore, the stock market crash during the financial crisis was much more dramatic. Thus, it seems safe to assume that the credit boom contributed to an asset price bubble. However, the extent to which this phenomenon is an asset price bubble and the extent to which it reflects discounted expected returns is a topic for future research.

To sum up, the results suggest that stakeholder banks shield the banking sector and the economy from crises. Countries without stakeholder banks would benefit from their presence because they alleviate the harmful effects of such crises. In terms of policy suggestions, the establishment of cooperative banks and/or their penetration into new market areas should be encouraged. Such changes would alter the banking architecture of Western Europe in a more stable direction.

5. Conclusions

Using a panel of Western European banks, this study examined lending growth over the 2004–2013 period. Special attention was paid to the effects that the 2008–2009 financial crisis and the 2010–2013 sovereign debt crisis had on lending growth. Banks were divided into four groups by ownership type: retail-oriented commercial banks, cooperative banks and privately and publicly owned savings banks.

The results suggest that the lending growth of cooperative and publicly owned savings banks was unaffected by the shocks caused by the two crises. However, the contractive effects of the two crises on the lending of commercial banks and private savings banks were striking, and those banks have not yet recovered. However, including country-year interactions in the regressions suggests that when the country-year-specific factors are considered, the lending growth of private savings banks was typically higher during the crisis years than the lending growth of commercial banks. This finding suggests that, without private savings banks, the collapse in lending growth would have been even higher in the countries where they were located. Thus, the lending of cooperative banks, private savings banks and publicly owned savings banks lack the procyclical effects that characterize the lending of commercial banks. This result is strongest for cooperative banks but holds for both types of savings banks to a lesser extent. Moreover, the result holds for the full sample covering Western Europe and the sample consisting of the countries experiencing a systemic banking crisis.

For cooperative banks, a potential explanation for the cycle-neutral result is that the objective of these banks is to serve their members. These banks do not curb their lending during economic crises; they instead aim to meet their members' financial needs independent of the macroeconomic environment. They thereby seek to maintain long-term lending relationships with their member-customers (for further evidence, see Ferri et al., 2014a). Therefore, cooperative banks do not amplify financial shocks; hence, they act as shock absorbers within the financial system. Moreover, cooperative banks did not participate in the excess credit growth during the pre-crisis period, which can be explained by their relationship-oriented banking and the absence of profit maximization goals.

Similar to cooperative banks, private savings banks do not seek to maximize profits and thus have no incentive to participate in risky projects. Thus, their lending is not as procyclical as that of shareholder-owned commercial banks. Although their lending growth decreased substantially during the crisis years, the results suggest that this decrease was caused by factors related to the countries in which they were located. This result suggests that private savings banks are committed to their "social mission" despite economic challenges. The results with regard to publicly owned savings banks agree with those earlier studies that have suggested that the lending behavior of government-owned banks is less procyclical.

Therefore, the lending policies of stakeholder banks improve the banking sector's ability to absorb shocks and to protect the economy from excess credit growth. In general, relationship banking and stakeholder banks might mitigate the credit supply problems in banking crises and lessen the procyclical dynamics of the banking system. On average, lending growth was much more cyclical in countries with no stakeholder banks. Moreover, the rapid credit growth of commercial banks likely contributed to an asset price bubble. Hence, the results suggest that one explanatory factor for the financial health differences among eurozone countries is the presence or absence of stakeholder banks. The importance of these results is reinforced by the bank-based financial system of Western Europe. Together with the large market shares of stakeholder banks, these results should be considered by financial sector regulators. In particular, a significant share of the Western European banking system already meets the new objectives regarding shock absorption that are suggested in Basel III.

Different loan types (e.g., commercial or residential loans) were not included in this study because the data on these loans are scarce and unreliable. Other researchers are advised to be particularly cautious when using data on loan types. Moreover, banks should be encouraged to report loan types more often in their annual reports. Reliable data on loan types would have numerous uses in the literature on banking and financial stability. For instance, the role of bank ownership type in the credit supply to the non-financial companies that were dependent on bank lending (SMEs) during the two crises requires further research.

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Appendix A. Appendix

See Tables A1 and A2

Table A1
Description of bank variables.

Pre-tax profits	Includes the operating profit, the share of profit from associates under equity accounting, non-recurring income/expenses and other non-operating income/expenses
Net loans	Includes all other loans, except loans for banks. Net loans do not include reserves built in for loan losses or loans to banks
Liquid assets	Includes assets that are available to counter suddenly withdrawn customer and short-term funds
Total assets	Includes total earning assets, cash and cash due from banks, foreclosed real estate, fixed assets, goodwill and other intangibles, current tax assets, deferred tax assets, discontinued operations (e.g., assets of a sold business) and all other assets not otherwise categorized (e.g., prepayments)
Total customer deposits	Includes current deposits, savings deposits and term deposits made by customers
Total equity	Includes common and premium shares, retained earnings, reserves for general banking risks and statutory reserves, loss absorbing minority interests and revaluation reserves

Table A2
Explaining lending growth using a dataset of consolidated data (2004–2013).

	(1)	(2)	(3)
d2008	−7.32 (0.000)	−2.34 (0.247)	6.78 (0.070)
coop × d2008	6.79 (0.004)	4.44 (0.049)	−2.17 (0.443)
privsavi × d2008	−12.95 (0.000)	−12.27 (0.000)	−4.90 (0.046)
statesavi × d2008	14.30 (0.000)	10.01 (0.010)	2.71 (0.611)
d2009	−13.06 (0.000)	−7.20 (0.000)	−3.61 (0.448)
coop × d2009	8.00 (0.000)	7.62 (0.000)	6.98 (0.009)
privsavi × d2009	3.34 (0.196)	4.28 (0.105)	3.93 (0.098)
statesavi × d2009	11.08 (0.001)	9.23 (0.009)	3.62 (0.430)
d2010	−9.46 (0.000)	−1.36 (0.612)	−3.24 (0.665)
coop × d2010	6.46 (0.001)	6.63 (0.002)	6.87 (0.006)
privsavi × d2010	−1.20 (0.669)	0.97 (0.725)	2.37 (0.392)
statesavi × d2010	15.56 (0.000)	13.70 (0.007)	0.27 (0.961)
d2011	−12.89 (0.000)	−7.28 (0.004)	−4.67 (0.361)
coop × d2011	7.35 (0.000)	8.30 (0.000)	9.72 (0.000)
privsavi × d2011	−2.22 (0.347)	2.92 (0.248)	4.68 (0.092)
statesavi × d2011	13.47 (0.000)	12.29 (0.005)	5.82 (0.216)
d2012	−12.18 (0.000)	−6.07 (0.022)	−1.77 (0.691)
coop × d2012	4.61 (0.041)	5.85 (0.022)	5.58 (0.072)
privsavi × d2012	0.64 (0.828)	4.52 (0.146)	4.92 (0.141)
statesavi × d2012	10.22 (0.002)	10.17 (0.013)	4.69 (0.306)
d2013	−14.28 (0.000)	−7.86 (0.002)	−7.13 (0.174)
coop × d2013	6.18 (0.000)	8.48 (0.000)	8.84 (0.001)
privsavi × d2013	−7.77 (0.001)	−3.51 (0.231)	4.00 (0.257)
statesavi × d2013	9.83 (0.001)	9.81 (0.025)	4.03 (0.383)
L.Profits	3.81 (0.000)	2.51 (0.000)	1.78 (0.002)
L.Liquidity ratio	0.14 (0.000)	0.28 (0.000)	0.25 (0.003)
L.Liabilities	0.08 (0.000)	0.05 (0.691)	0.05 (0.620)
L.Equity ratio	−0.11 (0.467)	0.35 (0.423)	0.71 (0.060)
L.log(total assets)	−0.53 (0.030)	−18.31 (0.000)	−15.49 (0.000)
Cooperative bank	−5.43 (0.000)		
Private savings bank	1.68 (0.312)		
Publ. savings bank	−7.84 (0.007)		
L.GDPGrowth		0.43 (0.135)	−1.04 (0.269)
Constant	9.12 (0.007)	167.34 (0.000)	143.72 (0.000)
Observations	2619	2619	2619
Banks	433	433	433
R^2	0.27	0.31	0.43
Fixed country effects	Yes	No	No
Fixed bank effects	No	Yes	Yes
Country-year interactions	No	No	Yes

All the bank-specific variables, except log(total assets), have had the values below the 1st and above the 99th percentiles removed. All the variables, except dummies and log(total assets), are ratios to total assets, which are shown as percentages. × = interaction term, L = lagged by one period. The results for the country dummies and country-year interactions are omitted. *P*-values are given in parentheses.

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Western European Stakeholder Banks' Loan Loss Accounting

Jari-Mikko Meriläinen[1]

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Abstract This study examines loan loss provisions (LLPs) in Western European banks over the 2004–2015 period. In particular, this study examines the discretionary cyclical component of LLPs and the timeliness of loan loss provisioning. Moreover, this study investigates the cyclicality of impaired loans. Banks are divided into four groups according to bank ownership type. The groups are commercial banks, cooperative banks, private savings banks and publicly owned savings banks. We thus study the implications of bank ownership type on banks' loan loss accounting. The regression results suggest that, in general, provisions have a component that is unexplained by discretionary factors and that decreases during economic expansions and increases during recessions. However, in cooperative banks, this component is significantly smaller, suggesting that they do not decrease provisions because of, for example, over-optimism. Furthermore, stakeholder banks allocate provisions for the near-future expected losses whereas commercial banks do not. Finally, the impaired loans of savings banks are less sensitive to changes in the business cycle than those of commercial banks and cooperative banks.

Keywords Banks · Loan loss provisions · Bank ownership types

JEL Classifications G21 · M41

1 Introduction

1.1 Introduction

Loan loss provisions (LLPs) are the largest accruals on bank income statements. Empirical evidence has shown that LLPs grow rapidly in recessions, causing a shock to bank profitability. Olszak et al. (2017) identify several factors that affect the sensitivity of bank's LLPs to

✉ Jari-Mikko Meriläinen
jari-mikko.merilainen@uva.fi

[1] Economics, University of Vaasa, Wolffintie 34, FI-65200 Vaasa, Finland

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changes in GDP growth, i.e., the cyclicality of LLPs, using data from 27 EU countries from 1996 to 2011. These include factors that are related to regulatory environment and bank characteristics. In addition, these authors show that Western European cooperative banks and savings banks have less cyclical LLPs than their commercial counterparts. A similar result is shown by Alessi et al. (2014), who suggest that Italian cooperative banks' LLPs are less cyclical than those of Italian commercial banks from 2006 to 2012.

Furthermore, Bertay et al. (2015) show that state-owned banks' LLPs are less procyclical, i.e., less negatively linked to GDP growth, than those of private banks using a sample of banks from 111 countries over the 1999–2010 period. These authors propose two alternative explanations for this result; the first suggests that loan deterioration is less cyclical in state-owned banks. Alternatively, the difference may be caused by more conservative accounting for loan deterioration in state-owned banks during booms. Bertay et al. (2015) propose that the latter interpretation can result in over-optimistic provisioning during booms that could also be motivated by profitable lending opportunities elsewhere.

This study considers a similar setting to these studies and examines the cyclicality of LLPs. In particular, this study examines whether banks have a cyclical LLP component that could result from subjective factors, such as over-optimism, as suggested by Bertay et al. (2015). Unlike Olszak et al. (2017), who studied the general cyclicality of LLPs in 27 EU countries, this study aims to decompose this discretionary cyclical component of LLPs. In terms of estimation, this implies that there is a component of LLPs that is not explained by non-discretionary variables, i.e., by loan losses, and that relates (negatively) to GDP growth. This is the part of LLPs that could be caused by, e.g., over-optimism or exaggeration, as proposed by Bertay et al. (2015).

Banks are divided into four groups by bank ownership type. The groups are commercial banks, cooperative banks and private and publicly owned savings banks. This classification is motivated by the results of Olszak et al. (2017), Bertay et al. (2015) and Alessi et al. (2014). We thus examine whether differences in banks' missions and objectives stemming from their ownership type affect their provisioning. Furthermore, differences in ownership structure potentially provide different risk-taking incentives for management, which may in turn affect their LLPs. These differences are explained in detail after the introduction. In addition, Olszak et al. (2017) argue that commercial banks' LLPs are more cyclical than those of stakeholder banks because internationally operating commercial banks are more prone to changes in the state of the economy. This implies that their stronger cyclicality is explained by non-discretionary factors; therefore, bank ownership types should exhibit no differences in cyclicality after controlling for these factors.

Based on these studies and hypotheses, we examine whether LLPs are differently related to GDP growth based on the bank ownership type; we assume that because stakeholder banks maximize stakeholder value instead of shareholder value, their LLPs do not have a cyclical component that decreases during economic booms. Consequently, the hypothesis tested is that i) stakeholder banks' provisioning is less cyclical than that of commercial banks, i.e., stakeholder banks' LLPs do not have a discretionary component, unexplained by non-discretionary factors, that is (negatively) related to GDP growth.

Second, this study examines whether bank ownership type differentially affects LLPs for expected near-future profits, i.e., whether they have differences in 'explicit forward-lookingness' (as in Bushman and Williams 2012). We assume that because stakeholder banks are subject to different constraints in their firm value maximization problem, they are encouraged to allocate more timely LLPs for expected near-future losses, whereas commercial banks' LLPs are expected to be less timely. Therefore, the hypothesis tested is that ii) stakeholder

banks that maximize stakeholder value instead of shareholder value allocate LLPs for expected near-future losses in a forward-looking manner. This is motivated by the studies mentioned above and by the results of Nichols et al. (2009) who suggest that publicly traded banks allocate larger and timelier LLPs than do private (unlisted) banks. In this study, this hypothesis is examined in the context of shareholder/stakeholder ownership.

Third, this study examines the cyclicality of impaired loans. As Bertay et al. (2015) suggest, the cyclicality of LLPs is affected both by the cyclical pattern of loan deterioration and by discretion. This study uses a regression function to explain the cyclicality of impaired loans. We thus examine whether the results of Olszak et al. (2017) that cooperative banks and savings banks' LLPs are less cyclical than those of commercial banks are affected by discretionary behavior or cyclical patterns of recognized non-performing loans. Consequently, the hypothesis is that iii) stakeholder banks' loan deterioration is less cyclical than that of commercial banks.

The link between LLPs and GDP growth, i.e., cyclicality, is well documented in the literature. Typically, the connection between the two variables is negative, which in this study is defined as procyclicality. Laeven and Majnoni (2003) show that LLPs are lower during economic booms using a large sample of banks over the 1988–1999 period. Similarly, Bikker and Metzemakers (2005) use a sample of banks from OECD countries from 1991 to 2001 to show that LLPs are negatively related to GDP growth. Albertazzi and Gambacorta (2009) suggest that the GDP growth and bank LLPs of 10 industrialized countries are negatively correlated over the 1981–2003 period. Moreover, Pérez et al. (2008) use a sample of Spanish banks from 1986 to 2002 to show that LLPs in Spain are strongly procyclical. Furthermore, Fonseca and González (2008) use data on banks from 40 countries from 1995 to 2002 to suggest that LLPs are procyclical. In addition, Bertay et al. (2015) show that the LLPs of banks in 111 countries from 1999 to 2010 are procyclical. Olszak et al. (2017) suggest that the LLPs of large, listed and commercial banks, as well as of banks reporting consolidated statements, are more procyclical. Furthermore, capital requirements and investor protections decrease the procyclicality of LLPs.

The practice of accumulating reserves for future losses was restricted in the incurred loss approach, which is designed to limit the creation of reserves that could be used for earnings management (Gaston and Song 2014). The incurred loss approach is described in the IAS 39 accounting standard and requires banks to allocate LLPs strictly for losses that have been incurred. Banks are required to show objective evidence of the incurred losses. Despite this requirement, Gaston and Song (2014) suggest that banks maintain latitude in selecting objective evidence of loan losses and in using expert judgment to estimate impairment losses. Likewise, Beatty and Liao (2014) argue that LLPs reflect information asymmetry because they are estimates of loan losses. In the EU, IAS 39 has been mandatory for listed banks since 2005. However, Spanish banks use a dynamic provisioning system that was implemented in 2000. The Spanish system aims to decrease the procyclicality of LLPs by collecting reserves for loan losses during economic booms before losses are incurred (Balla and McKenna 2009).

However, even if IAS 39 restricts the collection of reserves and empirical studies show that LLPs tend to be procyclical, banks anticipate near-future losses and allocate LLPs accordingly. Bushman and Williams (2012) use data from 1996 to 2006 and suggest that banks around the world anticipate future deteriorations in the performance of their loan portfolios in their current provisions. These authors suggest that this explicit forward-lookingness enhances discipline over bank risk-taking. The results of Nichols et al. (2009) also suggest that public banks anticipate future loan losses when allocating LLPs. These authors suggest that the demand for conservative accounting dominates managers' abilities and motives to engage in income-increasing accounting within public (listed) banks. Moreover, Balasubramanyan et al. (2016)

show that banks use forward-looking LLPs in loan loss recognition using data for U.S. banks from 1997 to 2013. These authors suggest that early loss recognition is greatest during the 2008–2009 crisis period. Beatty and Liao (2011) suggest that banks with longer delays in expected loss recognition reduce their lending during recessions more than banks with shorter delays. This implies that LLPs in the incurred loss model amplify business cycles.

The sample of this study consists of banks from 18 Western European countries over the 2004–2015 period. Therefore, this study includes the economic boom preceding the crisis, the 2008–2009 financial crisis and the recession from 2010 onwards. This study thereby contributes to the literature in several ways: in particular, this study decomposes the cyclical discretionary component of LLPs from the cyclical component caused by non-discretionary factors. This study thus complements those of Olszak et al. (2017), Bertay et al. (2015) and Alessi et al. (2014). Furthermore, this study provides knowledge of the role of accounting in Western European banks by examining the relation between LLPs and changes in expected impaired loans. Additionally, this study examines the cyclicality of loan deterioration. Moreover, this study uses a large dataset covering Western European commercial, cooperative and savings banks. Thus, this study contributes to the literature on bank ownership by offering information on the role of ownership type in the use of LLPs.

The results indicate that, in general, LLPs have a cyclical component that amplifies business cycle effects on bank income. This component of LLPs is negatively related to GDP growth and increases during recessions. However, in cooperative banks, this component is significantly smaller. We argue that this results from their member-based ownership structure, their different constraints in the firm maximization problem and the variable nature of their capital. Cooperative banks have stronger incentives to protect their capital using LLPs because members' shares of capital can be withdrawn.

Moreover, the regressions examining the relation between LLPs and changes in near-future impaired loans suggest that stakeholder banks allocate LLPs for expected near-future losses but that commercial banks do not. This is an explanatory factor for the reduced cyclicality of LLPs among cooperative banks and savings banks shown by Olszak et al. (2017). One possible explanation for this behavior is that stakeholder banks are not strictly profit focused. Therefore, they have less interest in income-increasing accounting than do shareholder-owned commercial banks. Alternatively, this can be explained by stakeholder banks' incentives to protect capital. Finally, cooperative banks' impaired loans are equally cyclical to those of commercial banks. In contrast, the impaired loans of private savings banks and publicly owned savings banks are less cyclical. This suggests that the reduced cyclicality of cooperative banks' LLPs, as shown by Olszak et al. (2017), result in discretion for cooperative banks. For savings banks, less cyclical loan deterioration is an explanatory factor.

The remainder of this paper is structured as follows: after the introduction, descriptions of the econometric specifications and the dataset are provided. The summary statistics and regression results are then described. Finally, conclusions are presented.

1.2 Commercial banks, cooperative banks and savings banks

The bank ownership types considered in this study are commercial banks, cooperative banks, private savings banks and publicly owned savings banks. Commercial banks are shareholder banks that distribute profits to their shareholders. Therefore, maximizing shareholder value is a common objective of commercial banks. Typically, these banks are primarily profit focused (Ayadi et al. 2010). In a commercial bank, power is divided by one share–one vote rules, and

the shares are tradable on secondary markets. On the contrary, cooperative banks are not strictly profit oriented. They make limited profit distributions or no distributions at all. Therefore, Fonteyne (2007) argues that cooperative banks have lower risk-taking incentives.

Unlike commercial banks, cooperative banks are member owned. Ayadi et al. (2010) argue that rather than strictly being profit oriented, cooperative banks also seek to serve their members and non-member clients. Therefore, instead of maximizing shareholder value, they maximize stakeholder value for a larger and more diversified group of subjects with diverse interests (Ayadi et al. 2010). Thus, unlike commercial banks, profit maximization is not the exclusive or primary aim of cooperative banks. Membership in a cooperative bank is usually open to everyone. The membership stake is not tradable; hence, there are no secondary markets. Ayadi et al. (2010) propose that banks that distribute profits to shareholders are less likely to collect reserves for recessions than are stakeholder banks because stock market pressures force them to choose more profitable options. Furthermore, Gaston and Song (2014) propose that privately owned banks are more likely to interpret accounting standards optimistically because they want to maximize their share prices.

Ayadi et al. (2010) argues that agency problems are typically more prevalent in cooperative banks than in commercial banks because the owners (members) have less influence on managers than do shareholders. This is because cooperative banks have many members that are dispersed and have small ownership stakes. However, Ayadi et al. (2010) also argue that cooperative banks have a powerful disciplinary mechanism that commercial banks lack; member exit and withdrawal of the member share. Selling shares in secondary markets does not directly affect equity in commercial banks. However, in cooperative banks, member exit causes a reduction in capacity because, unlike in commercial banks, a portion of the assets under the control of management is removed. Therefore, Ayadi et al. (2010) suggest that potential member share withdrawal creates incentives to produce high-quality banking services.

Furthermore, Ayadi et al. (2010) suggest that the lack of a capital market option is a control mechanism in cooperative banks. Cooperative banks' capital structure is dependent on retained profits because they do not have access to external equity finance. Therefore, Ayadi et al. (2010) argue that cooperative banks are more risk averse because they cannot offset business mistakes that shrink capital with external capital injections.

The characteristics of savings banks are similar to those of cooperative banks, although they differ in ownership structures and objectives. Savings banks are not owned by their members; rather, they are foundations (non-profit organizations) whose objective is to offer banking services to their customers. In some countries, e.g., in Germany, savings banks are owned by the government. According to Ayadi et al. (2009), savings banks have a social mission – a regional commitment and a mandate to contribute to the common good. Unlike cooperative banks, savings banks have no member shares that are subject to withdrawal. Therefore, member exits do not reduce the equity of a savings bank.

Ayadi et al. (2009) argue that banks that are not strictly profit oriented manage intertemporal risk differently than do profit-oriented banks. Ayadi et al. (2010) suggest that risk-averse banks highly value intertemporal risk management; they further argue that because of profit distribution, shareholder banks are less likely to collect reserves for recessions than are stakeholder banks. Because there are no reserves, the economy is exposed to intertemporal risk, whereas smoothing out this risk by collecting reserves would be a more socially valuable option.

According to Gutiérrez (2008), cooperative banks' practices include collecting reserves for loan losses. Gutiérrez suggests that Italian cooperative banks use a rule-based method to allocate profits to reserves. Banche Popolari must allocate at least 10% of their profits to reserves, while Banche di

Credito Cooperativo have stricter requirements: they must allocate at least 70% of net profits to reserves. In addition, 3% of net profits must be allocated to a mutual aid fund. Furthermore, Detilleux and Naett (2005) suggest that French cooperative banks are required by law to channel 15% of their profits into reserves. According to the IMF (2006), Spanish savings banks used similar practices, where at least 50% of profits were required to be allocated to reserves.

The 4000 cooperative banks in Europe serve over 200 million customers through their 70,000 branches (EACB 2014). Most of these are located in Western Europe, as cooperative banks have especially large market shares in France, Italy, Finland and German-speaking countries. As with cooperative banks, savings banks have large market shares in Western Europe. Savings banks can be found in almost every country in Western Europe, but they are especially prominent in Norway, Spain, Germany, Austria and Switzerland. They have over 50,000 branches in Western Europe and 50 million customers in Germany alone (ESBG 2014).

2 Data and empirical methodology

2.1 Empirical methodology

The econometric specifications rely on the previous literature that has analyzed LLPs. The dependent variable is the LLPs-to-net-loans ratio, where net loans are lagged by one period (as in Beatty and Liao 2011; Bushman and Williams 2012). The baseline regression function is specified to explain how LLPs are related to GDP growth controlling for other factors affecting LLPs. GDP growth interacts with the ownership type dummies, which is similar to Bertay et al. (2015). The comparison group is commercial banks. The signs of the variables indicate the extent of cyclicality: positive (or near-zero) results can be interpreted as banks increasing discretionary LLPs during economic booms. Likewise, a negative result implies that banks decrease discretionary LLPs during economic upswings.

In addition, several variables control for other factors that affect LLPs. For non-discretionary factors, control variables are included for the ratio of growth of impaired loans to lagged net loans (as in, e.g., Bushman and Williams 2012). Additionally, the lagged growth of impaired loans is included as a control variable for the previous year's loan losses[1].[2]

$$\begin{aligned}\frac{LLPs_{it}}{Net\ loans_{i(t-1)}} &= \alpha_i + \beta_1 \frac{LLPs_{i(t-1)}}{Net\ loans_{i(t-2)}} + \beta_2 \mathrm{GDP}\ growth_{it} + \beta_{3\text{-}5} \mathrm{I}_{2\text{-}4} \mathrm{GDP}\ growth_{it} \\ &+ \beta_6 \frac{Profits_{it}}{Net\ loans_{i(t-1)}} + \beta_7 \frac{\Delta Impaired\ loans_{it}}{Net\ loans_{i(t-1)}} + \beta_8 \frac{\Delta Impaired\ loans_{i(t+1)}}{Net\ loans_{it}} \\ &+ \beta_9 \frac{\Delta Impaired\ loans_{i(t-1)}}{Net\ loans_{i(t-2)}} + \beta_{10} \frac{\Delta Net\ loans_{it}}{Net\ loans_{i(t-1)}} + \beta_{11} Capital\ ratio_{i(t-1)} \\ &+ \beta_{12} \log(total\ assets)_{i(t-1)} + \sum Ownership_i + \sum_{2007}^{2012} D_{year} + \varepsilon_{it}\end{aligned} \tag{1}$$

[1] Interpreting impaired loans as non-discretionary factors that affect LLPs assumes that the reported figures indicate the quality of the loan portfolio (Nichols et al. 2009). Bertay et al. (2015) argue that reported impaired loans do not necessarily imply the actual occurrence of impaired loans because they can be affected by discretion. However, because IAS 39 requires banks to provide objective evidence for impaired loans, we make a similar assumption to that used by Nichols et al. (2009); we assume that reported impaired loans are 'relatively non-discretionary' and reflect the quality of the loan portfolio. For more discussion on this subject, see Nichols et al. (2009).

[2] Bankscope figures for impaired loans are as reported in annual reports.

As for the discretionary variables affecting LLPs, the ratio of profits to net loans measures profitability and is significantly positive if banks use LLPs for earnings smoothing (as shown in studies such as Beatty et al. 2002, Fonseca and González 2008, Leventis et al. 2011). Profits are pre-impairment cost, and pre-tax profits and net loans are lagged by one period. The risk-weighted capital ratio is included as a control variable for the capital management hypothesis (as in, e.g., Ahmed et al. 1999, Fonseca and González 2008 and Beatty and Liao 2011). Moreover, a forwarded value of the growth of impaired loans is included as a control variable for the explicit forward-lookingness of future losses (as in Bushman and Williams 2012). Finally, the log of total assets is a control variable for bank size (as in, e.g., Anandarajan et al. 2007). All variables, except the log of total assets, are expressed as percentages for clarity.

The regression model includes a lagged dependent variable to control for the forward-lookingness of LLPs. Forward-looking provisions imply that provisioning decisions are dynamic and aim for intertemporal optimization; banks may provision less today if they plan to provision more tomorrow. The coefficient of the lagged dependent variable can be interpreted as the cost (e.g., the opportunity cost) of reaching for optimal LLP levels. The coefficient of this variable is expected to be positive and less than one.

Using panel ordinary least squares (OLS) would lead to bias caused by endogeneity (with a small T value) because the lagged dependent variable includes the time invariant component of the error term. This is shown in Eq. 2. In addition, the bank-specific independent variables are likely to be endogenous. Therefore, system GMM estimators are used, as suggested by Arellano and Bover (1995) and Blundell and Bond (1998).

$$\begin{aligned} y_{it} &= y_{i(t-1)} + \varepsilon_{it} \ (where \ \varepsilon_{it} = \mu_i + \varepsilon_{it}) \\ y_{it} &= \left(y_{i(t-1)} + \mu_i + \varepsilon_{i(t-1)}\right) + (\mu_i + \varepsilon_{it}) \end{aligned} \tag{2}$$

$$[\Delta y_{it}] = \alpha[\Delta, y_{it-1}] + [\Delta \varepsilon_{it}] \qquad Z_i = [Y_{it-2}, Y_{it-3}, \ldots] \tag{3}$$

$$\begin{bmatrix} y_{i2} \\ \Delta y_{i2} \end{bmatrix} = \alpha \begin{bmatrix} y_{i1} \\ \Delta y_{i1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{i2} \\ \Delta \varepsilon_{i2} \end{bmatrix} \quad Z_i = \begin{bmatrix} \Delta y_{i1} & 0 \\ 0 & y_{i0} \end{bmatrix} \tag{4}$$

Equation 3 is the Arellano-Bond estimator, and Eq. 4 is the system GMM estimator. The Zs are the matrices of instruments for the estimators. System GMM estimators are similar to the more common dynamic estimators suggested by Arellano and Bond (1991), except that the system GMM estimators construct a system of two equations. In addition to differencing the equation and instrumenting the differences of the endogenous variable(s) with lagged levels of the variable(s), a second level equation is included. The level of the endogenous variable is instrumented by the lagged difference of the variable. According to Blundell and Bond (1998), the inclusion of the level equation improves the precision of the first-difference estimator.

Because the equation is differenced, the individual effects are removed, producing fixed effects estimators. Consequently, no country dummies are included in the specification. However, system GMM allows the inclusion of time-invariant independent variables because the second equation is in levels. Therefore, the bank ownership type dummies are taken out of the error term because they may convey relevant information. The estimators used in this study are two-step estimators, which over-reject because of severely downward biased standard errors. Therefore, the standard errors are corrected as suggested by Windmeijer (2005).

The instruments matrix is constructed such that up to four lags of the endogenous variable are used as instruments to avoid instrument proliferation. According to Roodman (2009), a high number of instruments weakens the Hansen test results that are used to assess their orthogonality. Hence, the endogenous variables use the lags t-(2–5), and the lagged dependent variable uses the lags t-(1–4) as instruments. GDP growth, year dummies and ownership dummies are defined as exogenous variables. All bank-specific variables are defined as endogenous. However, if they are lagged by one period, they use the lags t-(1–4) as instruments.

Because the system GMM estimators are rather sensitive by nature, robustness is checked by running Eq. 1 using Arellano-Bond estimators. Moreover, the regression is run as a static fixed effects estimation (as in Laeven and Majnoni 2003, who used a static regression as their primary regression specification). This examines whether the static OLS estimators yield similar results to the dynamic ones. Moreover, robustness is checked by controlling for the dynamic nature of LLPs by including the beginning-of-the-year loan loss reserves (LLRs) as a control variable (as in Nichols et al. 2009). This variable controls for the possibility that a bank has previously over/under-provisioned.

$$\frac{LLPs_{it}}{Net\ loans_{i(t-1)}} = \alpha_i + \beta_1 \mathrm{GDP}\ growth_{it} + \beta_2 \frac{\Delta Impaired\ loans_{i(t+1)}}{Net\ loans_{it}} + \beta_3 \frac{\Delta Impaired\ loans_{it}}{Net\ loans_{i(t-1)}} + \beta_4 \frac{\Delta Impaired\ loans_{i(t-1)}}{Net\ loans_{i(t-2)}} + \beta_5 \frac{\Delta Net\ loans_{it}}{Net\ loans_{i(t-1)}} + \beta_7 \frac{Profits_{it}}{Net\ loans_{i(t-1)}} + \beta_8 \frac{LLRs_{i(t-1)}}{Net\ loans_{i(t-1)}} + \beta_9 Capital\ ratio_{i(t-1)} + \beta_{10} \log(total\ assets)_{i(t-1)} + \sum_{2007}^{2012} D_{year} + \varepsilon_{it} \quad (5)$$

Second, the model with the lagged LLRs variable (Eq. 5) is used to estimate separate regressions for the bank ownership types. These regressions examine whether the pooled estimation gives results that are similar to those of the separate regressions by bank ownership type. Using the pooled sample alone may not be appropriate because the banks' business models vary by ownership type. Unfortunately, the dynamic estimators cannot be used in the separate regressions because the number of observations for each bank ownership type is relatively small. Therefore, the estimators are OLS with bank fixed effects.

These regressions also examine the relation between changes in expected impaired loans and LLPs. Otherwise, the specifications mostly include the same variables as Eqs. 1 and 5. These regressions examine bank ownership type differences in the effect of expected future loan portfolio deterioration on current LLPs, i.e., in explicit forward-lookingness. The main variable of interest is the forwarded growth of impaired loans. Different coefficients for this variable would indicate that bank ownership type differentially affects the allocation of LLPs for expected future losses.

Some authors (e.g, Balasubramanyan et al. 2016) include a variable for net charge-offs as an additional control variable for credit quality. Unfortunately, the Bankscope data do not have very frequent observations for this variable. This is especially true for publicly owned savings banks. Therefore, including this variable decreases the number of observations drastically (by 30–50%). For this reason, the variable is not included in the analysis on the relation between changes in near-future impaired loans and current LLPs. This may cause omitted variable bias. Despite the decrease in the number of observations, including the variable in the regressions did not affect the results.

Furthermore, Balasubramanyan et al. (2016) show that pooling pre-crisis, crisis and post-crisis observations is not appropriate because the control variables have different effects on

LLPs in these periods. Balasubramanyan et al. (2016) use data on U.S. banks and define the period 2008–2009 as the financial crisis. Furthermore, they define 2010–2013 as the post-crisis years. However, this study uses data on Western European banks instead of U.S. data. In Europe, the 2008–2009 financial crisis continued as the sovereign debt crisis (also known as the Eurozone crisis). Therefore, dividing the sample into crisis and post-crisis periods is not as straightforward as it is for U.S. data. Moreover, the sovereign debt crisis does not have a clear ending year.[3] Consequently, an examination of the different phases of the cycle is excluded from this study. Nonetheless, this is a subject for further research.

To examine the cyclicality of impaired loans, a regression function similar to Bertay et al. (2015) is constructed. The specification includes the same GDP growth variables as Eq. 1. The specification includes control variables for liquid assets, total customer deposits, capital ratio and bank size. To control for macroeconomic conditions, a variable for inflation, measured as the annual change in the GDP deflator, is included (as in Bertay et al. 2015). The coefficients for the GDP growth variables can be interpreted as the cyclicality of non-performing loans. The estimators are system GMM, as in Eq. 1.

Finally, the dependent variable of Eq. 6 is changed to the LLPs-to-impaired-loans ratio. This is a robustness check for Eq. 1 to examine whether the cycle of impaired loans affects the results. The bank ownership type may affect the loan type, which in turn affects the cycle performance of their loan portfolios. However, detailed data on loan types are not available from Bankscope. Therefore, LLPs are measured relative to impaired loans to examine whether differences in cyclicality of loan losses affect the results.

$$\begin{aligned}\frac{NPLs_{it}}{Net\ loans_{i(t-1)}} &= \alpha_i + \beta_1 \frac{NPLs_{i(t-1)}}{Net\ loans_{i(t-2)}} + \beta_2 \text{GDP}\ growth_{it} + \beta_{3\text{-}5} \text{I}_{2\text{-}4} \text{GDP}\ growth_{it} \\ &+ \beta_6 \frac{Liquid\ assets_{i(t-1)}}{Total\ assets_{i(t-1)}} + \beta_7 \frac{Deposits_{i(t-1)}}{Total\ liabilities_{i(t-1)}} + \beta_8 Capital\ ratio_{i(t-1)} \\ &+ \beta_9 \log(total\ assets)_{i(t-1)} + \beta_{10} Inflation_{i(t-1)} + \sum \text{O}wnership_i + \sum_{2007}^{2015} \text{D}_{year} + \varepsilon_{it}\end{aligned} \tag{6}$$

2.2 Data

The bank-specific data are drawn from Bankscope and consist of bank balance sheet and income statement data. The frequency of the data is annual, and the sample period is 2004–2015. The years before 2004 are not included because Bankscope is missing observations for the early 2000s. Therefore, these years are excluded to produce a more balanced dataset. The sample includes 18 Western European countries (see Table 1): the so-called "EU15" and the Western European countries that are not

[3] Balasubramanyan et al. (2016) end their post-crisis period in Q3:2013, which is also the end of their dataset. However, the dataset used in this study includes the years 2014–2015. Albertazzi et al. (2014), who examine the effect of the sovereign debt crisis on Italian banks, define the sovereign debt crisis as the period from 2010:Q2 to 2011:Q4, which is when their sample period ends. Arghyrou and Kontonikas (2012) argue that the sovereign debt crisis started in Greece in the autumn of 2009. In 2010, Ireland applied for emergency assistance, followed by Portugal in 2011. The second bailout package for Greece was agreed upon in 2012. Furthermore, Arghyrou and Kontonikas (2012) mark the beginning of the crisis period as August 2007, when the first emergency loan provided by the ECB to European banks. In addition, these authors identify two phases of the sovereign debt crisis: the early stage from February 2009 to February 2010 and the second stage from March 2010 to August 2011, which is when their sample period ends.

in the EU or euro area: Norway, Switzerland, and Iceland. The microstates of Western Europe are not included. Data are consolidated and, hence, concern the bank group level.

The dataset downloaded from Bankscope was reviewed to remove multiple observations of the same banks. For example, Sparkasse Finanzgruppe, the German savings bank group, was listed in the unedited dataset three times: first, the parent organization, second, the bank central organizations, and third, the regional member banks of the group. Similarly, Crédit Agricole, the French credit cooperative, had three entries in the downloaded dataset. In addition, the dataset included several subsidiary banks that were already included in the accounts of a consolidated bank but still had their own entries. All these entries were corrected, and the edited dataset does not have overlapping ownership structures.

Furthermore, the bank specializations were reviewed to ensure comparability of ownership types. Ownership information was gathered manually from bank websites and annual reports, which was sometimes not possible. In these cases, we relied on the Bankscope information. The downloaded dataset included commercial banks, cooperative banks, savings banks and bank holding companies. The latter group is included because data for some banks are available only for the bank holding company.

The data are selected for this study such that bank group members are preferred to central organizations whenever possible. The ownership of stakeholder bank groups is concentrated in the regional banks; thus, it seems reasonable to prefer these data. For example, in the case of Crédit Agricole, regional banks own the central organization together, although the central organization itself possesses partial decision-making power over the regional banks. Sometimes regional data are unavailable; in that case, data for the central organization are

Table 1 Market shares in terms of total assets and number of banks by country and bank ownership type (2014)

	Commercial banks		Cooperative banks		Priv. savings banks		Publ. savings banks	
	%	#	%	#	%	#	%	#
Greece	100	5	0	0	0	0	0	0
Ireland	100	4	0	0	0	0	0	0
Iceland	100	1	0	0	0	0	0	0
Luxembourg	100	4	0	0	0	0	0	0
Sweden	100	6	0	0	0	0	0	0
United Kingdom	99.1	22	0.8	1	0.1	1	0	0
Denmark	98.8	10	0.2	1	0.9	6	0	0
Belgium	95.1	4	0.3	1	4.6	1	0	0
Portugal	86.4	7	5.4	1	8.1	1	0	0
Finland	3.7	1	96.3	1	0	0	0	0
Austria	42.3	5	52.2	3	0	0	5.5	1
Netherlands	66.9	11	33.1	1	0	0	0	0
France	73.4	15	26.1	47	0.5	1	0	0
Italy	75.7	14	22.5	19	1.8	7	0	0
Norway	70.6	3	0	0	29.4	27	0	0
Spain	68.9	9	5.7	4	25.5	8	0	0
Germany	64.6	8	12.7	6	0	0	22.8	6
Switzerland	79.3	19	7.2	1	0	0	13.6	9

Source: Bankscope

used. Finally, banks with less than two observations for the growth of impaired loans are removed from the sample because they are not included in the regressions. In total, the reviewed dataset includes 374 banks. Table 1 lists the sample countries and their bank ownership types. The table also shows market shares by bank ownership type in the countries in which they are domiciled. The figures indicate that stakeholder banks are concentrated in certain Western European countries. Commercial banks have large market shares in every sample country, and in some sample countries, commercial banks are the sole ownership type.

This study uses 9 bank-specific variables. The bank-specific ratio, difference and growth variable values below the 1st and above the 99th percentile are removed, as outliers for variables constructed from the data are categorized as reporting errors. For example, the highest observation for LLPs to lagged net loans was over 46%, whereas the mean of the variable is 0.86. Likewise, the highest value for net loan growth was 95,329%. Outliers are removed from the sample to minimize the bias caused by extreme values. The total assets variable is left intact. See Table 2 for the variable definitions. Descriptions of the data can be found in Table 8 of the appendix.

The cyclical nature of LLPs can be seen in the summary statistics. Fig. 1 shows average LLPs, profitability and impaired loans in Western Europe. The variables are expressed as ratios (as percentages) to net loans. For clarity, impaired loans and profitability are measured on the right axis, while LLPs are on the left axis. Fig. 1 shows that provisions are, on average, low during the period before the crisis, increasing rapidly during the 2008–2009 financial crisis and remaining high during the sovereign debt crisis. Impaired loans have a similar pattern to LLPs, while profits are high during the boom and plunge during the financial crisis. In our sample, LLPs represent, on average, 36% of pre-impairment cost profits from 2004 to 2015. This finding differs from that of Kanagaretnam et al. (2009), who find an average for U.S. banks from 1993 to 2004 of 15%.

Fig. 2 shows the average yearly LLPs by bank ownership type. Cooperative banks' averages typically range from 0.4% to 0.8% of total assets, and their average provisions do not decrease during the pre-crisis period. During the 2008–2009 financial crisis, the average provisions of commercial banks and private savings banks increase very rapidly, remaining high for the rest of the sample period. The mean increase observed among cooperative banks is more modest. Although the average of publicly owned savings banks is the lowest of the four ownership types for the sample period, the increase during the financial crisis is relatively steep.

Table 2 Variables definitions

LLPs	Ratio of loan loss provisions to lagged net loans (%)
Profits	Ratio of pre-tax and pre-impairment cost profits to lagged net loans (%)
Net lending growth	Percent growth of net loans
ΔImpaired loans	Ratio of growth of impaired loans to lagged net loans (%)
Impaired loans	Ratio of impaired loans to lagged net loans (%)
LLPs-to-Impaired loans	Ratio of LLPs to impaired loans (%)
Capital ratio	Ratio of total equity to risk-weighted total assets (%)
LLRs	Ratio of loan loss reserves to lagged net loans (%)
Liquid assets	Liquid assets-to-total assets ratio (%)
Deposits	Total customer deposits-to-total liabilities ratio (%)
log (total assets)	Log of total assets
Cooperative bank	Dummy variable indicating cooperative banks
Priv. savings bank	Dummy variable indicating private savings banks
Publ. savings bank	Dummy variable indicating publicly owned savings banks
GDP growth	Percent growth of GDP (source: the World Bank)

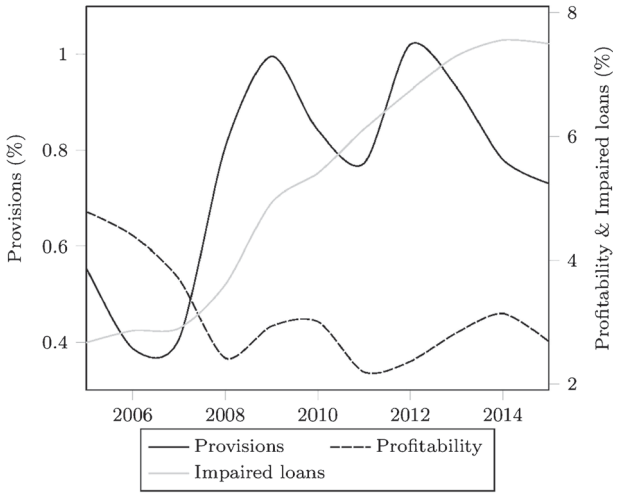

Fig. 1 Average loan loss provisions, profitability and impaired loans in Western Europe. The variables are LLPs-to-net loans ratio, pre-tax and pre-impairment cost profit-to-net loans ratio and impaired loans-to-net loans ratio. Impaired loans and profitability are measured on the right axis. The variables are expressed as percentages

The descriptive statistics for the study variables are shown in Tables 3 and 4. The figures suggest that, on average, LLPs are highest in commercial banks and private savings banks; they are lowest in publicly owned savings banks. Commercial banks are the most profitable, whereas publicly owned savings banks' are the least profitable. The capital ratio is lowest in cooperative banks and highest in commercial banks. Growth of impaired loans is highest in cooperative banks and private savings banks. Mean growth is negative for publicly owned savings banks. The LLRs are, on average, highest in cooperative banks; the ratios are lowest in publicly owned savings banks.

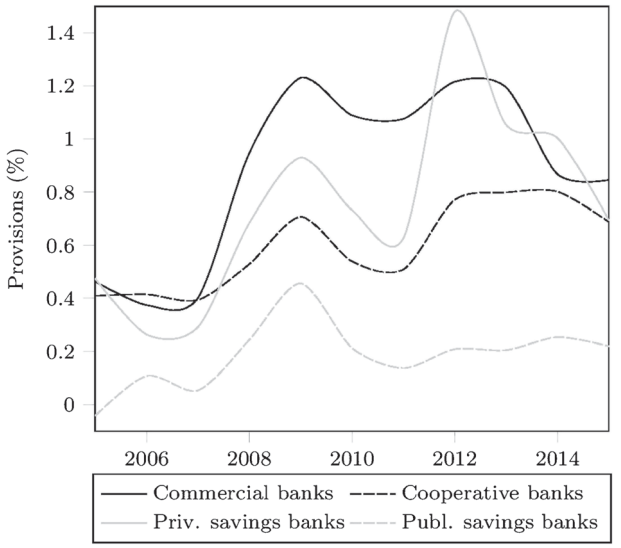

Fig. 2 Average loan loss provisions by bank ownership type. The variable is LLPs-to-net loans ratio (as percentage)

Table 3. Descriptive statistics for the study variables (2004–2015). Values below the 1st and above the 99th percentiles have been removed for all variables. All variables, except growth of impaired loans and growth of net loans, are measured as ratios to lagged net loans. All variables are expressed as percentages

LLPs	Mean	S.D.	Min	Max	Median	N
Commercial banks	0.91	1.3	0.91	8.85	0.49	1498
Cooperative banks	0.62	0.76	0.84	6.62	0.4	786
Priv. savings banks	0.75	1.11	0.96	8.9	0.38	649
Publ. savings banks	0.2	0.31	0.88	1.64	0.1	167
Total	0.76	1.12	0.96	8.9	0.4	3100
Profits	Mean	S.D.	Min	Max	Median	n
Commercial banks	3.45	6.69	-9.76	65.89	1.88	1539
Cooperative banks	1.72	0.78	-2.73	7.44	1.67	790
Priv. savings banks	2.26	4.94	-6.61	61.44	1.58	656
Publ. savings banks	0.97	0.5	-1.94	1.96	0.98	172
Total	2.64	5.27	-9.76	65.89	1.67	3157
Capital ratio	Mean	S.D.	Min	Max	Median	n
Commercial banks	15.09	4.67	8.02	38.1	13.9	1258
Cooperative banks	13.81	3.58	7.61	27.27	13.29	414
Priv. savings banks	14.65	4.08	7.8	38.3	14.1	660
Publ. savings banks	14.48	2.85	9.45	22.5	14.1	137
Total	14.72	4.28	7.61	38.3	13.8	2469
ΔImpaired loans	Mean	S.D.	Min	Max	Median	n
Commercial banks	0.6	2.28	-7.38	13.6	0.15	1283
Cooperative banks	0.95	1.87	-5.43	12.71	0.31	533
Priv. savings banks	0.78	1.99	-6.99	13.31	0.25	556
Publ. savings banks	-0.16	1.09	-4.62	3.11	-0.08	147
Total	0.67	2.09	-7.38	13.6	0.18	2519
LLRs	Mean	S.D.	Min	Max	Median	n
Commercial banks	3.37	3.95	0.04	24.83	2.2	1437
Cooperative banks	3.51	2.52	0.09	20.79	2.91	745
Priv. savings banks	2.71	3.12	0.06	21.84	1.54	627
Publ. savings banks	1.58	1.01	0.2	7.95	1.45	165
Total	3.17	3.39	0.04	24.83	2.3	2974
Net lending growth	Mean	S.D.	Min	Max	Median	n
Commercial banks	8.15	21.08	-46.94	151.83	4.53	1537
Cooperative banks	5.44	8.33	-22.28	65.95	4.24	789
Priv. savings banks	7.34	16.16	-41.87	108.14	5.17	655
Publ. savings banks	5.79	11.93	-21.39	115.32	3.43	172
Total	7.18	17.24	-46.94	151.83	4.42	3153

Moreover, the growth of net lending is lowest in cooperative banks and highest in commercial banks. Commercial bank assets are the most liquid of the bank ownership types. As for the deposit funding ratio, private savings banks use customer deposit funding the most. The ratio is lowest for cooperative banks. Regarding LLPs relative to impaired loans, the figures are sometimes different from the values of the LLPs-to-net loans ratio. The mean is highest for private savings banks and commercial banks. However, unlike the LLPs-to-net loans ratio, private savings banks have the highest mean.

Finally, commercial banks are, on average, easily the largest bank ownership type. They are almost twice as large as the second-largest ownership type, publicly owned savings banks. Furthermore, commercial banks are more than eight times as large as private savings banks.

Table 4. Descriptive statistics for the study variables (2004–2015) (continued). Values below the 1st and above the 99th percentiles have been removed for all variables, except Total assets. Liquid assets = liquid assets-to-total assets ratio, Deposits = total customer deposits-to-total assets ratio. All variables, except Total assets, are expressed as percentages

Liquid assets	Mean	S.D.	Min	Max	Median	N
Commercial banks	24.83	17.64	0.98	78.66	20.34	1701
Cooperative banks	12.03	8.34	1.4	54.24	9.87	883
Priv. savings banks	9.34	8.91	0.96	77.06	6.42	732
Publ. savings banks	19.49	9.56	4.89	48.64	17.85	190
Total	18.08	15.41	0.96	78.66	12.98	3506
Deposits	Mean	S.D.	Min	Max	Median	n
Commercial banks	50.33	21.68	2.74	90.94	50.81	1657
Cooperative banks	43.88	19.04	6.69	89.98	41.77	883
Priv. savings banks	55.07	13.5	10.18	89.97	53.96	746
Publ. savings banks	46.75	19.13	14.83	72.19	55.3	190
Total	49.51	19.76	2.74	90.94	50.54	3476
LLPs-to-Impaired loans	Mean	S.D.	Min	Max	Median	n
Commercial banks	21.79	30.34	-30.34	228.57	13.59	1442
Cooperative banks	12.56	13.87	-18.42	158.54	9.36	622
Priv. savings banks	23.46	27.46	-32.12	157.35	15.54	651
Publ. savings banks	6.78	10.16	-11.54	84.9	4.09	164
Total	19.32	26.54	-32.12	228.57	12.11	2879
Total assets (MEUR)	Mean	S.D.	Min	Max	Median	n
Commercial banks	150,797.70	345,357.30	62.3	2,202,423	11,170.50	1754
Cooperative banks	40,788.70	98,567.70	480.1	750,710	12,427.60	883
Priv. savings banks	17,236.10	45,754	131.2	358,988.80	4,030.30	749
Publ. savings banks	79,203.80	109,046.10	768	447,738	22,302	190
Total	91,855.20	255,875.30	62.3	2,202,423	10,724.80	3576

However, this is largely explained by some very large values for commercial banks. The median values suggest that cooperative banks and commercial banks are similarly sized. The median is highest for publicly owned savings banks.

3 Regression results

Table 5 shows the regression results for the regressions examining the discretionary cyclical component of LLPs. The main result for GDP growth suggests that provisions generally have a cyclical component. The results also show that this component is much less dependent on business cycle movements in cooperative banks than in the three other ownership types. Overall, the general term and the interaction suggest that the magnitude for cooperative banks is approximately zero. Moreover, the cyclical component of provisions of both types of savings banks does not differ from that of the control group, commercial banks. The ownership dummy for publicly owned savings banks is significantly negative, which suggests that they have, on average, lower provisions than the three other ownership types. This pattern was suggested by Fig. 2. Furthermore, the forwarded impaired loans variable is significantly positive. This suggests that banks execute explicit forward-lookingness by allocating LLPs for near-future expected losses.

The results remain mostly the same in the second regression that uses Arellano-Bond estimators. However, the combined result for the general term and cooperative banks suggests

Table 5 Examining cyclicality of LLPs (2004–2015). The dependent variable is LLPs-to-lagged-net-loans ratio (%). The control group is commercial banks. The estimators in (1) are system GMM, in (2) Arellano-Bond and in (3) and (4) OLS with bank fixed effects. L = lagged by one period, F = forwarded by one period, × = an interaction. *t* statistics in parentheses. The results for the year dummies are omitted. ΔImpaired loans = the ratio of the difference of impaired loans to lagged net loans, Profits = pre-impairment cost and pre-tax profit-to-lagged-net loans ratio, Net lending growth = percent growth of net lending, LLRs = loan loss reserves-to-net loans ratio

	(1)	(2)	(3)	(4)
L.LLPs	0.395***	0.209**		
	(4.05)	(2.44)		
GDP growth	−0.039**	−0.043***	−0.058***	−0.052***
	(−2.49)	(−2.61)	(−3.76)	(−3.22)
Cooperative × GDP growth	0.036**	0.047**	0.043***	0.038**
	(2.17)	(2.56)	(2.78)	(2.41)
Priv. saving × GDP growth	−0.014	−0.001	−0.007	−0.015
	(−0.73)	(−0.06)	(−0.35)	(−0.76)
Publ. saving × GDP growth	−0.007	0.006	0.013	0.000
	(−0.45)	(0.38)	(0.82)	(0.01)
Cooperative	−0.086			
	(−1.49)			
Priv. savings bank	−0.021			
	(−0.27)			
Publ. savings bank	−0.149*			
	(−1.86)			
F.ΔImpaired loans	0.098***	0.096***	0.056***	0.045***
	(3.46)	(3.16)	(3.67)	(3.16)
ΔImpaired loans	0.133***	0.097***	0.166***	0.160***
	(6.55)	(3.29)	(9.32)	(8.43)
L.ΔImpaired loans	0.051***	0.055***	0.081***	0.104***
	(2.81)	(2.62)	(5.18)	(7.09)
Profits	0.056	0.128***	0.088	0.082
	(1.32)	(2.77)	(1.43)	(1.34)
Net lending growth	−0.014***	−0.006**	−0.008***	−0.009***
	(−4.07)	(−2.08)	(−3.25)	(−3.54)
L.Capital ratio	−0.009	−0.020	−0.002	−0.002
	(−1.17)	(−1.10)	(−0.22)	(−0.17)
L.log(total assets)	0.020	0.036	0.039	−0.028
	(0.89)	(0.15)	(0.34)	(−0.22)
L.LLRs			0.094***	
			(3.14)	
Constant	0.405		−0.120	0.730
	(1.26)		(−0.11)	(0.61)
Observations	1354	1067	1343	1362
Banks	271	230	273	273
Instruments	245	182		
Hansen (p)	0.34	0.15		
AR2 (p)	0.24	0.35		
Difference-in-Hansen (level)	0.87			
Difference-in-Hansen (lagged)	0.64	0.71		

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

that the LLPs of cooperative banks have a slightly positive cyclical component. This implies that instead of being procyclical, their LLPs have a countercyclical component. The results for the three other ownership types are similar to the earlier results. Specifications 3 and 4 show the results for the static OLS regressions with bank fixed effects. The main results are the same as in the earlier specifications.

Table 6 shows the results for the specifications without the lagged dependent variable. These regressions control for the dynamic effect of LLPs using the lagged LLRs. Moreover, these regressions examine the relation between LLPs and future losses. The regressions confirm the results for the regressions examining the cyclical component of LLPs. The coefficient for GDP growth for cooperative banks is close to zero and statistically insignificant, whereas the coefficients for the other bank ownership types indicate that their LLPs have a cyclical component that is negatively related to GDP growth.

As for the relation between LLPs and expected changes in impaired loans, the results show that bank ownership types significantly affect allocations of LLPs for near-future losses. The forwarded variable for growth in loan losses is insignificant for commercial banks, implying that they do not allocate LLPs for expected future losses but rather that their LLPs are specific. The coefficients for the stakeholder banks are significant and of similar size. This implies that stakeholder banks evaluate near-future losses and allocate LLPs accordingly in a forward-looking manner. Furthermore, bank ownership types have differences in the effect of last year's losses on LLPs; commercial banks and private savings banks have significant results, whereas cooperative banks and publicly owned savings banks' coefficients are insignificant.

Table 6 Examining LLPs by bank ownership type (2004–2015). The dependent variable is the LLPs-to-lagged-net-loans ratio (%). The control group is commercial banks. The estimators are OLS with bank fixed effects. L = lagged by one period, F = forwarded by one period. *t* statistics in parentheses. The results for the year dummies are omitted. ΔImpaired loans = a ratio of the first difference of impaired loans to lagged net loans, Profits = pre-impairment cost and pre-tax profit-to-lagged-net loans ratio, Net lending growth = percent growth of net lending, Capital ratio = a ratio of regulatory capital-to-risk-weighted total assets, LLRs = loan loss reserves-to-net loans ratio

	(1)	(2)	(3)	(4)
GDP growth	−0.045**	0.012	−0.132***	−0.114***
	(−2.26)	(0.50)	(−3.12)	(−4.16)
F.ΔImpaired loans	0.024	0.084***	0.082***	0.060**
	(1.29)	(3.54)	(2.98)	(2.53)
ΔImpaired loans	0.173***	0.189***	0.136***	0.066**
	(7.15)	(4.50)	(2.68)	(2.81)
L.ΔImpaired loans	0.079***	0.045	0.111***	0.029
	(3.93)	(1.15)	(2.66)	(1.23)
Profits	0.081	0.176	0.117	0.059
	(1.18)	(1.38)	(1.23)	(0.70)
Net lending growth	−0.006**	−0.018**	−0.010	−0.009*
	(−2.46)	(−2.52)	(−1.45)	(−1.78)
L.Capital ratio	−0.002	−0.009	−0.000	−0.024
	(−0.14)	(−0.39)	(−0.01)	(−1.05)
L.log(total assets)	0.057	0.052	−0.425	0.303
	(0.43)	(0.14)	(−0.88)	(0.68)
L.Loan loss reserves	0.076**	0.063	0.104	0.131
	(1.99)	(0.70)	(1.48)	(1.67)
Constant	−0.386	−0.342	3.975	−2.538
	(−0.30)	(−0.10)	(0.98)	(−0.50)
Sample	Commercial banks	Cooperative banks	Priv. savings banks	Publ. savings banks
Observations	684	245	336	78
Banks	134	46	76	17
R^2	0.37	0.53	0.45	0.64

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The coefficient for the contemporary growth of impaired loans is statistically significant for every ownership type.

Table 7 shows the regression results for the impaired-loans-to-lagged-net-loans ratio. They suggest that the impaired loans of cooperative banks are equally cyclical to those of commercial banks. However, private savings banks and publicly owned savings banks have less cyclical loan deterioration. The result for publicly owned savings banks is similar to that of Bertay et al. (2015). The second column of the table shows the results for the regression examining the LLPs-to-impaired-loans ratio. These results are similar to those of Eq. 1 and thereby confirm the main result for cooperative banks; relative to impaired loans, their LLPs do not increase or decrease according to GDP growth. These results suggest that the results of Olszak et al. (2017), who showed that savings banks' LLPs are less cyclical than those of commercial banks, can be explained by less cyclical loan deterioration in these banks. For cooperative banks, this reduced cyclicality is explained by more conservative provisioning policy.

The results concerning the cyclical component of LLPs are robust to different estimation strategies. Therefore, we conclude that the result is robust. However, robustness was checked in several other ways. First, cooperative banks are concentrated in a few Western European countries. Thus, the results could be caused by

Table 7 Explaining impaired loans-to-lagged-net-loans ratio and LLPs-to-impaired-loans ratio (2004–2015). The dependent variable in (1) is the impaired-loans-to-lagged-net-loans ratio and in (2) is the LLPs-to-impaired loans ratio. L = lagged by one period, × = an interaction. The estimators are system GMM in both regressions. The results for the year dummies are omitted. *t* statistics in parentheses. Liquid assets = liquid assets-to-total assets ratio, Deposits = total customer deposits-to-total assets ratio

	(1) Impaired loans		(2) LLPs-to-Impaired loans	
L.Impaired loans	1.056***	(20.26)		
L.LLPs-to-Impaired loans			0.394***	(7.64)
GDP growth	−0.328***	(−4.98)	−1.208***	(−3.21)
Cooperative × GDP growth	0.024	(0.22)	1.149**	(2.49)
Priv. savings bank × GDP growth	0.148**	(2.38)	0.708	(0.85)
Publ. savings bank × GDP growth	0.190**	(2.43)	−0.778	(−1.02)
Cooperative	0.072	(0.28)	−6.341***	(−4.23)
Priv. savings bank	0.309	(0.85)	−4.085*	(−1.82)
Publ. savings bank	−0.631**	(−2.39)	−3.901*	(−1.66)
Inflation	−0.139***	(−4.94)	0.197	(0.58)
L.Capital ratio	−0.118**	(−2.21)	0.319	(1.06)
L.log(total assets)	−0.091	(−0.52)	−0.699	(−0.77)
L.Liquid assets	−0.007	(−0.40)	−0.118	(−0.97)
L.Deposits	−0.035*	(−1.75)	0.043	(0.43)
Constant	5.208*	(1.87)	19.894	(1.41)
Observations	1736		1872	
Banks	292		289	
Instruments	229		238	
Hansen (p)	0.28		0.47	
AR2 (p)	0.77		0.20	
Difference-in-Hansen (level)	0.67		0.96	
Difference-in-Hansen (lagged)	0.52		0.93	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

banks in a certain country. To eliminate such a possibility, the regression was re-estimated after excluding these groups, e.g., after excluding Italian banks. This process was repeated for each sample country with cooperative banks; the main results remained unchanged and are unreported.

Moreover, the results could be affected by the profitability variable that is also related to the business cycle. Therefore, robustness was checked by estimating Eq. 1 without controlling for profitability. These results were similar to the earlier results. Likewise, the forwarded growth of impaired loans could hamper the examination of cyclicality. However, the results remained similar after excluding this variable. Furthermore, the variable for lagged LLRs is included in the dynamic regressions to control for the adequacy of existing LLRs. This is controlled for by the lagged dependent variable in the baseline regressions. Including the LLRs in the equation did not affect the results, which are not reported.

Moreover, several studies (e.g., Fonseca and González 2008; Olszak et al. 2017) have suggested that regulatory and institutional factors, such as supervisory power and capital regulation, affect bank LLPs. Therefore, these variables are included in the regression function to control for the possibility that they are causing the results for cooperative banks. However, because the sample countries are relatively homogeneous, these variables are not expected to have large effects on the results. The variables used as control variables are taken from the database created by Barth et al. (2013). The indices controlling for the factors were developed by Barth et al. (2001). The variables are scaled indices for capital regulation, supervisory power, private sector monitoring, overall restrictions on banking activities and moral hazard (as in Olszak et al. 2017). The results are consistent despite the inclusion of these variables and are not reported. Furthermore, the pooled sample was used to examine the allocation of LLPs for near-future losses. This regression included interactions with bank ownership type. The variables concerning regulatory and institutional factors were included in this regression to examine whether they affect the allocation of LLPs for expected loan losses. These results are consistent and unreported.

In addition, an indicator of the financial structure is included in the regression analysis to control for factors that are related to the development and structure of the financial system (as in, e.g., Fonseca and González 2008). The indicators are calculated as in Beck and Levine (2002). The indicator is the first principal component of two variables: the logged ratio of the value of stock transactions to private credit and the logged ratio of market capitalization to private credit. The data for these variables were drawn from Beck et al. (2000). The results for both cyclicality and forward-looking provisioning remain unchanged.

4 Conclusions

Using a panel of consolidated bank data, this study examined Western European banks' LLPs from 2004 to 2015. In particular, this study examined the cyclical discretionary component of LLPs and the relation between near-future loan losses and LLPs. Banks were divided into four groups by ownership type: commercial banks, cooperative banks, private savings banks and publicly owned savings banks. Despite controlling for loan losses and other factors, the results show that LLPs have

a component that decreases during economic booms and increases during recessions. This amplifies the cyclical pattern of LLPs and causes volatility in profitability. This could be caused by factors such as exaggerated loan losses, over-optimism or other subjective reasons.

However, the regression results and thorough robustness checks suggest that cooperative banks' LLPs have a much smaller cyclical component than those of the three other ownership types. GDP growth has only a slight effect on their LLPs after controlling for loan losses and other factors. This suggests that they do not under- or overestimate their LLPs in different business cycle phases. This result complements that of Olszak et al. (2017), which suggest that cooperative banks' LLPs are less cyclical than those of commercial banks. Moreover, Čihák and Hesse (2007) and Groeneveld (2014) have shown that cooperative banks' earnings volatility is lower than that of commercial banks. Because LLPs are a large accrual on the income statement, more conservative provisioning is an important explanatory factor for their lower earnings volatility.

Furthermore, Olszak et al. (2017) argue that commercial banks' LLPs are more cyclical because they operate in larger, often international market areas than cooperative and savings banks, which typically operate locally. The results of this study show that this argument does not provide a full explanation because banks generally have a cyclical component in their LLPs. Thus, differences across bank ownership types in the cyclicality of LLPs are partially caused by this component. Moreover, the results concerning the cyclicality of impaired loans suggest that cooperative banks' loan deterioration is equally cyclical to that of commercial banks. Therefore, the regression results suggest that the findings of Olszak et al. (2017) on the lesser cyclicality of cooperative banks' LLPs can be explained by conservative provisioning rather than by the cyclicality of impaired loans. As for savings banks, their lesser cyclicality is explained by less cyclical loan impairment.

In addition, the results concerning the relation between expected loan losses and LLPs suggest that all stakeholder banks allocate LLPs for expected future loan losses. They recognize larger and timelier LLPs than do shareholder banks. A possible explanation is that stakeholder banks are not strictly profit oriented and have no profit distributions. Because there are no pressures from stock markets, stakeholder banks face different constraints when solving their firm value maximization problem. Therefore, these banks may allocate LLPs for expected losses in a forward-looking manner. This implies that their loan loss accounting is more conservative than that of commercial banks. Furthermore, Gutiérrez (2008) suggests that in the case of Spanish banks, cooperative banks receive preferential tax treatment compared to commercial banks. Consequently, because LLPs are a pretax deduction, the results can be affected by tax treatment that varies by bank ownership type.

These results have an important implication because Beatty and Liao (2011) show that banks that recognize loan losses earlier reduce their lending by less during recessionary periods. Therefore, the results from this study support those of Ferri et al. (2014) and Meriläinen (2016) that the lending of stakeholder banks, especially cooperative banks, is less cyclical than that of commercial banks. Moreover, Bushman and Williams (2012) show that provisioning for expected future losses is associated with enhanced discipline in bank risk-taking. García-Marco and Robles-Fernández (2008) show that Spanish savings banks are less risk-inclined than Spanish commercial banks from 1993 to 2000. Similarly, Čihák and Hesse

(2007) argue that the risk of insolvency is lower in cooperative and savings banks than in commercial banks from 1994 to 2004. Thus, it may be that provisioning for near-future expected losses is an implication of stakeholder banks' greater risk aversion.

All the stakeholder banks use forward-looking LLPs for expected loan losses, yet both types of savings banks have a cyclical component similar to that of commercial banks even though they do not maximize shareholder value. As is suggested in the introduction, the motives for cooperative banks' behavior can be legal by nature. Other possible explanations for the difference include the member-based ownership structure of cooperative banks and the variable nature of cooperative capital. Cooperative banks are member owned and democratic, and as Ayadi et al. (2010) conclude, "members and customers are largely one and the same". Thus, cooperative banks have incentives to manage risks because their member-owners ultimately want to protect their interests. Thus, we suggest that cooperative banks' provisioning is more conservative because they use LLPs to manage intertemporal risk.

Second, we propose that cooperative banks protect their capital using provisions. Capital in cooperative banks differs from capital in other bank ownership types because part of it consists of assets held by members. Moreover, members can withdraw their shares of capital (Fonteyne 2007). This makes cooperative capital variable, and in theory, cooperative banks may face capital runs. Thus, there has been debate about whether member shares should be classified as liabilities or equity (IFRS 2004). We suggest that cooperative banks want to protect their capital and keep their member base steady by preempting capital runs. Thus, by using provisions, they aim to stabilize their cooperative capital and prevent it from vanishing. Moreover, we propose that they aim to decrease the variability of cooperative capital to ensure that it is classified as equity in the future. Therefore, as Ayadi et al. (2010) suggest, member exit and member share withdrawal represent efficient disciplinary mechanisms in cooperative banks. As a consequence, their provisioning is more conservative, and their LLPs do not have a discretionary component that relates to business cycle phases. Generally, banks may be more inclined to ensure robust provisions when they have stronger incentives to protect their capital. Therefore, if LLPs are to be more forward-looking, then capital and capital requirements both have key roles in ensuring their robustness.

Further research should explore whether cooperative banks' more conservative provisioning and stakeholder banks' earlier provisioning for loan losses are determinants of their less cyclical lending growth. Future research could also consider whether stakeholder banks are also more conservative in profit accounting, i.e., whether they anticipate profits with a longer delay than commercial banks. Furthermore, as Balasubramanyan et al. (2016) propose, bank LLPs are driven by different determinants during different cycle phases; therefore, future research should examine whether bank ownership type changes provisioning policies according to the cycle phase.

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Compliance with Ethical Standards

Conflict of Interest The author has no conflict of interests.

Appendix

Table 8 Description of the data

Pre-impairment cost and pre-tax profit	Includes net interest income plus non-interest operating income minus non-interest expenses plus the share of profit/loss from associates, where operating (at equity profit/loss) plus change in fair value of own debt is included in trading income. Hence, this is operating profit minus all credit impairment costs.
Loan loss provisions	An expense for bad loans; defaults, renegotiations, etc.
Loan loss reserves	Reserves that have been provided for loan losses but not charged off.
Net loans	Includes residential mortgage loans, other mortgage loans, other consumer/retail loans, corporate and commercial loans and all the other loans that do not fall into these categories. Net loans do not include reserves built for loan losses or loans to banks.
Impaired loans	The amount of loans that is impaired. This item includes impaired loans as stated in the accounts. The definition of an impaired loan may vary across countries and banks.
Liquid assets	Includes cash, trading securities and interbank lending of maturities less than three months.
Deposits	Includes current, savings and term deposits; customer transaction accounts which can be withdrawn on demand or short notice, customer accounts with limitations as to the timing or number of withdrawals per period which has no set maturity date and customer deposits for which there is a set maturity date.
Total assets	Includes total earning assets, cash and dues from banks, foreclosed real estate, fixed assets, goodwill and other intangibles, current tax assets, deferred tax assets, discontinued operations (e.g., assets of a sold business) plus all other assets not otherwise categorized (e.g., prepayments).
Capital ratio	Includes Tier 1 and Tier 2 capital. Tier 1 capital includes shareholders' funds plus perpetual non-cumulative preference shares. Tier 2 includes subordinated debt, hybrid capital, loan loss reserves and revaluation reserves. The ratio is risk weighted.

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A comparative study of the Spanish dynamic loan loss provisioning system

Jari-Mikko Meriläinen

Abstract

This study is a comparative study of the Spanish dynamic loan loss provisioning system. The Spanish system is compared to the incurred loss approach used in other Western European countries. This study examines whether the Spanish system succeeded in its primary objective of reducing the cyclicality of loan loss provisions (LLPs). Moreover, this study examines whether Spanish banks were more or less prone to fail during the 2008-2013 economic crisis. The results suggest that Spanish banks provisioned more in the pre-crisis period; consequently, relative to impaired loans, their loan loss reserves (LLRs) were larger before the 2008-2009 financial crisis than the reserves in other Western European countries. However, the countercyclicality is largely explained by the low amount of impaired loans in Spain in the lead-up to the crisis. The Spanish reserves were quickly depleted when impaired loans began to increase in 2008. Therefore, the system was unable to smooth the cyclical pattern in LLPs. The collected reserves did not prevent the Spanish banking crisis: Spanish banks failed more often than banks in other Western European countries. However, this is mostly explained by the collapse of the Spanish savings-bank sector. Moreover, Spanish banks were more likely to fail than banks in other Western European countries if their asset quality was high in the lead-up to the crisis.

Keywords: Banks; Loan loss provisions; Cyclicality; Failure

JEL classification: G21

1. INTRODUCTION

Spain has had a dynamic provisioning system since 2000. The idea behind the system is to establish loan loss reserves (LLRs) for recessions in good times (Jiménez et al., 2012). These reserves do not reflect expected losses at the moment; they are instead created as an extra cushion against future losses that have yet to be identified (Barth and Landsman, 2010). This extra cushion aims to reduce the cyclicality of loan loss provisions (LLPs), i.e., their relation to GDP (gross domestic product) growth, preventing them from peaking in recessions and thereby strengthening the solvency of credit institutions (Trucharte and Saurina, 2013). Agénor and da Silva (2017) argue that such a dynamic provisioning system can be highly effective in reducing the pro-cyclicality of the financial system. Similarly, Chan-Lau (2012) shows that dynamic LLPs can reduce the banking system's pro-cyclicality.

This study compares Spanish banks' LLPs to the provisioning in banks in other Western European countries during the period of economic growth (2005-2007), the financial crisis (2008-2009), and the subsequent sovereign debt crisis. We investigate how the Spanish system achieved its objectives in terms of reducing the cyclicality of LLPs. Therefore, our first study hypothesis is as follows: i) Spanish banks' LLPs are less cyclical than LLPs in banks in other Western European countries, i.e., they are not as strongly linked to GDP growth as LLPs in other Western European countries.

Furthermore, as the second subject of the study, logit estimations are used to evaluate whether Spanish banks with dynamic reserves were more or less likely to fail during the crisis period of 2008-2013. As Trucharte and Saurina (2013) suggest, the Spanish system ultimately aims to improve financial institutions' solvency, i.e., to prevent them from failing during crisis periods. For this purpose, we construct a database of failed banks similar to those used in Vazquez and Federico (2015) and Chiaramonte et al. (2015). Given that Spanish banks are obliged to collect dynamic reserves by allocating larger-than-needed LLPs during economic booms, the second hypothesis of the study is as follows: ii) After controlling for pre-crisis factors, Spanish banks were less likely to fail during the 2008-2013 crisis.

Chan-Lau (2012) shows that a dynamic provisioning system such as that of Spain will improve banks' resilience to financial shocks. Furthermore, Agénor and Zilberman (2015) use a DSGE model to show that a dynamic provisioning system can smooth the cyclical pattern in LLPs. According to Agénor and Zilberman (2015), this smoothing will reduce the pro-cyclicality of lending in the financial system because the increase in loan rates after a shock to non-performing loans is more moderate. Moreover, Beatty and Liao (2011) show that the loans of banks with shorter delays in expected loss recognition are less procyclical than those of banks that delay loan loss recognition. This finding suggests that collecting

buffers during favorable economic conditions to offer protection during economic crises may dampen the procyclicality of the financial system.

Several previous studies have shown that LLPs have cyclical patterns. For instance, using a large sample of banks from 1988-1999, Laeven and Majnoni (2003) show that banks postpone LLPs when the cycle phase is favorable. Similarly, Bikker and Metzemakers (2005) use a sample of banks from OECD countries from 1991–2001 to show that LLPs are higher when GDP growth is lower. Likewise, Fonseca and González (2008) use data on banks from 40 countries from 1995-2002 to suggest that LLPs are cyclical. Albertazzi and Gambacorta (2009) show that LLPs of banks from 10 industrialized countries were negatively correlated with GDP growth from 1981–2003. Moreover, Alessi et al. (2014) use a sample of Italian banks from 2006–2012 to show that LLPs are cyclical. Further, Bertay et al. (2015) show that the LLPs of banks in 111 countries were cyclical from 1999–2010. Lastly, Olszak et al. (2017) show that investor protection and restrictive capital standards reduce the cyclicality of LLPs. Moreover, large and publicly traded banks have more cyclical LLPs. In addition, bank ownership type has an effect on the cyclicality of LLPs; commercial banks' LLPs are more cyclical than those of cooperative banks and savings banks.

Furthermore, current accounting standards set restrictions on collecting reserves for unidentified losses. Listed banks in Western Europe are currently obliged to specifically allocate LLPs for incurred losses (Anandarajan et al., 2011). The incurred loss approach requires an entity to assess whether any objective evidence shows that the financial asset is impaired. The incurred loss approach was designed to limit management's ability to create hidden reserves that could be used for earnings management (Gaston and Song, 2014). Previously, banks could allocate a general provision to LLRs without identifying any defaulted assets (Anandarajan et al., 2011). International Accounting Standard (IAS) 39[3] restricted the creation of such reserves. Beginning in January 2018, IAS 39 and the incurred loss approach will be replaced by the IFRS 9 and the expected loss model. The differences between these two provisioning schemes are explained in the appendix.

Even though the Spanish dynamic system is the only one of its type in Western Europe, we know that similar systems exist in Peru, Bolivia, Colombia and Uruguay (Wezel, 2010). The Uruguayan system was introduced one year after a similar system was introduced in Spain, and the Peruvian, Bolivian and Colombian systems were introduced from 2007–2008. The systems have some differences, but all of them have the common objective of reducing the cyclicality

[3]The approach has been criticized for delaying loss recognition until a loss actually occurs (Bank for International Settlements [BIS], 2009; International Financial Reporting Standards Foundation [IFRS], 2013). Furthermore, the Financial Crisis Advisory Group (FCAG, 2009) suggests that the incurred loss approach delays the recognition of loan losses because the model struggles to identify the appropriate trigger points for loan loss recognition. Consequently, the new IFRS 9 will replace the incurred loss model with an expected loss model (IFRS, 2014).

of LLPs. Cihak et al. (2013) use data from a World Bank survey to show that the regulators in countries that experienced a bank crisis during the 2008–2009 financial crisis were less able to set a minimum requirement for specific provisions or to set a regulatory requirement for general provisions. This suggests that the establishment of regulatory requirements for LLPs could improve the stability of the financial sector.

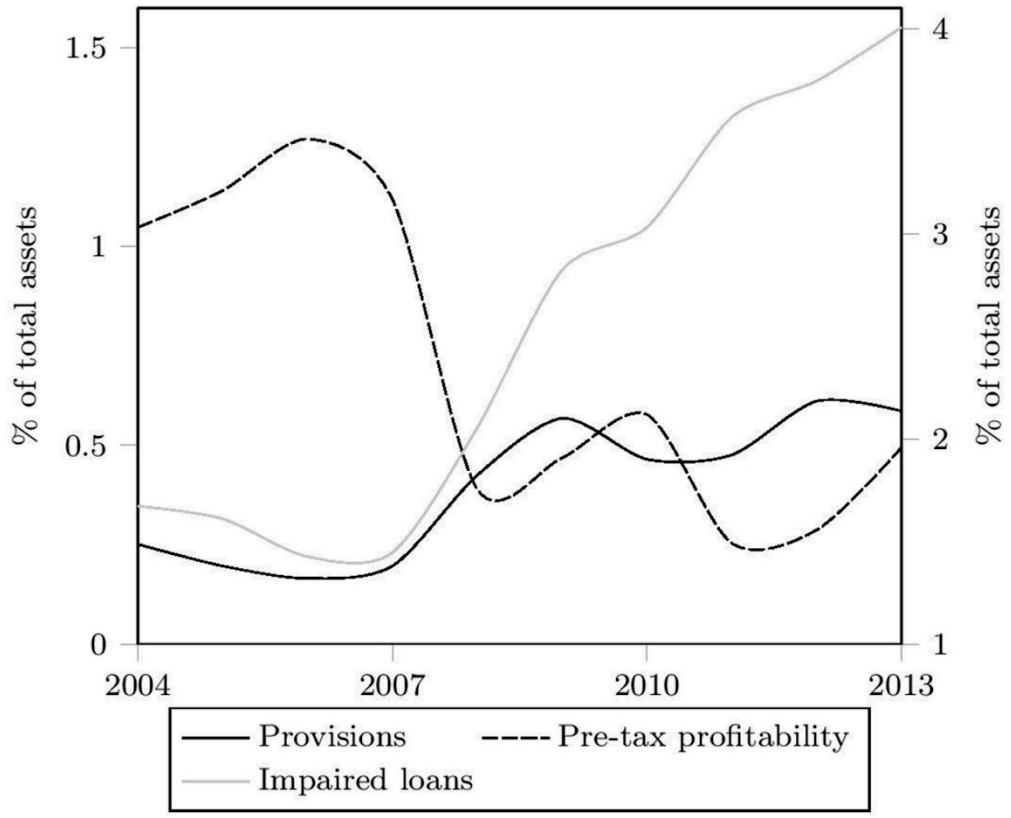

Figure 1. Ratios of LLPs, profitability, and impaired loans to net loans.

Figure 1 shows the average LLPs, pre-tax profits, and impaired loans ratios (as a percentage of total assets) of Western European banks from 2004–2013. For clarity, impaired loans are measured on the right y-axis. LLPs are large accruals in income statements, and Western European banks' LLPs accounted for an average of 23% of net interest income from 2004-2013[4]. Balla and McKenna (2009) suggest that LLPs amplify the effect of the economic cycle on banks' incomes and capital because banks delay provisioning for bad loans until the economic downturn occurs. The figure shows that, when profitability was high, provisions were low. Provisions increased rapidly in 2008–2009 and remained at a high level thereafter. In the meantime, profitability plummeted. Similarly,

[4]Source: Bankscope.

impaired loans were low from 2004–2007 and increased from 2008 onwards. Consequently, if more weight were given to the long-run credit risk in creating LLPs, banks' profitability would be more stable over time than in a system with specific provisions. Balla and McKenna (2009) use a simulation to show that, in the U.S., a dynamic provisioning system would have smoothed bank income over the cycle, thus necessitating fewer LLPs during the financial crisis of 2007–2009.

The dataset for this study consists of banks from 18 Western European countries from 2004–2013. Therefore, the study includes the economic upswing preceding the crisis, the financial crisis of 2008–2009, and the sovereign debt crisis of 2010–2013. The study thereby contributes to the literature in several ways: it offers information on the use of LLPs during the pre-crisis period and the crisis years of 2008–2013 and on the cyclicality of LLPs. Hence, the study contributes to the literature concerning LLPs and the cyclicality of the banking sector. Moreover, to the best of our knowledge, this study is the first academic attempt to analyze Spain's dynamic provisioning system and its effectiveness using a large dataset that includes data from both the financial crisis and the sovereign debt crisis.

According to the results, LLPs are generally cyclical and thereby amplify the business cycle's impacts on banks. Spain's provisioning system partially achieved countercyclicality: Spanish banks provisioned more during the pre-crisis period than other Western European banks did. However, the countercyclicality results mostly in a low amount of impaired loans during the pre-crisis period. Therefore, the reserves collected were too small to smooth the cyclical pattern of LLPs and were depleted rapidly during the crisis.

Moreover, the results suggest that the Spanish system did not improve the solvency of credit institutions. Between 2008 and 2013, Spanish banks were more likely to fail than banks in other Western European countries. However, this failure is explained by the collapse of the Spanish savings bank sector. Spanish commercial banks were not more or less likely to fail than commercial banks in other Western European countries. Furthermore, Spanish banks with high asset quality during the lead-up to the crisis were substantially more likely to fail than banks in other Western European countries. By contrast, there were no significant differences among banks that had high loan impairment during the lead-up to the crisis. Furthermore, Spain's most profitable banks were less likely to fail during the crisis period than their counterparts in other Western European countries. This suggests that for these banks, the collected reserves may well have been sufficient for the system to function as intended.

The paper is structured as follows: after the introduction, the Spanish provisioning system is explained in detail. An introduction to the Spanish housing bubble and economic crisis is then presented. This is followed by a description of the dataset and econometric specifications. Summary statistics are then presented, followed by the regression results and the discussion section. Finally, conclusions are drawn.

2.1. The Spanish provisioning system

The Spanish dynamic provisioning system was introduced in 2000 and was modified slightly in 2005. On the eve of its implementation in 1999, Spain had the lowest average number of LLPs in OECD countries, and the correlation between LLPs and the GDP growth rate from 1991–1999 was highest (at -0.97) in Spain (Saurina, 2009). Before 2005, the original dynamic system had three types of provisions: general, specific, and statistical provisions (see Fernández de Lis et al., 2001 for details). The statistical provision was the dynamic component that was expected to counterbalance LLPs' pro-cyclicality in LLPs. In 2005, the original dynamic provisioning system was adapted to conform to the IFRS adopted by the EU. Moreover, according to Fernández de Lis and Garcia-Herrero (2009), the system was modified because of the excess accumulation of statistical reserves and because it was criticized for favoring earnings smoothing. Lastly, Fernández de Lis and Garcia-Herrero (2010) suggest that Spanish financial institutions complained that the system provided a competitive advantage to competitors in other European countries. Formally, the provision was called the general provision, although it is informally known as the dynamic provision (Trucharte and Saurina, 2013).

$$\text{General provisions}_{it} = \sum_{i=1}^{6} \alpha_i \Delta C_{it} + \sum_{i=1}^{6} \left(\beta_i - \frac{\text{Specific provision}_{it}}{C_{it}}\right) C_{it} \qquad (1)$$

Equation 1 shows the Spanish dynamic provisioning system since 2005 (Balla and McKenna, 2009). The statistical provision and the general provision are unified in this system. From this equation, the general provisions can be seen to be a function of credit stock C, credit growth, risk category parameters α and β, and specific provisions. The general provisions compensate for the decreasing specific provisions because the statistical component of provisions increases the general provisions. Here, the system differs from the Uruguayan system, which subtracts the net loan loss from the dynamic provision rather than the flow of specific provisions. The Peruvian system has no gradually built cumulative fund. Instead, it has an activation period for the accumulation of the dynamic fund. The period is triggered by a GDP growth threshold (Wezel, 2010).

α (0–2.5%) and β (0–1.64%) are the risk category parameters (Balla and McKenna, 2009). α is the estimate of the average credit impairment in a cyclically neutral year. β is the historical average of the specific provision for each asset class. α and β are set by the Bank of Spain (Jiménez et al., 2012). The relative amount of specific provisions is subtracted from β, and the result serves as the parameter for the statistical LLPs. No forecasting exists; hence, the dynamic provisioning system is technically backward-looking rather than forward-looking. This backward-looking quality and the cyclically neutral estimate differentiate the dynamic system from the expected loss approach,

which is based on forecasts of future cycles. (Balla and McKenna, 2009). Thus, the extra cushion created by the system does not reflect loan values—as would be the case in the expected loss model (Barth and Landsman, 2010).

Trucharte and Saurina (2013) suggest that over 95% of the total exposure in Spain fell into the medium-risk or low-risk categories during the 2005–2007 pre-crisis period. As a consequence, general provisions were collected using the smaller risk-weight coefficients of αs and βs. Moreover, the general provision fund has an upper limit, which was reduced in the 2005 reform (International Monetary Fund [IMF], 2006). In addition, a lower limit was set. Trucharte and Saurina (2013) suggest that the lowering of the upper limit reduced the stock of general provisions. Thus, without the new upper limit, the reserves would have been higher on the eve of the financial crisis. However, Trucharte and Saurina (2013) suggest that this reform caused a slight downward adjustment in the stock of general provisions. General provisions were, on average, 78–84% of the total provisions from 2005–2007. Lastly, the lower limit was eliminated in 2008 (Trucharte and Saurina, 2013).

2.2. The Spanish economic crisis and the real estate bubble

The Spanish economy had sustained a ten-year period of economic growth before the 2008–2009 financial crisis (Ruiz et al., 2015). Moreover, Carballo-Cruz (2011) suggests that Spain experienced an exceptionally long cycle of housing expansion over the 1997–2007 period; the average annual growth of the construction sector was greater than 5% during this period. On the eve of the financial crisis, the construction sector was responsible for 16% of the GDP and 14% of employment. The building boom and the following burst of the financial bubble had devastating effects, especially on Spanish savings banks, i.e., the Spanish *cajas*. As a consequence of the crisis, these financial institutions, which were more than a century old, virtually disappeared (Sagarra et al., 2015).

Carballo-Cruz (2011) argues that the main factors underlying the housing boom were economic expansion and lower interest rates on housing loans after Spain became a member of the EMU. Moreover, Ruiz et al. (2015) suggest that inflation in Spain was higher than it was in other EMU countries during this period. As a result, real interest rates turned negative in Spain between 2001 and 2005. Carballo-Cruz (2011) argues that the inflation in housing prices fueled itself because the expectations of the future growth in housing prices increased housing demand, which again increased inflation even more. The Bank of Spain (2012) shows that the annual housing price inflation was 10–17% over the 2001–2005 period. After housing prices began to decrease from their peak in 2008, the cumulative decrease in housing prices until 2012 was 22% (27% in real terms).

Furthermore, Carballo-Cruz (2011) suggests that private debt grew rapidly in Spain until 2006. Ruiz et al. (2015) argue that the high level of private debt

became a structural weakness of the Spanish economy. The annual growth in private debt over the 2004–2007 pre-crisis period was, on average, 21.8%. By comparison, the mean annual growth was 8.9% in other Eurozone countries. Carballo-Cruz (2011) argues that the most important factor explaining the fast growth in private debt is credit expansion in productive activities, especially in the real estate and construction sectors. Accordingly, Bank of Spain (2012) shows that credit to non-financial corporations grew more than 10% in a year throughout the 1997–2007 period, reaching its highest value in 2006, when annual growth was 30%. Moreover, Bank of Spain (2012) shows that the growth of credit to non-financial companies began to decrease beginning in 2007 and became negative beginning in 2009. Similarly, the growth of credit to households quickly began to decrease from 2007 and turned negative beginning in 2011.

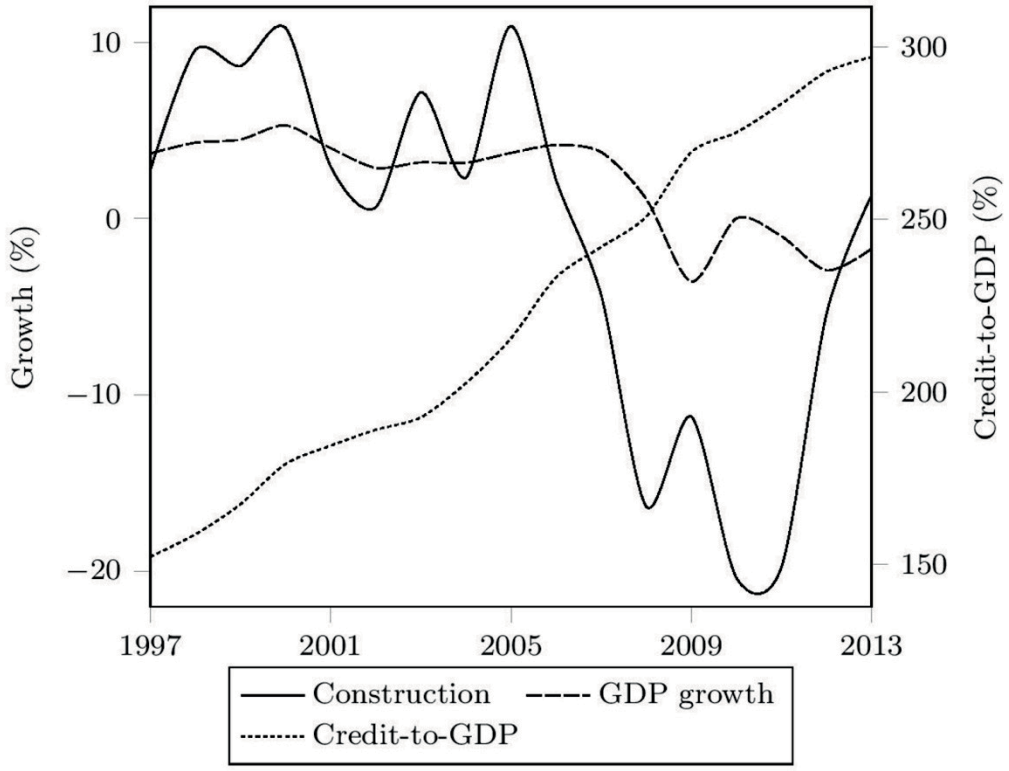

Figure 2. GDP growth, construction growth and credit to the non-financial sector-to-GDP ratio (as percentages).

Figure 2 shows the annual GDP growth, the annual rate of growth in construction, and the credit to non-financial sector-to-GDP ratio (as percentage) in Spain over the 1997–2013 period. The GDP growth and the growth in construction are measured on the left y-axis, whereas the credit-to-GDP ratio is shown on the right y-axis. The source for the variables concerning GDP growth and growth in construction is OECD. The data for the credit-to-GDP ratio is

provided by BIS (2017). The graphs suggest that GDP growth in Spain was positive from 1997 until the financial crisis. Similarly, the growth in construction was positive at the beginning of the 1997–2013 period. However, there was a steep decline in the growth in construction during the economic stagnation of the early 2000s. Furthermore, the growth in construction began to slow earlier than GDP growth did during the lead-up to the 2008–2009 financial crisis. The lowest figure for the growth rate of construction was less than -20%, in 2010. This was accompanied by stagnant GDP growth.

Turning to the credit to non-financial sector-to-GDP ratio, the figure shows that it grew constantly over the whole period. The ratio was 150% at the beginning of the sample period. However, at the end of the period, the ratio had nearly doubled. Ruiz et al. (2015) suggest that the stock of private debt relative to GDP was 167% from 2007. Therefore, private debt constituted the majority of the overall stock of debt in the Spanish non-financial sector. Carballo-Cruz (2011) suggests that high private debt was the main source of economic problems in Spain. Ruiz et al. (2015) suggest that the credit expansion was spearheaded by Spanish savings banks.

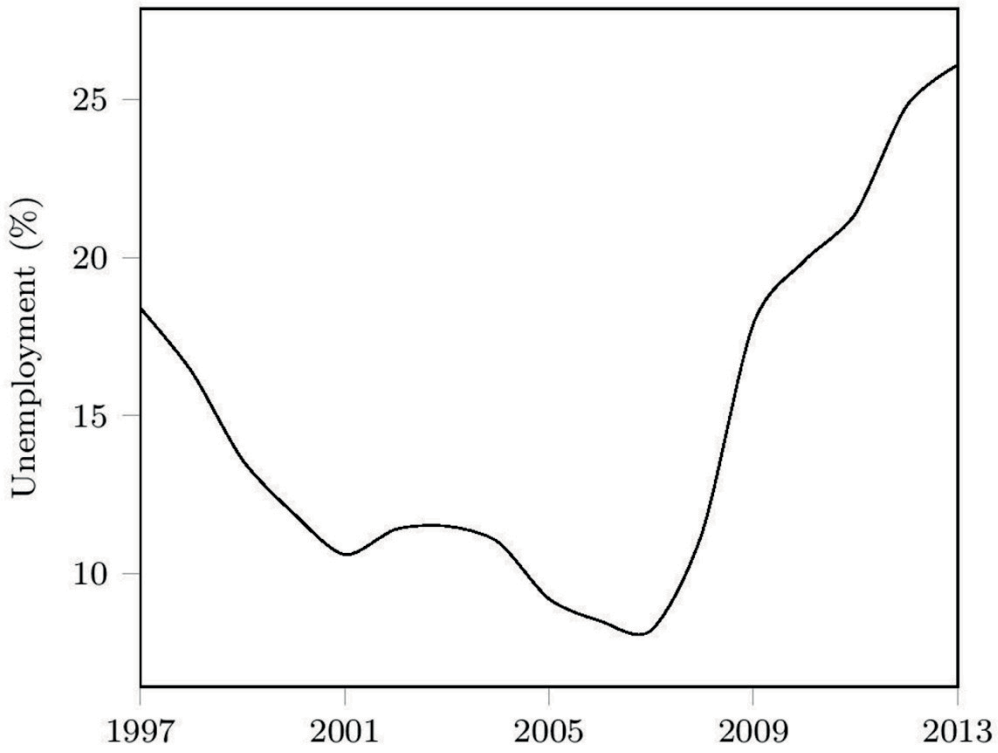

Figure 3. Unemployment rate in Spain (source: OECD).

As the recession began in Spain in 2007, unemployment increased rapidly. Figure 3 shows the annual unemployment rate in Spain in 1997–2013. The graph shows that unemployment decreased during the economic expansion until 2008. The lowest unemployment rate over this period was 8.2% in 2007. The unemployment rate increased very steeply from 2007 until the end of the sample period. The unemployment rate was over 25% in 2013. Carballo-Cruz (2011) suggests that the Spanish construction sector lost more than 36% of its jobs over the 2008–2010 period. Because employment in the construction sector was relatively high in Spain during the lead-up to the crisis, the reduction in jobs in this sector had a large impact on Spanish employment rates.

Sagarra et al. (2015) argue that the Spanish savings bank sector accounted for half of the Spanish banking system before the economic crisis. Only the savings bank sector in Norway enjoyed similar relevance among European countries. Savings banks' balance sheet growth accelerated from 1997 and reached a historical high in 2007, when Spanish savings banks outgrew commercial banks in loans; Ruiz et al. (2015) suggest that savings banks increased their lending by 700% over the 1997–2007 period. Moreover, savings banks' lending to the real estate and construction sectors increased by 1300% between 1997 and 2007. As a result, savings banks had a larger volume of loans in these sectors than did commercial banks on the eve of the financial crisis. Sagarra et al. (2015) suggest that the share of real estate loans in Spanish savings banks' books ranged from 10 to 50 percent before the financial crisis. This was a result of intensive involvement in the building boom of the 2000s. The growth in credit to other sectors was more moderate (Ruiz et al., 2015).

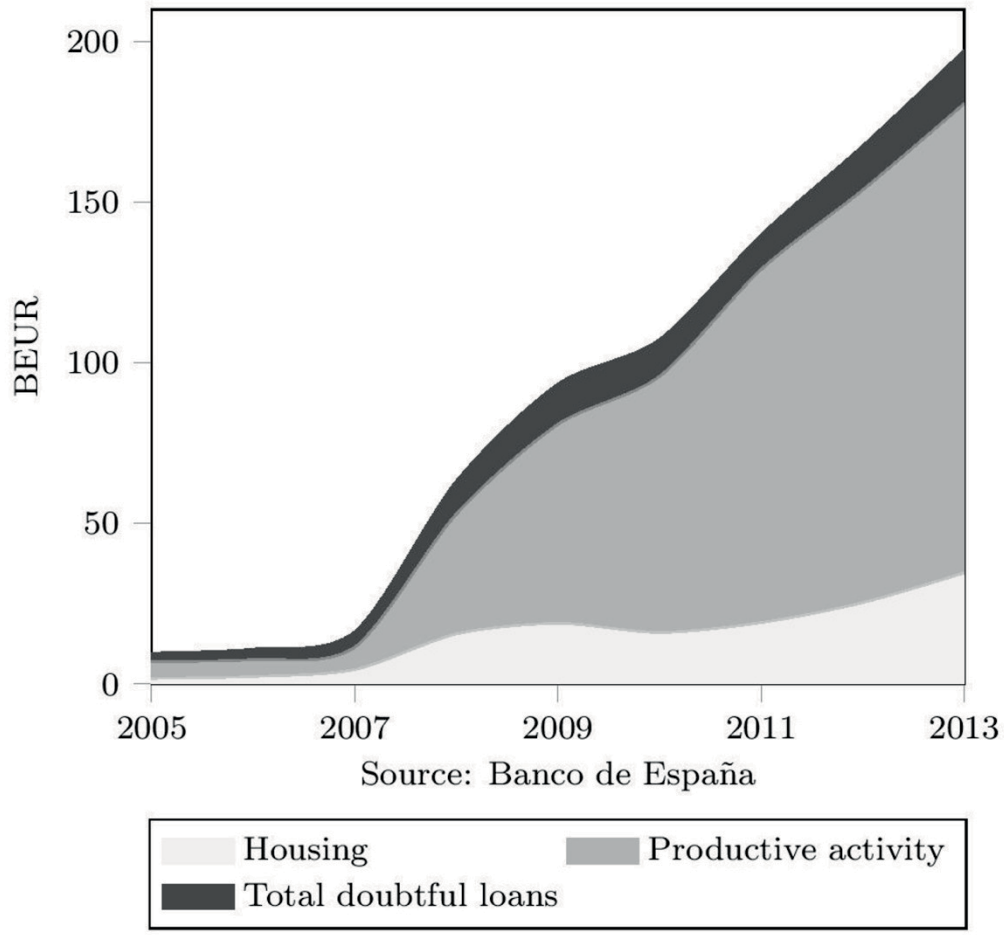

Figure 4. Stocks of overall doubtful loans and doubtful loans in the productive activity and housing sectors in Spain (in billions of euros).

Figure 4 shows the amount of doubtful loans in millions of euros in Spain in 2005–2013 (Bank of Spain, 2012, 2014). The figure reveals a very steep increase in problem loans beginning in 2008. Moreover, the figure shows that most of the doubtful loans were loans to corporations and construction companies (productive activity). In 2013, they accounted for approximately 75% of problem loans, whereas housing loans accounted for 18% of problem loans; together, they accounted for almost all problem loans in 2013. Nonetheless, the increase in problem loans was very high in all three categories; problem loans in productive activities were 30 times as high in 2013 as in 2005, and problem loans in housing and other types of loans were 20 times as high in 2013 as in 2005.

When unemployment, bankruptcies, impairments and delinquency rapidly increased in the construction and real estate sectors, a number of Spanish savings banks were in need of additional capital. Sagarra et al. (2015) suggest that this need was unprecedented because deposit guarantee funds had never rescued a caja before. Moreover, Ruiz et al. (2015) argue that not all cajas were

experiencing difficulties, because only some of Spain's 45 savings banks were heavily exposed to the real estate bubble. However, as a response to the crisis, Bank of Spain designed a series of mergers that also included savings banks that were not in serious difficulties. The mergers took place in the context of a newly created institution, the "Fund for Orderly Bank Restructuring" (Carballo-Cruz, 2011). The resultant merged entities were automatically turned into commercial banks (Ruiz et al., 2015). Only two small savings banks preserved their ownership structure. Bank of Spain (2012) suggests that the restructured savings banks (a total of 11 new entities) covered 99% of the risk-weighted assets of the Spanish savings banks sector.

In addition to Spanish savings banks, the Spanish commercial banking sector experienced difficulties. According to Ruiz et al. (2015), the two biggest Spanish commercial banks, Santander and BBVA, were the only banks that were not in need of state guarantee schemes provided to banks that had to issue new debts. Santander and BBVA helped mitigate loan losses in the Spanish banking sector because they obtain most of their profits abroad.

3. DATA AND EMPIRICAL METHODOLOGY

3.1. Data

The dataset consists of bank-level balance sheet and income statement data. Bankscope is the source for the bank-specific data. The frequency of data is annual, and the sample period is 2004–2013. The years preceding 2004 are not included because, unfortunately, Bankscope does not have many observations for Spanish banks' provisions in the early 2000s. Therefore, the years preceding 2004 are excluded to provide a more balanced dataset. The sample countries include both the EU15[5] and Western European countries outside the EU and the euro area: Norway, Switzerland, and Iceland. The microstates of Western Europe are not included.

The dataset includes only consolidated data. Consolidated data are preferred to unconsolidated data to avoid possible problems arising from profit/loss manipulation via, for example, transfer pricing; in addition, regulation is applied in banks at the consolidated level. The dataset was reviewed to remove multiple observations from the same banks. For example, the German savings bank group

[5]The EU15 includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

"Sparkasse Finanzgruppe" is reported three times in the dataset: (i) the parent organization, (ii) the central organization, and (iii) consolidated data for the regional member banks of the group. Moreover, several subsidiary banks are included in a consolidated bank in the dataset but also have their own entries. All of these entries were corrected, and the dataset does not include any overlapping ownership structures. The downloaded dataset includes data for commercial banks, cooperative banks, savings banks, and bank holding companies. The last group is included because, for some banks, data are only available for the bank holding company.

The data are selected for the study such that, whenever possible, bank group members are preferred to central organizations. Thus, when a bank has figures from several levels of the "organizational tree", the observations closest to the root level are used. Consequently, whenever the data for regional consolidated organizations are available, they are used instead of the data for central organizations. When regional data are unavailable, the data for the central organization are used.

The study uses ten bank-specific variables. For every bank-specific ratio, difference, and growth variable, the values below the 1st percentile and above the 99th percentile are removed. The variables constructed from the data have large outliers that have been categorized as reporting errors. For example, the highest value for lending growth is 1,700%. For all ratios and growth variables, the outliers are removed from the dataset to avoid bias caused by extreme values. The variable for the log of total assets remains intact because it is not a ratio or a growth variable. See Table 1 for variable definitions and Table 2 for a description of the data.

Table 1. Definitions of the variables

LLPs	Loan loss provisions-to-lagged total assets ratio (%)
Profits	Pre-tax and pre-impairment cost profits-to-lagged total assets ratio (%)
Lending growth	The ratio of growth of net lending to lagged total assets
Impaired loans	Impaired loans-to-total assets ratio (%)
Capital ratio	Total equity-to-risk weighted total assets ratio (%)
log(total assets)	Log of total assets
Net loans	Net loans-to-lagged total assets ratio (%)
LLRs	Loan loss reserves-to-lagged total assets ratio (%)
Cost-to-income	Non-interest expense-to-gross revenues ratio (%)
Loans-to-deposits	Net loans-to-total customer deposits ratio (%)
Equity ratio	Total equity-to-total assets ratio (%)
GDP growth	Percent growth of GDP (source: OECD)
Spain	A dummy indicating Spain

Table 2. Description of the data (source: Bankscope).

Pre-impairment cost and pre-tax profit	Includes net interest income plus non-interest operating income, minus non-interest expenses, plus the share of profit/loss from associates where operating (at equity profit/loss) and the change in the fair value of own debt included in the trading income. Hence, this is the operating profit minus all the credit impairment costs.
Loan loss provisions	An expense for bad loans, defaults, renegotiations, etc.
Loan loss reserves	The reserves that have been provided for loan losses but not charged off.
Net loans	Includes residential mortgage loans, other mortgage loans, other consumer/retail loans, corporate and commercial loans, and all other loans that do not fall into these categories. Net loans do not include reserves created for loan losses or loans to banks.
Impaired loans	The share of loans that are doubtful. The definition for an impaired loan may vary between countries and banks.
Capital ratio	Includes Tier 1 and Tier 2 capital. Tier 1 capital includes shareholders' funds plus perpetual non-cumulative preference shares. Tier 2 includes subordinated debt, hybrid capital, loan loss reserves, and revaluation reserves. The ratio is risk-weighted.
Total equity	Includes common equity, non-controlling interest, securities revaluation reserves, foreign exchange Revaluation Reserves plus other revaluation reserves.
Cost-to-income ratio	Non-interest expense-to-gross revenues ratio.
Deposits	Includes current, savings and term deposits, i.e., customer transaction accounts that can be withdrawn on demand or short notice, customer accounts with limitations as to the timing or number of withdrawals per period that have no set maturity date and customer deposits for which there is a set maturity date
Total assets	Includes total earning assets, cash and dues from banks, foreclosed real estate, fixed assets, goodwill and other intangibles, current tax assets, deferred tax assets, discontinued operations (e.g., the assets of a sold business), and all other assets not otherwise categorized (e.g., prepayments).

Tables 3 and 4 show the descriptive statistics for the study variables for the 2005–2007 pre-crisis period, for the 2008–2009 financial crisis, and for the 2010–2013 recession period. The asterisks show the significance of the mean-comparison t-test with a hypothesis that the means between Spain and other Western European countries are different. The results show that during the pre-crisis period, the differences between Spain and other Western European countries are often significant. The figures show that provisions are almost twice as large in Spain from 2005–2007. The median LLPs in Spain are more than three times as high as those of other Western European countries. In addition, LLRs are higher in Spain, as previously suggested by Balla and McKenna (2009). Profitability is lower in Spain from 2005-2007. Moreover, impaired loans are lower in Spain during the lead-up to the crisis. Furthermore, the net lending ratio is significantly higher in Spain during the 2005-2007 period.

Table 4 shows that lending growth is much higher in Spain from 2005–2007. The cost-to-income ratio is slightly lower in Spain from 2005-2007. Similarly, the net loans-to-deposits ratio is lower in Spain, implying that banks in Spain have more liquid balance sheets, although the difference is not statistically significant. The figures also show that, on average, Spanish banks have less regulatory capital than banks in the other Western European countries and that Spanish banks are smaller. Finally, GDP growth in Spain is higher during the economic boom preceding the crisis.

Turning to the descriptive statistics from the 2008–2009 financial crisis period, Tables 3 and 4 show that many of the figures have changed. Profits have decreased in both samples and the means are not significantly different from 2008-2009. Impaired loans in Spain have grown very rapidly and are now higher than in other Western European countries. Moreover, net lending growth in Spain has halted and is significantly lower than in other Western European countries. The cost-to-income ratio has increased in both subsamples, but the increase is much greater in the sample that excludes Spanish banks. Finally, the difference in bank size is not significant from 2008-2009.

Table 3. Descriptive statistics for the study variables.

Loan loss provisions		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	0.30***	0.15	0.14	0.79	0.29	114
	2008–2009	0.66***	0.48	0.15	2.53	0.59	86
	2010–2013	0.81***	0.86	0.06	4.21	0.56	95
Western European countries, excluding Spain	2005–2007	0.17	0.29	0.23	3.54	0.08	679
	2008–2009	0.47	0.53	0.07	3.59	0.31	505
	2010–2013	0.51	0.71	0.19	4.63	0.24	1057
Profits		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	0.96***	0.50	0.26	4.37	0.86	116
	2008–2009	0.39	0.95	−3.98	3.56	0.42	86
	2010–2013	−0.07***	1.32	−5.78	2.88	0.26	94
Western European countries, excluding Spain	2005–2007	1.18	0.84	−3.87	5.13	1.03	659
	2008–2009	0.44	0.99	−5.35	4.27	0.48	476
	2010–2013	0.43	1.11	−5.98	4.90	0.50	999
Loan loss reserves		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	1.44***	0.31	0.02	2.24	1.43	111
	2008–2009	1.95***	0.65	0.07	4.78	1.94	81
	2010–2013	3.04***	1.82	0.01	10.18	2.36	98
Western European countries, excluding Spain	2005–2007	1.02	1.05	0.01	8.21	0.68	572
	2008–2009	1.37	1.22	0.01	8.78	0.97	446
	2010–2013	1.93	1.97	0.01	11.03	1.29	979
Impaired loans		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	0.64***	0.38	0.14	2.32	0.55	111
	2008–2009	3.05**	1.62	0.44	11.34	2.90	80
	2010–2013	4.91***	3.19	0.11	14.95	4.08	98
Western European countries, excluding Spain	2005–2007	1.66	1.75	0.02	10.63	1.06	530
	2008–2009	2.34	2.40	0.02	16.81	1.59	449
	2010–2013	3.45	3.85	0.02	20.97	1.99	1024
Net lending		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	73.04***	7.80	51.76	89.72	73.06	114
	2008–2009	72.34***	7.43	58.11	90.43	72.71	84
	2010–2013	63.37**	10.55	39.31	84.16	63.83	99
Western European countries, excluding Spain	2005–2007	58.32	22.48	5.35	91.54	62.42	703
	2008–2009	59.74	21.55	5.33	91.44	65.39	510
	2010–2013	60.20	20.13	5.09	91.34	64.16	1069

All the variables are shown in percent. Loan loss provisions = LLPs-to-total assets ratio, Profits = pre-tax and pre-impairment cost profit-to-total assets ratio, Loan loss reserves = LLRs-to-total assets ratio, Impaired loans = impaired loans-to-total assets ratio, Net lending = net loans-to-total assets ratio. The asterisks show the significance for the mean-comparison t-test with a two-sided hypothesis that the means between Spain and Western European countries, excluding Spain, are different. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Descriptive statistics for the study variables (continued).

Net lending growth		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	15.02***	6.07	-6.77	30.3	15.47	105
	2008–2009	1.28**	4.32	-8.85	10.67	1.18	82
	2010–2013	-0.43***	6.12	-15.13	35.93	-0.97	90
Western European	2005–2007	8.34	8.13	-13.07	44.59	7.57	573
countries, excluding Spain	2008–2009	3.58	8.14	-15.54	32.8	2.94	485
	2010–2013	2.3	7.11	-15.34	41.92	1.22	1041
Cost-to-income ratio		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	57.87***	10.98	28.04	98.61	56.18	116
	2008–2009	58.79***	13.97	34.22	119.21	57.54	85
	2010–2013	62.34**	18.44	29.65	162.44	60.16	99
Western European	2005–2007	61.75	12.53	27.53	156.96	60.92	699
countries, excluding Spain	2008–2009	68.12	19.75	27.64	155.87	65.84	493
	2010–2013	66.76	19.13	26.76	165.14	64.66	1067
Loans-to-deposits		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	146.44	44.36	19.57	256.56	141.20	113
	2008–2009	145.30	41.19	17.02	240.27	145.83	83
	2010–2013	121.73	36.58	16.39	230.36	120.07	101
Western European	2005–2007	163.09	220.16	13.94	2786.54	132.91	680
countries, excluding Spain	2008–2009	159.09	177.59	12.39	1636.07	130.86	494
	2010–2013	148.72	184.65	13.66	2962.98	123.54	1052
Capital ratio		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	11.8***	1.54	8.8	17.45	11.66	91
	2008–2009	12.23***	1.94	8.22	19.75	12.1	70
	2010–2013	13.02***	3.39	7.8	27.1	12.56	77
Western European	2005–2007	13.13	3.99	8.1	35.6	11.99	513
countries, excluding Spain	2008–2009	14.14	4.22	8.07	35.57	13.26	390
	2010–2013	15.58	4.17	8	34.1	14.86	780
Total assets (MEUR)		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	56,455*	149,540	565	912,915	15,433	118
	2008–2009	76,034	184,481	327	1,110,000	21,392	86
	2010–2013	126,992	257,801	351	1,270,000	39,435	102
Western European	2005–2007	97,266	253,457	62	1,930,000	9,298	715
countries, excluding Spain	2008–2009	109,459	294,876	74	2,200,000	10,181	520
	2010–2013	103,063	279,607	99	2,160,000	11,338	1091
GDP growth		Mean	S.D.	Min	Max	Median	n
Spain	2005–2007	3.7***	0.3	3.5	4.1	3.6	141
	2008–2009	-1.5*	2.4	-3.8	0.9	-1.5	94
	2010–2013	-0.8***	0.7	-1.6	0.1	-0.7	188
Western European	2005–2007	2.7	1.1	0.7	7.2	2.6	912
countries, excluding Spain	2008–2009	-1.9	2.4	-8.5	2.2	-1.6	608
	2010–2013	0.7	2.0	-7.1	6.6	1.1	1216

All the variables except Total assets are shown in percent. Net lending growth = growth of net lending, Cost-to-income ratio = non-interest expenses-to-gross revenues ratio, Loans-to-deposits = net loans-to-total customer deposits ratio, Capital ratio = risk-weighted capital-to-total assets ratio. The asterisks show the significance for the mean-comparison t-test with a two-sided hypothesis that the means between Spain and Western European countries, excluding Spain, are different. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

As for the recession period, LLPs in Spain grow even higher from 2010–2013. LLPs in other Western European countries from 2010–2013 are at the same level as those from 2008–2009. In Spain, the average profitability is negative and significantly lower than in other Western European countries. From 2010-2013, the average difference in the net lending ratio has decreased to three percentage points. Liquidity in both subsamples has increased from the pre-crisis values. This can be seen in the lower averages for the loans-to-deposits ratio from 2010-2013. Finally, the average GDP growth in Spain is negative from 2010–2013.

3.2. Empirical methodology

3.2.1. Cyclicality

The regression model that examines LLPs' cyclicality is similar to that used by Bikker and Metzemakers (2005) and Olszak et al. (2017). The specification aims to determine whether and to what extent Spanish LLPs are cyclical compared with those in other Western European countries. The first dependent variable is the LLPs-to-impaired loans ratio. This variable differs from that of Bikker and Metzemakers (2005) and Olszak et al. (2017), who utilize an LLPs-to-total assets ratio. Using a ratio to total assets does not account for the growth in non-performing loans; therefore, the differences in cyclicality may be simply caused by different patterns in impaired loan growth. A ratio to non-performing loans overcomes this problem because the Spanish system is designed to allocate higher-than-needed LLPs during economic expansions. Therefore, the signs of the GDP growth variables indicate the extent to which the Spanish system is countercyclical: a positive result for the combined general term and the interaction implies that the system is countercyclical. If LLPs are strictly allocated for incurred losses, the coefficient should be close to zero.

$$\begin{aligned}\text{LLPs/LLRs}_{it} &= \alpha_i + \beta_1 \text{LLPs/LLRs}_{i(t-1)} + \beta_2 \text{GDP growth}_{it} + \beta_3 \text{Spain} \times \text{GDP growth}_{it} \\ &+ \beta_4 \frac{\text{Profits}_{it}}{\text{Net loans}_{i(t-1)}} + \beta_5 \frac{\Delta\text{Net loans}_{it}}{\text{Total assets}_{i(t-1)}} + \beta_6 \frac{\text{Net loans}_{it}}{\text{Total assets}_{i(t-1)}} + \beta_7 \text{Capital ratio}_{i(t-1)} \\ &+ \beta_8 \log(\text{total assets})_{i(t-1)} + \beta_8 \text{Spain}_{it} + \sum D_{\text{Year}} + \dot{o}_{it} \end{aligned} \quad (2)$$

In addition, several other variables control the factors that affect LLPs. The coefficient for profitability is significantly positive if banks use LLPs for earnings smoothing. Similar variables have been used by Ahmed et al. (1999), Anandarajan et al. (2007) and Fonseca and González (2008). Here, profits include pre-impairment costs and pre-tax profits, and they are measured as a

ratio to lagged total assets. The variable for loan growth (as in, e.g., Bikker and Metzemakers, 2005; Nichols et al., 2009) measures the increase in overall credit risk. The variable is measured as the percent growth of net loans. The risk-weighted capital ratio is included as a control variable to capture the possible use of LLPs to manage regulatory capital (similar to, e.g., Fonseca and González, 2008). Moreover, Olszak et al. (2017) show that the bank size affects the cyclicality of LLPs. Therefore, the log of total assets is included as a control variable (as in Anandarajan et al., 2007). All the stock variables are lagged by one period to avoid endogeneity problems.

In the second regression, the dependent variable is changed to the LLRs-to-lagged impaired loans ratio. This specification examines the cyclicality of LLRs (similar to Laeven and Majnoni, 2003). The Spanish system aims to collect large reserves during booms and to release them during a recession, whereas the incurred loss system collects reserves according to identified losses. Therefore, the Spanish system should be less cyclical. Furthermore, in the third regression, the dependent variable is the LLPs-to-lagged total assets ratio, which examines the cyclicality of LLPs when loan losses are not accounted for. If the Spanish system succeeded in smoothing the cyclical pattern of LLPs, the result for the interaction variable for Spain would be positive; i.e., LLPs would react less to changes in GDP growth in Spain. Fourth, the dependent variable is changed to the LLRs-to-lagged total assets ratio. We expect Spanish LLRs to be less related to the business cycle compared with LLRs in other Western European countries.

A lagged dependent variable is included as a control variable for the forward-looking nature of LLPs: forward-looking provisions imply that the decision regarding LLPs is a dynamic decision that aims to achieve intertemporal optimization. The coefficient for the lagged dependent variable can be interpreted as (e.g., opportunity) costs for reaching for the optimal level of LLPs. The coefficient of the variable is expected to be positive and less than one.

Because of the lagged dependent variable, using panel ordinary least squares (OLS) will lead to bias caused by endogeneity (with a small T value) due to the time-invariant component of the error term. Furthermore, the bank-specific independent variables are also likely to be endogenous. To reduce the imprecision caused by endogeneity, the specifications use the system GMM estimators suggested by Arellano and Bover (1995) and Blundell and Bond (1998). The more common dynamic estimators suggested by Arellano and Bond (1991) were developed further by Arellano and Bover (1995) and Blundell and Bond (1998); instead of differencing the equation and instrumenting the differences of the endogenous variable by the lagged levels of the variable, system GMM estimators construct a system of two equations.

$$\Delta y_{it} = \alpha \Delta y_{i(t-1)} + \beta' \Delta X_{it} + \theta_t + \Delta \varepsilon_{it} \quad (3)$$

$$y_{it} = \alpha y_{i(t-1)} + \beta' X_{it} + \eta_i + \theta_t + \varepsilon_{it} \quad (4)$$

In addition to the difference equation used in the Arellano-Bond estimators (Equation 3), system GMM estimators have a second equation that is in levels (Equation 4). The level of the endogenous variable is instrumented by the lagged differences of the variable. According to Blundell and Bond (1998), the inclusion of the level equation improves the precision of the standard first-difference estimator. Because the equation is differenced, the individual effects are differenced away; hence, the estimators are fixed-effects estimators. However, in the system GMM, time-invariant variables can be included in the regression. Therefore, the country dummy for Spain is removed from the error term in the regressions because it has a clear interpretation.

The estimators used in the study are two-step estimators. The standard errors are corrected using the correction suggested by Windmeijer (2005), as two-step estimators over-reject because of severely downwardly biased standard errors. The instruments matrix is constructed such that up to 2–6 lags of the endogenous variables are used as instruments. All the bank-specific variables are defined as endogenous, whereas the GDP growth variables, year dummies, and the country dummy for Spain are defined as exogenous. If the bank-specific variables are lagged by one period, they use up to 1–5 lags as instruments.

3.2.3. Failure

In the regressions explaining bank failure over the 2008-2013 period, a model (Equation 5) similar to those used in Chiaramonte et al. (2015) and Poghosyan and Čihak (2011) is used. The dependent variable is a dummy variable that takes the value of 1 if the bank failed from 2008-2013. The definition of a failed bank is similar to that used by Vazquez and Federico (2015) and Chiaramonte et al. (2015). First, a bank is defined as a failed bank through its status changes from active to dissolved, dissolved by merger, in liquidation or bankruptcy over the 2008-2013 period. Second, a bank fails if its capital ratio decreases below 8 from 2008-2013. Third, similar to Chiaramonte et al. (2015), a bank fails if it received state aid from 2008-2013. Data for the government bailouts of banks are taken from the database by MedioBanca (2014).

$$\Pr(\text{Failure})_i = \alpha + \beta_1 \text{Spain}_i + \beta_2 \frac{\text{Equity}_i}{\text{Total assets}_i} + \beta_3 \frac{\text{Impaired loans}_i}{\text{Total assets}_i}$$
$$+ \beta_4 \frac{\text{Costs}_i}{\text{Income}_i} + \beta_5 \frac{\text{Profit}_i}{\text{Total assets}_i} + \beta_6 \frac{\text{Net loans}_i}{\text{Customer deposits}_i} + \varepsilon_i \qquad (5)$$

The main independent variable is the country dummy for Spain. This variable is interpreted as Spain's effect on the bank's probability of failing from 2008-2013. Similar to Poghosyan and Čihak (2011) and Chiaramonte et al. (2015), the independent variables include the so-called CAMEL variables, i.e., variables for capitalization, asset quality, managerial skills, earnings and liquidity. Consequently, the bank-specific variables are equity ratio, impaired loans-to-total assets ratio, cost-to-income ratio (proxy for managerial skills), pre-tax profitability and net loans-to-total customer deposits ratio. All of the values are averages for the years 2004-2007 (similar to Vazquez & Federico, 2015). These variables capture the differences between the banks during the lead-up to the financial crisis. Because the values are averages, the regression is purely cross-sectional.

First, the regression is run with the full sample including all banks. After this, following Poghosyan and Čihak (2011), the regression is repeated separately for the subsamples of i) only commercial banks and ii) excluding commercial banks (i.e., including stakeholder banks) and iii) including private savings banks. Finally, the regression is run for the subsample of Spanish private savings banks. All of the regressions use logit estimators, and the standard errors are robust for heteroskedasticity.

4. DESCRIPTIVE STATISTICS AND REGRESSION RESULTS

4.1. Descriptive statistics

Table 5 shows the yearly averages for the LLPs-to-impaired loans ratio and for the first difference of this ratio. Moreover, the table shows the t-values and the significances for the mean comparison tests with the hypotheses that LLPs are larger and the growth in LLPs is lower in Spain than in other Western European countries. In every year from 2005-2007, the average provisions are higher in Spain than in other Western European countries. Moreover, the growth in LLPs in 2008 is much lower in Spain. In Spain, the provisions increase rapidly in 2012, marking the Spanish banking crisis. Excluding the banking crisis, the descriptive statistics suggest that on average, the LLPs are less cyclical in Spain than in other

Western European countries and that the Spanish system functions as intended at the beginning of the recession.

Table 5. The LLPs-to-impaired loans ratio (%) and the first difference of this ratio in Spain and in Western European countries, excluding Spain (2005–2013).

	LLPs-to-impaired loans ratio			The first difference of the LLPs-to-impaired loans ratio		
	Western European countries, excluding Spain	Spain	t	Western European countries, excluding Spain	Spain	t
2005	11.91	59.12	-9.93***	-4.35	11.88	-2.50
2006	12.68	68.82	-11.14***	0.65	9.91	-2.72
2007	12.40	57.83	-12.07***	-0.76	-11.48	2.64***
2008	29.20	23.47	1.18	14.03	-33.96	9.91***
2009	26.66	26.24	0.09	-1.48	-0.21	-0.30
2010	16.75	16.37	0.09	-8.71	-10.03	0.27
2011	14.92	13.61	0.43	-1.53	-0.72	-0.19
2012	16.55	51.66	-7.73***	1.68	36.52	-7.51
2013	14.57	15.88	-0.40	-0.61	-31.31	8.17***
Average	17.29	37.00	-14.87***			

Columns 2 and 3 show the average ratio of LLPs to impaired loans (in percent), and columns 5 and 6 show the average first difference of the LLPs-to-impaired loans ratio in Spain and other Western European countries, excluding Spain. Column 4 shows the t-values and the asterisks for the significance of the mean comparison t-test with a one-sided hypothesis that the LLPs are higher in Spain than they are in other Western European countries, excluding Spain. The seventh column shows the t-statistic and the significance of the mean comparison test with a one-sided hypothesis that the first difference in Spanish banks is lower than in other Western European countries; i.e., the growth of the ratio is lower in Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6 shows the means for the LLPs relative to total assets and for the first difference of this ratio. The third column of the table shows the t-value for the mean comparison t-test with the hypothesis that the LLPs are higher in Spanish banks. The figures suggest that the LLPs are higher in Spain during the pre-crisis period, although the difference is not as large as it is when LLPs are measured relative to impaired loans. Therefore, the high LLPs-to-impaired loans ratios of Spanish banks during the pre-crisis period can be largely attributed to the low level of impaired loans. For the growth of LLPs, the figures and the t-statistics suggest that the LLPs in Spain do not grow less than LLPs in other Western European countries in 2008. The growth of LLPs in Spain is lower only in 2013, i.e., after the Spanish banking crisis.

Table 6. LLPs-to-total assets ratio (%) and the first difference of the ratio in Spain and in Western European countries, excluding Spain (2005–2013).

	LLPs-to-total assets ratio			The first difference of the LLPs-to-total asset ratio		
	Western European countries, excluding Spain	Spain	t	Western European countries, excluding Spain	Spain	t
2005	0.19	0.26*	-1.32*	-0.04	0.01	-0.96
2006	0.15	0.28***	-3.80***	-0.02	0.03	-2.06
2007	0.17	0.36***	-3.55***	0.01	0.07	-2.61
2008	0.40	0.56**	-2.17**	0.25	0.22	0.508
2009	0.54	0.76**	-2.30**	0.15	0.19	-0.55
2010	0.46	0.54	-0.70	-0.10	-0.13	0.35
2011	0.46	0.60	-1.08	0.00	0.13	-1.36
2012	0.55	1.52***	-5.04***	0.09	1.13	-8.04
2013	0.57	0.83*	-1.50*	0.03	-0.77	5.76***
Average	0.39	0.54***	-4.45***			

The table shows the yearly averages for the LLPs-to-total assets ratio (in percent) and for the first difference of the LLPs-to-total assets ratio (in percent) for Spanish banks and for banks in Western European countries, excluding Spain. The fourth column shows the t-statistic and the significance of the mean comparison test with a one-sided hypothesis that LLPs in Spanish banks are larger than those in other Western European countries; i.e., the difference of the variables in columns 2 and 3 is below 0. The seventh column shows the t-statistic and the significance of the mean comparison test with a one-sided hypothesis that the first difference in Spanish banks is lower than that in other Western European countries; i.e., the growth of the ratio is lower in Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7 shows the univariate analysis for overall LLRs as a percentage of impaired loans (i.e., the coverage ratio, as in Balla and McKenna, 2009). The figures show that compared with the LLRs in other Western European countries, Spain's dynamic provisioning system creates much higher average coverage ratios during the pre-crisis period (as Balla and McKenna, 2009, suggest). However, in the crisis years, the relative amount of reserves in Spain sharply decreases. This drop causes a large decline in the t-statistic (column 4), which does not reach the critical value from 2008–2013. Therefore, the average coverage ratios are not significantly larger in Spain after 2007. This finding implies that Spanish banks' abnormal reserves are depleted during the first crisis year.

Table 7. The average LLRs-to-impaired loans ratio (%) and mean comparison t-tests in Spain and in Western European countries, excluding Spain.

	Western European countries, excluding Spain	Spain	t
2005	93.21	273.40	-11.60***
2006	83.16	293.24	-15.28***
2007	80.31	245.56	-13.73***
2008	76.70	86.13	-0.90
2009	70.53	70.58	-0.01
2010	69.07	76.80	-0.81
2011	66.95	61.51	0.60
2012	67.67	70.64	-0.34
2013	64.85	60.94	0.49
Average	74.24	154.07***	-19.1***

The table shows the yearly averages for LLRs-to-impaired loans ratios (in percent) for Spain and for Western European countries, excluding Spain. The fourth column shows the t-value and the significance of the mean comparison test with a one-sided hypothesis that reserves in Spain are larger than in the other countries; i.e., the difference of the variables in columns 2 and 3 is below 0. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 5 shows the LLRs (a) and the impaired loans (b) relative to total assets in Spain and in other Western European countries. The figure shows that the pre-crisis reserves are not much higher in Spain than in other Western European countries when they are measured relative to total assets. Moreover, as the descriptive statistics in Table 3 suggest, Spanish banks are, on average, more oriented toward lending activities. Therefore, when LLRs are measured relative to net loans, the former are not any higher in Spain than in other Western European countries. However, other Western European countries' LLRs are already earmarked for loan losses, whereas the reserves in Spain are more "loose" and are partially meant to cover future losses. The figure also shows that, until 2012, the growth in reserves is similar in both groups. The growth in LLRs in Spain begins to increase in 2012.

The graph on the right shows that the impaired loans in Spain start increasing very rapidly in 2008; impaired loans are 0.6–0.7% of total assets from 2005–2007, and they almost quadruple in 2008. As Figures 2 and 3 show, this was when the Spanish housing bubble began to burst. The increase in impaired loans causes a decrease in the coverage ratio, which can be seen in Table 8. Thereafter, the reserves relative to impaired loans are at the same level as those in other Western European countries. Moreover, loan losses in Spain are very low in the lead-up to the crisis. Therefore, the coverage ratio values are high during the pre-crisis period because the level of impaired loans is low—not because the LLRs are high.

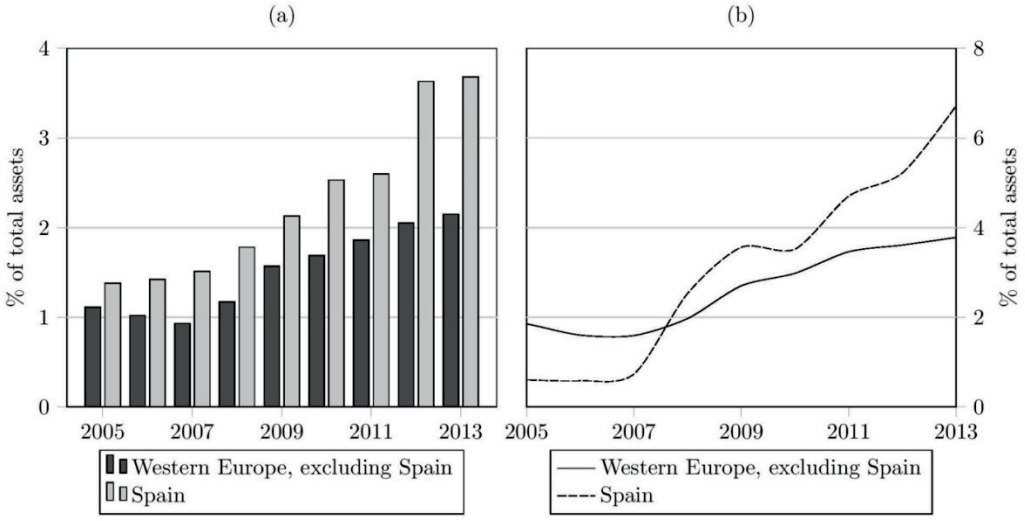

Figure 5. Loan loss reserves (a) and impaired loans (b) as ratios to total assets.

Finally, Table 8 shows the average probability of failure by bank ownership type[6] during the crisis period from 2008-2013. The figures show that on average, Spanish banks have a probability of 0.66 of failing during the economic crisis, whereas the probability is 0.46 for banks in other Western European countries. However, the difference in the probabilities is much smaller for commercial banks. Moreover, the difference is higher (0.4 higher) for private savings banks. This is in accord with Garicano (2012), who suggests that the Spanish banking crisis is mainly a savings bank crisis. Therefore, these descriptive statistics suggest that banks in Spain were more likely to fail during the economic crisis, but the difference in the probabilities between Spain and other Western European countries is mainly caused by the private savings banks.

[6] The publicly owned savings banks in this study are German, Swiss and Austrian savings banks. However, there is no clear division between private and publicly owned savings banks. In some cases, Spanish savings banks are also publicly owned, at least to some extent.

Table 8. Bank failure by bank ownership type from 2008-2013 in Spain and in Western Europe, excluding Spain. Source: Mediobanca (2014).

	Commercial banks	Cooperative banks	Private savings banks	Publicly owned savings banks	Stakeholder banks	Total
Western Europe, excluding Spain	0.40	0.79	0.36	0.16	0.54	0.46
Spain	0.45	0.57	0.76		0.72	0.66
Market share in total assets from 2008 (%)						
Western Europe, excluding Spain	84.6	8.7	0.8	5.7	15.2	
Spain	55.3	4.6	40.1		44.7	

The table shows the share of failed banks during the economic crisis from 2008-2013 by bank ownership type. The fifth column shows the average probability for stakeholder banks, i.e., cooperative banks and savings banks. The last column shows the average probability of failure for Spanish banks and banks in Western European countries, excluding Spain. The table also shows the market shares in total assets from 2008 by bank ownership type. The market shares in Western Europe, excluding Spain, equals bank ownership types' market shares of total Western European bank assets (excluding Spain).

Table 8 also shows the market shares in total assets during the onset of the financial crisis from 2008. The figures show that private savings banks have a market share of 40% in Spain from 2008. The overall market share of stakeholder banks in Spain is 45%, whereas their market share in other Western European countries is 15%. Therefore, private savings banks have a much larger market share in Spain than they have on average in other Western European countries. However, these figures are affected by the absence of stakeholder banks in some sample countries. Therefore, stakeholder banks' market shares are higher in the countries in which they are domiciled.

4.2. Regression results

4.2.1 Cyclicality

In addition to the common t-tests and F-tests, system GMM regressions have to pass the Hansen test to validate the instruments. Moreover, difference-in-Hansen tests are used to test the validity of the instruments both with the level equation and with the lagged dependent variable. Furthermore, the regressions have to pass the Arellano-Bond test of autocorrelation. Finally, the proper number of instruments has to be used to avoid instrument proliferation. The number of instruments and the test statistics are reported in the regression results table. The specifications pass all the tests; hence, the regression models work well.

The first regression (Table 9) suggests that the Spanish provisioning system is countercyclical. The combined result for the general term and the interaction

suggest that, relative to the beginning-of-the-year impaired loans, Spanish banks' LLPs grow during economic booms and decrease during recessions. By contrast, LLPs in other Western European countries are procyclical, which can be seen in the negative coefficient of the GDP growth variable. The second regression that examines LLRs relative to beginning-of-the year impaired loans gives a similar result, except that the magnitudes are larger (as expected). However, explaining the ratio to lagged total assets (Specification 3) suggests that provisions in Spain are as cyclical as those in other Western European countries. This result is similar to that of Olszak et al. (2017). Furthermore, the fourth regression, which explains the LLRs relative to total assets, shows that LLRs in Spain are slightly less procyclical than LLRs in other Western European countries. The dummy variable for Spain is significant in the first two regressions, which suggests Spanish banks, on average, provisioned more than banks in other Western European countries during the sample period, as the figures in Table 9 indicate. However, the dummies for Spain in the last two regressions are insignificant, which suggests that Spanish banks did not provision more or less than banks in other Western European countries during the sample period when measured relative to total assets.

Table 9. Examining cyclicality of LLPs and LLRs (2004-2013).

	(1) LLPs-to-Impaired loans	(2) LLRs-to-Impaired loans	(3) LLPs-to-Total assets	(4) LLRs-to-Total assets
L.LLPs-to-Impaired loans	0.248***			
	(3.61)			
L.LLRs-to-Impaired loans		0.405***		
		(7.42)		
L.LLPs-to-Total assets			0.512***	
			(6.70)	
L.LLRs-to-Total assets				0.977***
				(13.43)
GDP growth	-2.227***	-3.050***	-0.069***	-0.127***
	(-3.13)	(-2.89)	(-8.43)	(-5.58)
ES × GDP growth	11.118***	31.898***	0.006	0.033*
	(5.69)	(9.32)	(0.33)	(1.67)
ES	18.429***	52.493***	0.067	0.129
	(4.80)	(5.34)	(1.24)	(1.21)
Profitability	5.307*	-5.133	0.078	-0.110
	(1.74)	(-0.76)	(1.49)	(-0.99)
Net lending growth	-0.161	1.823***	-0.013***	-0.011
	(-0.50)	(3.15)	(-2.91)	(-1.25)
Net lending	-0.062	-0.398	0.004	-0.002
	(-0.44)	(-1.29)	(1.47)	(-0.34)
L.Capital ratio	0.487	1.214	-0.013	-0.018
	(0.62)	(0.97)	(-1.63)	(-1.08)
L.log(total assets)	-1.264	-5.814**	0.007	-0.021
	(-0.88)	(-2.00)	(0.35)	(-0.50)
Constant	28.887	108.705*	0.125	1.184
	(0.95)	(1.79)	(0.33)	(1.37)
Observations	1275	1170	1451	1327
Banks	270	253	275	264
Instruments	213	213	213	213
Hansen (p)	0.27	0.40	0.11	0.12
AR2 (p)	0.31	0.78	0.48	0.22
Difference-in-Hansen (level)	0.67	0.69	0.65	0.64
Difference-in-Hansen (lagged)	0.34	0.28	0.26	0.50

The dependent variable is LLPs-to-lagged impaired loans in (1), LLRs-to-lagged impaired loans in (2), LLPs-to-lagged total assets in (3) and LLRs-to-lagged total assets in (4). The values below the 1st percentile and above the 99th percentile are removed from all the bank-specific variables, except *log(total assets)*. L = lagged by one period, and × = an interaction. The estimators are system GMM estimators in every regression. *t* statistics are presented in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The regressions are repeated with a sample including only commercial banks because Olszak et al. (2017) suggest that cooperative banks' and savings banks' LLPs are less cyclical than those of commercial banks; in addition, these bank ownership types have large market shares in Spain during the sample period. The sample size decreases substantially when cooperative banks and savings banks are excluded. The p-values for the Hansen tests grow very high because of instrument proliferation. Therefore, the instrument matrix is collapsed into a single column (see Roodman, 2009) in these regressions. The results remain similar, and they are not reported.

4.2.2. Failure

The regression results concerning the probability of failure are shown in Table 10. The dependent variable in these regressions is a dummy that indicates bank failure during the crisis period from 2008-2013. The independent variables are average values from 2004-2007. Therefore, the regressions are purely cross-sectional. The results show that Spanish banks are more likely to fail than banks in other Western European countries from 2008-2013. This can be seen from the positive coefficient for the country dummy for Spain. Calculating the marginal effect for the average bank suggests that Spanish banks were 29% more likely to fail than banks in other Western European countries.

However, the second regression that uses the sample of commercial banks suggests that Spanish banks do not fail more or less often than their counterparts in other Western European countries. Furthermore, the third regression that excludes commercial banks and uses a sample of stakeholder banks suggests that Spanish banks were 42% more likely to fail than stakeholder banks in other Western European countries. Moreover, the fourth regression using the sample of private savings banks shows that Spanish savings banks have a 55% higher probability of failure than private savings banks in other Western European countries. Taken together, the results imply that the Spanish savings bank sector failed during the 2008-2013 economic crisis, whereas Spanish commercial banks were not more or less likely to fail than commercial banks in other Western European countries. Finally, the fifth column shows the results for the regression that uses the sample of Spanish (private) savings banks. The results suggest that low equity ratio and high impaired loans increase their probability of failure from 2008-2013.

Table 10. Explaining bank failure from 2008–2013.

	(1) Pr(Failure)	(2) Pr(Failure)	(3) Pr(Failure)	(4) Pr(Failure)	(5) Pr(Failure)
Spain	1.347***	0.245	2.486***	2.781***	
	(3.19)	(0.31)	(3.20)	(2.95)	
Equity ratio	-0.009	-0.123*	0.215**	0.119	-0.471*
	(-0.19)	(-1.95)	(2.09)	(1.11)	(-1.95)
Impaired loans	0.343**	0.255	0.476*	0.416	14.113*
	(2.30)	(1.38)	(1.73)	(1.13)	(1.86)
Cost-to-income ratio	-0.018	-0.026	0.043	0.012	-0.060
	(-1.22)	(-1.35)	(0.83)	(0.22)	(-0.39)
Profits	-0.601*	-0.277	-0.738	-0.646	1.196
	(-1.85)	(-0.67)	(-0.93)	(-0.82)	(0.35)
Net loans-to-deposits	0.001	0.002*	-0.001	-0.016**	0.034
	(1.28)	(1.80)	(-0.28)	(-2.23)	(0.64)
Constant	1.178	2.141	-4.037	0.255	-3.248
	(1.11)	(1.51)	(-1.03)	(0.06)	(-0.18)
Observations	231	125	106	68	23
Marginal effect for Spain	0.29***	0.06	0.42***	0.55***	

The dependent variable is a dummy indicating that the bank failed from 2008-2013. The sample in the regression (1) consists of all banks, in (2) of commercial banks, in (3) of stakeholder banks (cooperative and savings banks), in (4) of private savings banks and in (5) of Spanish private savings banks. *t* statistics in parentheses. The last row shows the marginal effect for the country dummy of Spain. The marginal effect is calculated for the average bank and for the dummy variable it is the discrete change from 0 to 1. The values for the independent variables are averages from 2004–2007. *Spain* = a dummy indicating Spanish banks, *Equity ratio* = total equity-to-total assets ratio, *Impaired loans* = impaired loans-to-total assets ratio, *Cost-to-income ratio* = non-interest expenses-to-net income ratio, *Profits* = pre-tax profit-to-total assets ratio, *Loans-to-deposits ratio* = net loans-to-total customer deposits ratio. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11 shows the regression results for the logit regressions that include the interactions with the country dummy for Spain and the independent (CAMEL) variables. The results show that the dummy for Spain has a significantly positive interaction with the variable for impaired loans (i.e., asset quality). Moreover, the general term is also positive and significant. This can be interpreted to mean that impaired loans during the lead-up to the crisis increase the probability of failure from 2008-2013, but the marginal effect is different for Spanish banks. Furthermore, cost-to-income ratio (quality of management) has a significant result only for Spanish banks. This suggests that high costs (i.e., bad management) from 2004-2007 increases the probability of failure during the economic crisis. Moreover, the result for profitability is significant only for Spanish banks. The coefficient for profitability is negative, which suggests that the more Spanish banks earned during the lead-up to the crisis, the less probable they were to fail from 2008-2013.

Table 11. Explaining probability of failure from 2008-2013.

	(1) Pr(Failure)	(2) Pr(Failure)	(3) Pr(Failure)	(4) Pr(Failure)	(5) Pr(Failure)
Spain	2.494**	-0.454	-1.934	5.476***	0.629
	(2.37)	(-0.45)	(-1.01)	(2.84)	(0.42)
Equity ratio	0.003	-0.006	-0.005	-0.004	-0.007
	(0.07)	(-0.14)	(-0.11)	(-0.10)	(-0.16)
Spain × Equity ratio	-0.150				
	(-1.26)				
Impaired loans	0.337**	0.328**	0.339**	0.337**	0.343**
	(2.29)	(2.26)	(2.30)	(2.31)	(2.30)
Spain × Impaired loans		3.297*			
		(1.90)			
Cost-to-income ratio	-0.019	-0.020	-0.023	-0.024	-0.017
	(-1.30)	(-1.32)	(-1.48)	(-1.61)	(-1.13)
Spain × Cost-to-income ratio			0.058*		
			(1.78)		
Profits	-0.580*	-0.583*	-0.571*	-0.469	-0.595*
	(-1.80)	(-1.80)	(-1.76)	(-1.50)	(-1.84)
Spain × Profits				-4.016**	
				(-2.07)	
Loans-to-deposits ratio	0.001	0.001	0.001	0.001	0.001
	(1.19)	(1.27)	(1.26)	(1.17)	(1.25)
Spain × Loans-to-deposits ratio					0.005
					(0.49)
Constant	1.148	1.281	1.458	1.403	1.098
	(1.11)	(1.19)	(1.32)	(1.34)	(1.02)
Observations	231	231	231	231	231

The dependent variable is a dummy indicating bank failure from 2008-2013. The samples in all the regressions consist of all banks. The values for the independent variables are averages from 2004–2007. *Spain* = a dummy indicating Spanish banks, *Equity ratio* = total equity-to-total assets ratio, *Impaired loans* = impaired loans-to-total assets ratio, *Cost-to-income ratio* = non-interest expenses-to-net income ratio, *Profits* = pre-tax profit-to-total assets ratio, *Loans-to-deposits ratio* = net loans-to-total customer deposits ratio. *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure 6 shows the marginal effects on the probability of failure for the country dummy of Spain for the range of values of the average impaired loans ratio from 2004-2007. In other words, the figure shows how the probability difference between Spain and other Western European countries varies with changes in impaired loans. The figure is interpreted such that when zero is included inside the 95% confidence interval, the difference between Spanish banks and banks in other Western European countries is insignificant. The significant values are shown as the shaded area in the graph.

If the marginal effect is positive, Spanish banks have a higher probability of failure during the crisis period than banks in other Western European countries when these groups have similar pre-crisis impaired loan ratios. Similarly, a negative marginal effect implies that Spanish banks have a lower probability of failure than banks in other Western European countries. Moreover, the figure shows the cumulative distribution function (CDF) on the right y-axis. The CDF shows the share of banks (between 0 and 1) that have a lower value for the impaired loans ratio than is the corresponding value on the x-axis.

The figure shows that banks in Spain are more likely to fail even if their asset quality is high during the lead-up to the crisis. This can be seen from the marginal effect for Spain that is already significant (shaded area) at the low values of impaired loans ratio. Moreover, the difference is significant until very high values in the ratio. The graph for the CDF shows that the significant values for the impaired loans ratio (between 0.5-5.6%) cover more than 90% of the sample banks. The marginal effect for Spanish banks is the highest, at approximately 1% of average impaired loan ratios. Therefore, the results suggest that Spanish banks with a good asset quality during the lead-up to the crisis are more likely to fail than banks in other Western European countries. This is likely due to the bursting of the housing bubble and the rapid increase in unemployment. The probability of failure is similar if Spanish banks already have poor asset quality from 2004-2007.

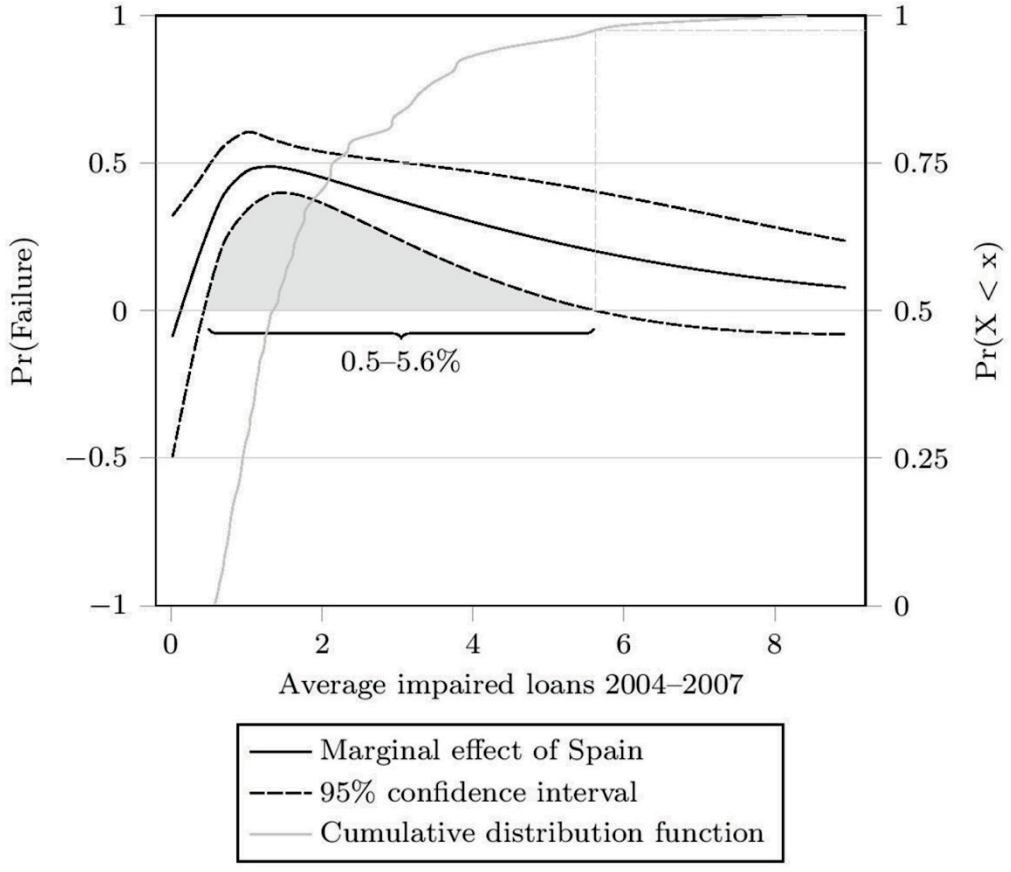

Figure 6. The impact of average impaired loans from 2004-2007 on the marginal effect of Spain on failure during the crisis period over 2008-2013.

Figure 7 shows the marginal effect on the probability of failure for the dummy indicating Spanish banks for the range of values for the average cost-to-income ratio from 2004-2007. The difference between the groups is significant for the

values higher than 50%. This can be seen from the lower confidence interval that crosses above the zero line at the value of 50%. The CDF shows that only a small group of banks has a cost-to-income ratio lower than 50%. Consequently, this means that only Spanish banks that were very well managed were not more likely to fail from 2008-2013 than their counterparts in other Western European countries. The CDF shows that these well-managed banks cover approximately 10% of banks. Furthermore, the graph is constantly increasing, which suggests that Spanish banks' likelihood of failure is higher if they have a cumbersome cost structure over the period 2004-2007, i.e., if they were badly managed. In this sense, the Spanish bank crisis caused creative destruction.

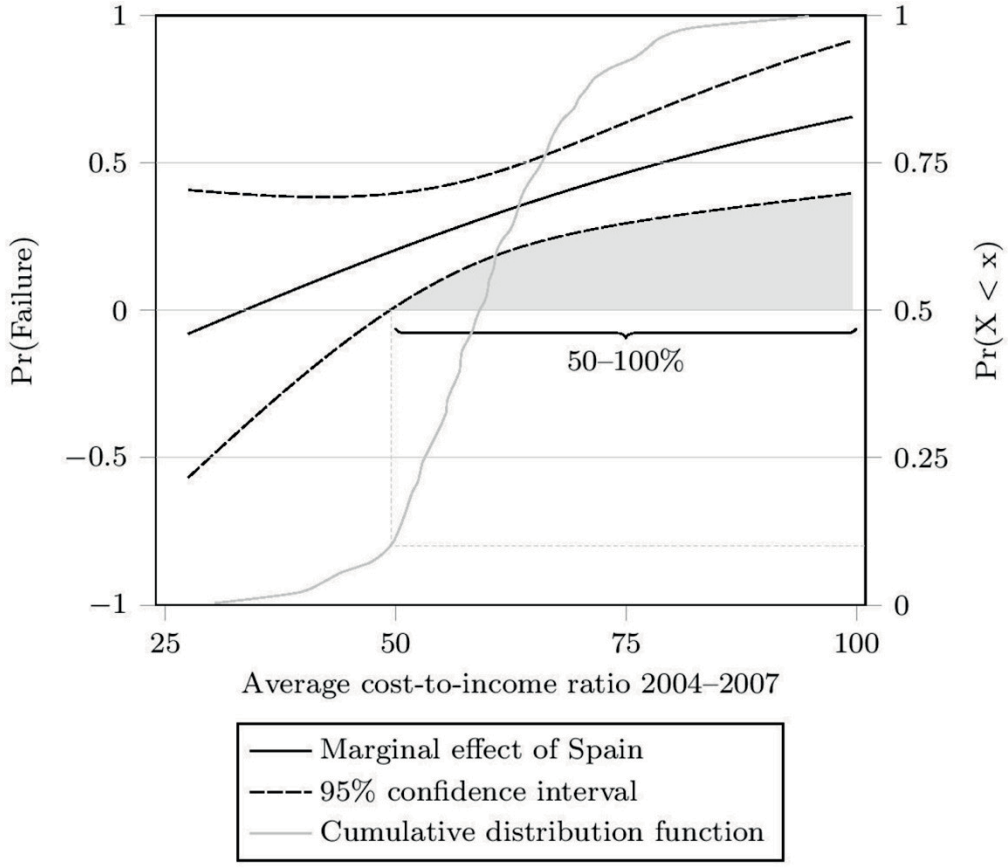

Figure 7. The impact of average cost-to-income ratio from 2004-2007 on the marginal effect of Spain on failure during the crisis period from 2008-2013.

Figure 8 depicts the marginal effects for the country dummy of Spain for the range of values for the average profitability from 2004-2007. Similar to the previous figures, the difference between Spain and other Western European countries is significant if the zero line is not included inside the confidence interval. The significant differences are shown as the shaded area in the figure. The figure shows that poorly profitable Spanish banks were more likely to fail

than banks in other Western European countries. This is shown by the marginal effect that is significantly above zero for the lower values of profitability. However, the difference is insignificant between 1.3-1.7%, implying that these banks have no probability differences. After these values, the marginal effect for Spain is negative and significant until the very highest values (until 3.3%) of the profitability variable. Therefore, these results suggest that a small fraction (i.e., roughly one bank in eight) of the most profitable banks in Spain are less likely to fail than banks in other Western European countries. This implies that there may be a handful of Spanish banks (i.e., the most profitable banks) that actually benefited from the collected reserves. Thus, it may be that the dynamic provisioning system proved a success for a limited group of Spanish banks.

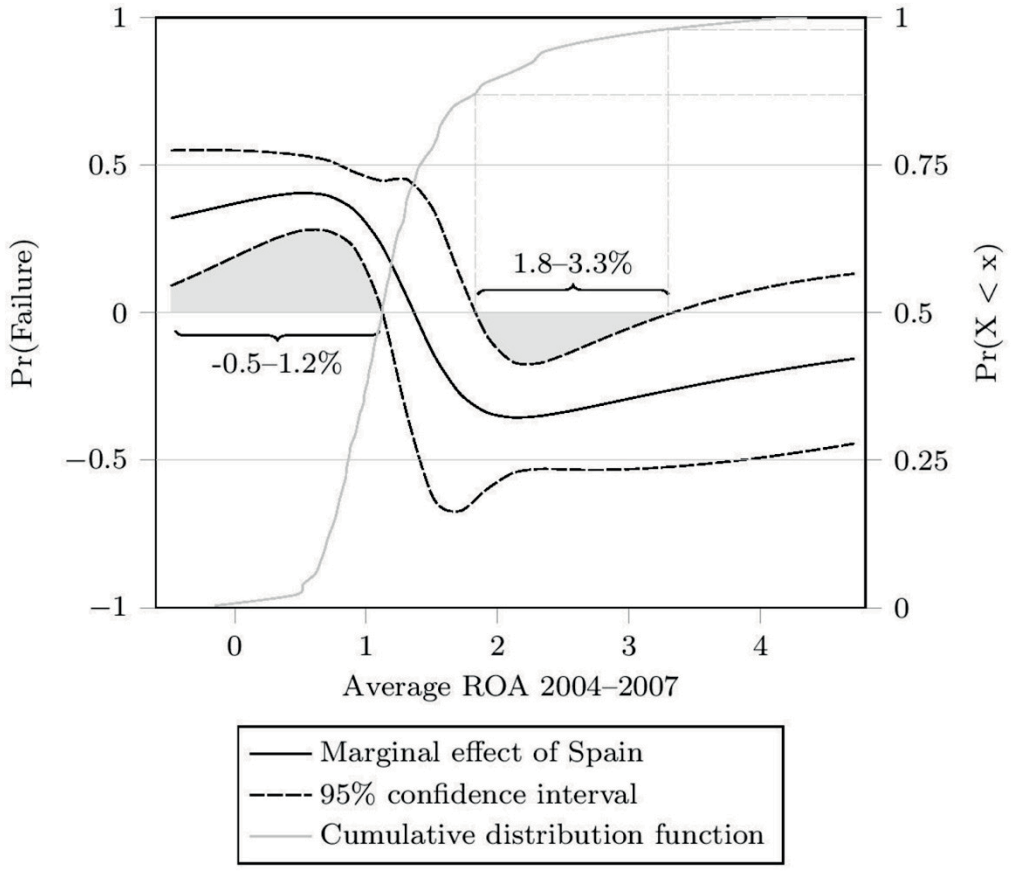

Figure 8. The impact of average profitability from 2004-2007 on Spain's marginal effect on failure during the crisis period from 2008-2013.

4.4. Discussion

To a limited extent, the Spanish provisioning system was countercyclical; however, since 2008, the average coverage ratio in Spain has not been significantly higher than in other Western European countries. Thus, the dynamic reserves were depleted very quickly and proved inadequate to function as designed. As Figures 3 and 4 suggest, 2008 was just the beginning of the crisis period. This finding is in accordance with the result of Wezel (2010), who uses stress-test methodology to show that Spanish banks' dynamic reserves would have been declined rapidly during the 2002–2003 economic crisis. Similarly, Fillat and Montoriol-Garriga (2010) suggest that a dynamic system similar to that in Spain would have smoothed the LLPs in the U.S. during the 2008–2009 financial crisis, but the reserves would have been depleted by the end of 2009.

Moreover, before the crisis, the reserves were thought to be excessively high, and the upper limit was thus lowered in 2005. If the upper cap had not been lowered, the reserves would have been (somewhat) larger at the beginning of the crisis. Therefore, one contributor to the eventual failure is that the reserves were cut during the pre-crisis period. Moreover, Illueca Muñoz et al. (2016) suggest that Spanish banks that showed high conditional accounting conservatism before the implementation of the Spanish dynamic system increased risk-taking after the introduction of the general provision. Therefore, the strong cyclicality of impaired loans in Spain may have partially originated from the dynamic system itself. This is a subject that requires more research because a key determinant of the failure of the Spanish provisioning system was the high growth in problem loans. Furthermore, Garicano (2012) proposes that the financial problems in Spanish savings banks would have become a concern earlier if there had been no dynamic reserves. Garicano (2012) argues that the reserves allowed the problem to be hidden longer than would have otherwise been possible.

Moreover, the regressions explaining the likelihood of a bank failure show that, in general, Spanish savings banks were substantially more likely to fail during the 2008-2013 economic crisis than banks in other Western European countries. However, contrary to expectations, Spanish commercial banks were not more or less likely to fail than commercial banks in other Western European countries. Moreover, Spanish savings banks are much more likely to fail than stakeholder banks or private savings banks in other Western European countries. Therefore, the results suggest that the Spanish banking crisis is a savings bank crisis (as Garicano (2012) argues). In addition, savings banks had a large market share in Spain on the eve of the financial crisis. Thus, the collapse of the savings bank sector had a devastating effect on the Spanish banking sector.

A likely explanation for the Spanish savings bank crisis is that savings banks had larger volumes of loans in the real estate sector than did commercial banks (as

Ruiz et al. (2015) suggest). Therefore, the Spanish savings bank sector collapsed with the burst of the Spanish housing bubble. Unfortunately, no data are available for the loan types, such as for mortgages and for commercial loans. In any case, a subject of further study is how the loan portfolio composition affects the cyclicality of Spanish banks' LLPs and their probability of failure.

However, Ruiz et al. (2015) suggest that the Spanish banking sector crisis cannot be explained by a single factor. In addition to the high concentration of credit in sectors related to the real estate bubble, these authors suggest that Spanish financial institutions were exposed to high growth rates, increasing leverage and deterioration of their financial margins. Furthermore, Sagarra et al. (2015) argue that the Spanish savings banks that required rescue were inefficient banks with high costs, low capital ratios, low performance and high risks. In addition, Ruiz et al. (2015) and Sagarra et al. (2015) suggest that there is a widespread debate about whether political appointees in Spanish savings banks' management contributed to failures. In any case, it seems evident that the failure of the cajas plays a role in the failure of the dynamic provisioning system.

The results show that a dynamic system such as that of Spain has only a limited ability to decrease the cyclicality of LLPs. Therefore, the suggestion of Agénor and da Silva (2017) and Agénor and Zilberman (2015), who claim that a dynamic regime can be highly effective in mitigating procyclicality of the financial system, is not supported by the Spanish case. Similarly, Wezel et al. (2012) propose that a dynamic provisioning formula, such that of Spain, smooths LLPs along the cycle. The empirical evidence does not support this claim. Likewise, Chan-Lau (2012) proposes that the Spanish dynamic provisioning formula would have substantially increased the solvency of Chilean financial institutions.

Moreover, Chan-Lau (2012) suggests that dynamic provisioning could not prevent LLPs from being insufficient for several banks because of the presence of fat-tails in loan losses. Therefore, he argues that the calibration based on historical data may inadequately address the presence of fat-tails in realized loan losses. Illueca Muñoz et al. (2016) suggest that one drawback of the Spanish dynamic system is that the estimation period of the risk categories and their coefficients cover only the economic cycle from 1986–1998. They argue that this period does not necessarily reflect the risks during the current economic period. In addition, Illueca Muñoz et al. (2016) argue that loans to real estate and construction companies were historically very safe in Spain.

Furthermore, problem loans during the economic boom were very low in Spain, which made the collected reserves appear larger than they actually were. Therefore, the figures presented by Balla and McKenna (2009) on Spanish banks' coverage ratio in 2006 are highly optimistic, as are their statements:

"[I]n 2006, the Spanish banking system had by far the highest coverage ratio [...] dynamic provisioning worked as expected in Spain, allowing large Spanish banks like Santander and BBVA to enter the crisis with substantial reserve cushions".

Spain's experience shows that the coverage ratio does not accurately measure the size of the reserves when problem loans are low during a boom period. Rapid growth (e.g., the quadruple growth in Spain) in impaired loans depletes the collected reserves quickly. Moreover, as Chan-Lau (2012) suggests, the implementation of a dynamic LLP regime requires careful stress-testing of loan-loss internal models. Overall, the Spanish case suggests that the high growth in impaired loans caused by the housing bubble was not anticipated by the designers of the system because the dynamic system was unable to smooth the cyclical pattern in LLPs as intended.

5. CONCLUSIONS

Using a panel of consolidated bank data from 2004-2013, this study investigated whether Spain's dynamic provisioning system differed in terms of LLP cyclicality from the incurred loss system used in other Western European countries. A dynamic regression model was created to examine how LLPs developed in the lead-up to the crisis and during the crisis years of 2008–2013. Moreover, logit estimations were used to examine the extent to which dynamic reserves helped Spanish banks prevent failure during the economic crisis.

The results suggest that the countercyclicality in the Spanish system results in the low amount of impaired loans during the lead-up to the crisis. LLPs in Spain are countercyclical only when they are measured relative to impaired loans. Consequently, when LLPs or LLRs are measured as a ratio to total assets, Spanish banks' LLPs or LLRs are as cyclical or just slightly less cyclical than those in other Western European countries. This result is similar to that of Olszak et al. (2017), who show that Spanish banks' LLPs are procyclical.

The reserves collected were not large enough for the system to smooth income in such a way that the cyclical outcome would differ much from the incurred loss system in other Western European countries. The bursting of the housing bubble and the high growth in the impaired loans depleted the collected reserves quickly, and Spanish banks' average coverage ratio of LLRs declined rapidly to the level of their counterparts in other Western European countries. The mean-comparison tests in this study suggest that the abnormal reserves in Spain were already depleted by 2008. Therefore, a dynamic system such as that in Spain could be a working macroprudential tool in short and moderate downturns, but it is unsuitable for long-lasting and/or deep depressions (e.g., the Spanish economic crisis).

On average, the collected dynamic reserves in Spanish banks did not decrease the probability of bank failure when Spanish banks were compared to banks in other Western European countries. However, Spanish commercial banks were not more or less likely to fail than commercial banks in other Western European countries. Indeed, Spanish private savings banks had a substantially higher probability of failure over the 2008-2013 period than their counterparts in other Western European countries. Therefore, the Spanish savings bank sector played a prominent role in the failure of the dynamic system. This is a subject that requires further research.

Furthermore, the results for logit regressions show that Spanish banks were more probable to fail if they had a high cost-to-income ratio over the 2004-2007 period. In contrast, well managed banks in Spain were not more likely to fail than banks in other Western European countries. Furthermore, Spanish banks with poor profitability had a higher likelihood of failure during the crisis. Conversely, Spanish banks with high profitability from 2004-2007 were less likely to fail than their counterparts in other Western European countries. This suggests that these banks may have actually benefited from the dynamic reserves, because for these banks, the dynamic reserves may well have been "excess reserves" that were not fully needed during the banking crisis. Finally, Spain's marginal effect on the probability of failure is higher for banks that have a high asset quality in the lead-up to the crisis. In other words, healthy banks failed in Spain. This implies that these banks had latent risks in their asset portfolios that were realized during the economic crisis. To conclude, Spain's experience encapsulates the self-evident dilemma of dynamic loan loss provisions: what is the correct provision when future losses are uncertain?

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Appendix

A.1. Differences in impairment between IAS 39 and IFRS 9

In IAS 39, entities (banks) are obliged to collect objective evidence for a financial asset or group of financial assets that is impaired. Such evidence includes observable data on events such as breach of contract, significant financial difficulties of the issuer or the obligor, or an increasing probability that the borrower will enter bankruptcy (see IAS 39 for more details). When such evidence is available, the entity shall determine the amount of any impairment loss. This approach has been criticized for delaying the recognition of losses until the occurrence of loss (IFRS, 2013). Moreover, FCAG (2009) suggests that the incurred loss approach delays the recognition of loan loss because the model has difficulties in identifying appropriate trigger points for loan loss recognition (i.e., there is a "loan loss threshold").

The IFRS 9 was issued in July 2014 and will be effective from 1 January 2018. In contrast to IAS 39, under the impairment approach in IFRS 9, it is no longer necessary for a credit event to have occurred before credit losses are realized (IFRS, 2014). Instead, an entity always accounts for expected credit losses and for changes in the expected credit losses. This requirement eliminates the loan loss recognition threshold of IAS 39. Consequently, in IFRS 9, an entity shall recognize a loss allowance for expected credit losses on a financial asset.

Moreover, at each reporting date, an entity shall update the amount of expected credit losses. This update aims to reflect the changes in credit risk since the initial recognition and thereby provide more timely information on credit losses. When making this assessment, an entity shall use the change in the risk of a default instead of the change in the amount of expected credit losses. Moreover, an entity cannot rely solely on *past due* information when determining whether there has been an increase in the credit risk if forward-looking information is available (without undue cost or effort). However, regardless of how the entity assesses significant increases in credit risk, the increase is presumed to be significant when contractual payments are more than 30 days past due. This presumption can be rebutted if the entity has information that shows that the credit risk has not increased.

If the credit risk on the financial instrument has increased significantly since the initial recognition, the entities shall measure the loss allowance for a financial instrument at an amount equal to the lifetime expected credit losses. If, at the reporting date, the credit risk on a financial instrument has not increased significantly, an entity shall measure the loss allowance for that financial instrument at an amount equal to the 12-month expected credit losses. An entity

may assume that the credit risk has not increased if the credit risk of the financial instrument is low at the reporting date. (IFRS, 2014).

Western European bank funding structures and the Basel III net stable funding ratio

Jari-Mikko Meriläinen

Abstract

The upcoming net stable funding ratio (NSFR) requires banks to acquire stable funding equivalent to the stability of their assets. The NSFR considers customer deposits, long-term liabilities and equity to be the most stable sources of funding. This study uses a large panel of Western European banks to examine the determinants of bank funding structures. In particular, this study examines the determinants of customer deposit funding, other long-term liabilities, the equity ratio and total stable funding. Furthermore, this study examines the role of bank ownership type in determining the bank funding structure. The results suggest that large banks are likely to have unstable funding profiles. Moreover, the liabilities of Western European stakeholder banks are typically more stable than those of commercial banks. However, this result does not hold for publicly owned savings banks.

Keywords: Banks, funding, net stable funding ratio, bank ownership types

JEL classification: G21

1. INTRODUCTION

1.1. Introduction

The upcoming liquidity regulation assigns different weights to bank liabilities according to their perceived stability. This regulation is a response to the liquidity crunch that quickly developed during the 2008–2009 financial crisis (BIS, 2014). Because of the liquidity management failures of some banks, Basel III sets new rules regarding the liquidity of bank assets and liabilities. Consequently, the net stable funding ratio (NSFR) sets a minimum ratio of stable liabilities to assets that are considered to require stable funding. This ratio requires banks to maintain a stable funding profile. The liquidity risk framework was first published in December 2009 (BIS, 2009), and the NSFR will become a minimum standard in 2018 (BIS, 2014).

The NSFR suggests that customer deposits, equity and liabilities with a residual maturity of at least one year are the most stable sources of bank funding. This study uses panel data regressions to examine the determinants of these funding types. Moreover, this study examines the stability of Western European bank funding structures by explaining a variable capturing a bank's total stable funding. This study complements the studies of, e.g., Gropp and Heider (2010) and Brewer III et al. (2008) on the determinants of bank capital ratios. Furthermore, this study contributes to a growing literature on the NSFR by examining the denominator of this ratio, available stable funding (ASF). In doing so, this study complements the studies of Hong, Huang and Wu (2014) and Dietrich, Hess and Gabrielle (2014).

In the previous literature, DeYoung and Jang (2016) have shown that large U.S. banks use less customer deposit funding than smaller banks. Similarly, Demirgüç-Kunt and Huizinga (2010) have suggested that large and fast-growing banks tend to have less customer deposit funding. Moreover, using data on U.S. commercial banks from 2001–2011, Hong et al. (2014) have suggested that large banks generally have smaller NSFRs than small banks. Furthermore, using a sample of U.S. and European banks from 1991–2004, Gropp and Heider (2010) have suggested that bank size is a determinant of bank leverage. In addition, these authors have suggested that banks financed balance sheet growth using non-deposit liabilities over the 1991–2004 period. Moreover, King (2013) has documented cross-country differences in the average value of bank NSFRs. Motivated by these studies, this study investigates the determinants and bank characteristics that explain bank funding strategies. Presently, the literature on bank funding structures is relatively sparse. Therefore, this study fills a gap in the literature by examining the funding structures of Western European banks.

Furthermore, this study examines Western European stakeholder banks in a separate section. To the best of our knowledge, this is the first study to examine

the effect of shareholder/stakeholder ownership on bank funding structures. Stakeholder banks are included in this study because of their different business models. It is assumed that stakeholder banks are more customer deposit oriented in their funding than are commercial banks. However, the new regulation will treat banks somewhat differently according to their ownership type (BIS, 2014). Therefore, bank ownership types are studied in a separate section, as the first section of this study includes only Western European commercial banks.

The results suggest that bank size is an important determinant of funding stability. Large banks have less stable funding profiles mostly because they use less customer deposit funding than smaller banks do. Large banks also have less equity than small banks. Therefore, even if large banks have more funding from other long-term liabilities, it does not offset the effect of lower customer deposit funding and equity ratios. Moreover, banks whose assets are based on customer deposits have lower equity ratios than banks that use other sources of funding. In addition, cross-country differences in funding stability are significant. Furthermore, stakeholder banks typically have more stable funding structures than commercial banks. However, this result does not hold for publicly owned savings banks. For cooperative banks, this result is dependent on data consolidation because cooperative banks use interbank funding from group members to manage liquidity.

The remainder of this paper is structured as follows: after the introduction, a literature review is provided followed by an overview of the dataset and descriptive statistics. The econometric specifications are then presented followed by the regression results. Finally, we present a discussion and provide conclusions.

1.2. Literature review

With the exception of bank capital, there are relatively few studies on bank funding structures; however, the number of studies has rapidly increased because of the recent introduction of the NSFR. As discussed in the introduction, DeYoung and Jang (2016) show that large banks use less customer deposit funding than smaller banks. Moreover, Demirgüç-Kunt and Huizinga (2010) argue that large and fast-growing banks place more emphasis on wholesale funding. Gropp and Heider (2010) suggest that large banks had lower equity ratios (i.e., more leverage) than small banks over the 1991–2004 period. In addition, these authors suggest that banks have financed balance sheet growth from non-deposit liabilities from 1991–2004. The share of equity remains almost unchanged during this period. Similarly, Brewer III, Kaufman and Wall (2008) use a sample of banks from 12 industrialized countries over the 1992–2005 period to show that large banks have lower equity ratios than do smaller banks. Moreover, profitable banks have higher equity ratios.

Furthermore, López-Espinosa et al. (2012) show that short-term wholesale funding is the most relevant systemic risk factor using data from 18 countries over the 2001–2009 period. These authors argue that this finding supports the introduction of the NSFR because it prevents excessive exposure to liquidity risk. Similarly, López-Espinosa et al. (2013) argue that obtaining funding through unstable sources increases both individual insolvency risk and the risk of spillover into the financial system.

De Haan and van den End (2013) argue that the level of retail deposits in Dutch banks was stable from 2004–2008 and even increased from 2009–2010. Moreover, these authors suggest that banks reduce lending, especially wholesale lending, in the case of a negative funding shock. Moreover, Distinguin, Roulet and Tazani (2013) use data on a sample of U.S. and European listed commercial banks for the period 2000–2006 to show that banks decrease their regulatory capital ratios when they face higher illiquidity. These authors suggest that this finding supports the need for minimum liquidity ratios.

Several studies have examined the NSFR and evaluated its effect on the banking system. For instance, Allen, Milne and Thomas (2012) suggest that banks need to respond to changes in regulations by using some combination of loan asset reductions and/or equity, long-term funding and stable deposit increases. In doing so, banks will increase their NSFRs. Allen et al. (2012) suggest that despite a long adjustment period for the new requirement, banks need to increase the liquidity of their assets and reduce the liquidity of their liabilities well ahead of the end of 2018.

Dietrich et al. (2014) use data on Western European banks for the 1996–2010 period to show that historically most banks have not fulfilled the minimum NSFR requirements. Furthermore, Giordana and Schumacher (2011) show using data from banks in Luxembourg for the 2003–2010 period that the median NSFR was above the minimum requirement in 2005 but declined to 80% before the financial crisis. Scalia, Longoni and Rosolin (2013) show, using a sample of euro area banks, that over the 2010–2012 period, banks with NSFRs below the minimum requirement have attempted to increase their NSFRs. These banks have mainly increased the ratio by increasing funding stability.

Chiaramonte and Casu (2016) use data for banks from 28 EU countries for the period 2004–2013 to suggest that the NSFR is a significant determinant of bank failure in Europe. Moreover, the capital ratio complements the NSFR in fostering financial stability only for the largest banks. Banks that run into trouble almost always have low NSFRs despite capital ratios above the required minimums. Furthermore, Vazquez and Federico (2015) argue that U.S. and European banks with high NSFRs over the 2001–2009 period were less likely to fail than banks with weaker structural liquidity. Similarly, Hong, Huang and Wu (2014) use U.S. Call Report data from 2001–2011 to show that the NSFR is negatively related to bank failure. Furthermore, the average ratio decreased during the 2008–2009 financial crisis.

2. DATA AND ECONOMETRIC SPECIFICATIONS

3.1. Data

Bank-specific variables are drawn from Bankscope, a commonly used database in banking studies. The database is maintained by Bureau Van Dijk and consists of bank income statement and balance sheet data. The study period is 2005–2015. The dataset is consolidated only; hence, it concerns banks on the group level. This source was chosen because this study examines a bank regulation that is applied on a consolidated basis. Therefore, using bank-level unconsolidated data could yield misguiding results.

The dataset is typically limited to commercial banks to keep the sample of banks homogeneous. In addition, cooperative banks are allowed, at the discretion of national supervisors, to include weight factors of up to 85% for interbank deposits within the same cooperative network in the NSFR calculation. However, because stakeholder banks cover approximately 20–25% of the assets of the Western European banking sector, they are also examined in this study. Moreover, their business models are often retail oriented, focusing on the traditional banking activity of transforming deposits into loans. We expect stakeholder banks to have more funding from customer deposits than commercial banks. Thus, stakeholder banks are included in this study in a separate section.

The dataset includes 18 Western European countries (see Table 1) – the EU15 and the Western European countries that are not part of the European Union or the Economic and Monetary Union, Norway, Iceland and Switzerland. To improve the quality of the data, the dataset was reviewed to remove any overlapping bank ownership structures. For example, several subsidiary banks had their own entries despite the fact that their parent companies were included in the dataset. After these corrections, the dataset contains no overlapping ownership structures.

Table 1. Number of banks in the sample countries (2005–2015).

	Commercial banks	Cooperative banks	Private savings banks	Publicly owned savings banks	Total
Austria	11	1		5	17
Belgium	10	1	1		12
Switzerland	35	1		1	37
Germany	22	12	1	1	36
Denmark	18	1	15		34
Spain	15	7	37		59
Finland	3	1	1		5
France	20	1	2		23
United Kingdom	36	1	1		38
Greece	11		1		12
Ireland	7				7
Iceland	3		5		8
Italy	23	23	10		56
Luxembourg	5	1			6
Netherlands	18	1			19
Norway	5		37		42
Portugal	10	1	1		12
Sweden	13	1	2		16
Total	265	53	114	7	439

The data were included in this study in such a way that bank parent companies were preferred on bank group members. This decision was made because some cooperative banking groups use interbank funding from other group members to manage their liquidity. Regulations allow cooperative banks to treat interbank deposits from other group members as stable liabilities similar to customer deposits. Because these interbank liabilities are from other group members, using data that concerns group parent companies prevents interbank deposits from other group members from being misinterpreted as unstable liabilities in the case of cooperative banks. Therefore, using data on group members would produce misleading results because these banks can access interbank funding from other group members.

The dataset is balanced by including only banks that have at least two observations for the measure of long-term liabilities. The frequency of observations is scarcer for this variable than it is for other variables. Therefore, the dataset is balanced to ensure that it includes the same banks in all regressions and descriptive statistics. In total, the dataset includes 265 commercial banks. The larger dataset, which includes stakeholder banks and commercial banks, consists of 439 banks. Finally, the GDP growth variable is obtained from the OECD. The variables used in this study are defined in Table 2.

Unfortunately, the NSFR includes many components, such as loan types, for which there are no data available in Bankscope. Therefore, we are unable to calculate an accurate proxy for the ratio. However, customer deposits are the largest source of stable funds. Moreover, similar to equity, liabilities that have a residual maturity of at least one year have a 100% weight in the calculation of the NSFR. Together, these three variables account for, on average, over 70% of bank funding and for the majority of stable funding. Thus, we use these three variables to examine the determinants of bank funding profiles.

Table 2. Variable definitions.

Customer deposits	Ratio of customer deposits to total assets (%)
Long-term liabilities	Ratio of long-term liabilities to total assets (%)
Equity ratio	Ratio of total equity to total assets (%)
ASF	Sum of customer deposits, equity and long-term liabilities as a share of total assets (%)
Listed	A dummy variable for listed commercial banks
Net lending	Ratio of net loans to total assets (%)
log(total assets)	Log of total assets
Δlog(total assets)	The first difference of the log of total assets
Income	Ratio of total income to total assets (%)
GDP growth	Growth rate of GDP (%) Source: OECD

Customer deposits, equity and long-term liabilities are summed to calculate a proxy for the stability of the bank funding profile. The more bank funding that comes from these sources, the better; according to the NSFR, these liabilities provide a stable funding profile. Likewise, if less funding comes from these sources, the share of funding from more unstable sources, such as interbank deposits, increases.

The NSFR includes a component that is weighted at 50% in the ASF calculation. These liabilities have residual maturities of less than one year from counterparties such as sovereigns and non-financial corporations. However, King (2013) suggests that the share of these liabilities is relatively small. Therefore, equity, customer deposits and long-term liabilities together cover most stable bank funding. Thus, this study focuses on stable funding, i.e., the funding sources that receive high weights in the ASF calculation.

3.2. Econometric specifications

The econometric model (Equation 1) is an OLS regression. The dependent variable in the first regression is the ratio of customer deposits to total assets. Furthermore, in the second and third sets of regressions, the dependent variables are the ratio of long-term liabilities to total assets and the equity ratio, respectively. Finally, the sum of these three variables is used as a proxy for the stability of the bank funding profile.

$$\frac{Y_{it}}{\text{Total assets}_{it}} = \alpha + \beta_1 \log(\text{total assets})_{i(t-1)} + \beta_2 \Delta \log(\text{total assets})_{it}$$
$$+ \beta_3 \text{Listed}_{it} + \beta_4 \frac{\text{Equity}_{i(t-1)}}{\text{Total assets}_{i(t-1)}} + \beta_5 \frac{\text{Net loans}_{i(t-1)}}{\text{Total assets}_{i(t-1)}} + \beta_6 \frac{\text{Income}_{it}}{\text{Total assets}_{i(t-1)}}$$
$$+ \beta_7 \text{GDP growth}_{it} + \sum D_{\text{Country}} + \sum D_{\text{Year}} + \varepsilon_{it} \quad (1)$$

The specifications test several hypotheses concerning funding structure choices. As Demirgük-Gunt (2010) suggests, fast-growing banks may have different funding strategies than banks that grow slowly. Consequently, the first study hypothesis is the following.

H_1: Banks that grow quickly use less funding from stable sources

Asset growth is measured as the first difference of log of total assets. The expectation for this variable is that fast growth is negatively related to funding stability. This is because fast growth may be difficult to fund from customer deposits. A similar variable is used by DeYoung and Jang (2016). Moreover, the independent variables include the log of total assets, which measures bank size and examines whether large banks have different funding structures from those of smaller banks. DeYoung and Jang (2016) suggest that large banks have access to liquidity solutions such as brokered deposits or loans that can be liquidated when necessary. Therefore, the expectation for this variable is negative. The second study hypothesis is as follows:

H_2: Large banks use less stable funding than small banks

Furthermore, there is an indicator variable for listed banks. This variable is expected to have a negative coefficient. DeYoung and Jang (2016) suggest that publicly traded banks have faster and less expensive access to sources of liquidity; moreover, they suggest that banks with large equity buffers can easily borrow liquidity when necessary. Consequently, they may prefer more liquidity risk. Therefore, the regression model includes a variable for the equity ratio whose expectation is negative.

H_3: Listed banks have less funding from stable sources

H_4: Banks with large equity buffers use less stable funding

Net lending is measured by the ratio of net loans to total assets, which is a control variable for the liquidity of bank assets. This variable controls for the required stable funding in the denominator of the NSFR. Moreover, DeYoung and Jang (2016) suggest that banks actively set targets for loans-to-deposits ratios and implicitly for the NSFRs from 1992–2012. Therefore, this variable examines whether banks with less liquid assets prefer a more stable funding structure. Consequently, the expectation for this variable is positive.

H_5: Banks with an illiquid asset portfolio have more funding from stable sources

Moreover, the specification includes a control variable for income, the sum of interest and non-interest income as a share of total assets. Tirole (2011) suggests that in the case of a liquidity shock, a bank can use its t-1 income as a source of liquidity. However, the expectation for this variable is ambiguous. In addition, a macroeconomic control variable for GDP growth is included. Furthermore, the specifications include year dummies that control for general trends among banks. Finally, country dummies are used to control for country-specific differences in the funding components. All the stock variables are lagged by one period, and the error terms are robust[7] in every regression.

The regressions are repeated using the same model with different dependent variables capturing the other sources of long-term stable funding, i.e., equity and long-term liabilities. Finally, the dependent variable is changed to total stable funding, i.e., the sum of these three funding sources. The independent variable for the equity ratio is excluded from the regression that explains total ASF because equity is part of this variable. The regression model is otherwise the same as Equation 1.

[7] In this study, robust standard errors are unclustered heteroscedasticity-consistent standard errors, i.e., Eicker-Huber-White standard errors.

3. DESCRIPTIVE STATISTICS AND REGRESSION RESULTS

3.1. Descriptive statistics

The descriptive statistics for the study variables are shown in Table 3. They show that, on average, banks fund slightly more than one-half of their assets from customer deposits, which is easily the largest source of bank funding. The ratio of long-term liabilities to total assets is, on average, 13%. As the ratio is higher than the equity ratio, which is, on average, 9%, this suggests that liabilities with a long maturity are an important source of funding for commercial banks. Together, customer deposits, equity and long-term liabilities cover approximately 71% of bank liabilities. Slightly more than one-half of the sample banks are listed. Moreover, approximately one-half of total bank assets consist of net loans.

Table 3. Descriptive statistics for the study variables (2005–2015).

	Mean	S.D.	Min	Max	Median	n
Customer deposits	51.52	23.23	0.06	92.66	53.05	1919
Long-term liabilities	13.38	14.35	0	77.04	9.00	1768
Equity ratio	9.09	7.23	0.90	54.56	7.02	1973
Total stable funding	70.94	19.76	7.47	99.46	74.28	1675
Total assets (MEUR)	127,294	324,554	23	2,202,423	7308	2008
Asset growth (%)	7.61	19.64	-39.06	124.72	4.65	1851
Listed	0.53	0.50	0	1	1	2508
Net lending	49.36	23.56	0.79	92.42	53.17	1959
Income	6.05	3.94	1.08	30.54	5.12	1964
GDP growth	1.05	2.56	-9.13	9.49	1.54	2508

Customer deposits = ratio of customer deposits to total assets. *Long-term liabilities* = ratio of long-term liabilities to total assets. *Equity ratio* = ratio of equity to total assets. *Total stable funding* = sum of customer deposits, long-term liabilities and equity as a share of total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to total assets. All bank-specific variables, except Total assets, are shown as percentages.

Table 4 shows the descriptive statistics by median level of total stable funding. The figures show that banks in the lower half of the distribution have much less funding from customer deposits than do banks in the upper half. Furthermore, banks in the lower half have less equity. Overall, the ratio of stable funding is approximately 30% lower for banks with a ratio below the median value. Furthermore, these banks are, on average, ten times as large as banks in the upper half of the distribution. Moreover, they are more likely to be listed, and their net lending ratio is lower than that of banks in the upper half of the distribution. Finally, banks that have more stable funding profiles have higher incomes. To sum up, these figures suggest that most differences in funding stability are explained by the customer deposit funding orientation. Moreover,

banks with unstable funding profiles are significantly larger than are banks with stable funding structures.

Table 4. Descriptive statistics by median level of total stable funding (2005–2015).

Below the median	Mean	S.D.	Min	Max	Median	n
Customer deposits	35.34***	16.71	0.06	68.81	37.97	838
Long-term liabilities	13.32	11.98	0	65.32	10.18	838
Equity ratio	6.71***	4.38	0.93	37.12	5.67	838
Stable funding	55.37***	15.70	7.47	74.28	59.98	838
Total assets (MEUR)	273,290***	457,687	74	2,202,423	40,520	838
Asset growth (%)	6.66	18.28	-38.20	121.88	5.03	779
Listed	0.73***	0.45	0	1	1	838
Net lending ratio	48.05***	21.94	0.79	92.00	51.25	831
Income	5.13***	2.76	1.08	30.54	4.52	825
GDP growth	0.97	2.51	-8.27	9.49	1.40	838
Above the median	Mean	S.D.	Min	Max	Median	n
Customer deposits	64.94***	17.72	0.06	92.66	67.27	837
Long-term liabilities	12.47	15.12	0.00	75.25	6.29	837
Equity ratio	9.11***	5.73	0.90	39.35	7.56	837
Stable funding	86.52***	7.00	74.35	99.46	86.55	837
Total assets (MEUR)	27,248***	72,481	23	838,528	4847	837
Asset growth (%)	7.66	17.78	-36.66	124.72	4.27	777
Listed	0.46***	0.50	0	1	0	837
Net lending ratio	55.75***	22.17	2.05	92.42	60.48	836
Income	6.08***	3.30	1.12	30.04	5.45	831
GDP growth	1.14	2.48	-9.13	9.49	1.54	837

Customer deposits = ratio of customer deposits to total assets. *Long-term liabilities* = ratio of long-term liabilities to total assets. *Equity ratio* = ratio of equity to total assets. *Total stable funding* = sum of customer deposits, long-term liabilities and equity as a share of total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to total assets. All bank-specific variables, except Total assets and Asset growth, are measured as ratios of total assets and are shown as percentages. Asterisks indicate significance for the mean comparison t-tests with a hypothesis that the means between the groups are different. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.2. Regressions results

3.2.1. Commercial banks

Table 5 presents the results of the regression specifications that explain the ratio of customer deposits to total assets. Bank size has a significantly negative result in every specification. This suggests that large banks use less customer deposit funding than do smaller banks. Moreover, the result for the equity ratio shows

that equity is negatively related to the customer deposit funding ratio. The coefficient for GDP growth is significant in the third regression. However, it is non-significant when the country dummies are included. The results are otherwise non-significant.

Table 5. Explaining customer deposit funding ratio (2005–2015).

	(1) Customer deposits	(2) Customer deposits	(3) Customer deposits	(4) Customer deposits
L.log(total assets)	-4.932***	-4.948***	-4.990***	-5.135***
	(-19.852)	(-19.158)	(-19.373)	(-18.761)
Δlog(total assets)	3.133	3.008	2.385	3.429
	(0.908)	(0.837)	(0.665)	(1.005)
L.Equity ratio	-0.737***	-0.736***	-0.748***	-0.756***
	(-9.111)	(-8.592)	(-8.734)	(-8.584)
Listed	-1.480	-1.487	-1.213	-0.891
	(-1.207)	(-1.215)	(-0.980)	(-0.685)
L.Net lending		0.002	0.008	0.050*
		(0.076)	(0.291)	(1.720)
Income		0.041	0.051	-0.060
		(0.257)	(0.317)	(-0.408)
GDP growth			0.646**	0.428
			(2.164)	(1.452)
Constant	97.848***	97.844***	96.357***	89.476***
	(28.266)	(22.838)	(21.843)	(19.215)
Observations	1738	1710	1710	1710
R^2	0.23	0.24	0.24	0.34
Fixed country effects	No	No	No	Yes

The dependent variable is the ratio of customer deposits to total assets. The estimators are OLS. *Equity ratio* = ratio of equity to total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses. The results for the year dummies are omitted. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6 shows the regression results of the specifications that explain the ratio of long-term liabilities to total assets. The results show a systematic pattern for bank size. Contrary to the results for customer deposits, the coefficients suggest that large banks use more funding from long-term liabilities than do smaller banks. This result suggests that large banks, at least partially, fill the "gap" caused by a lower customer deposit funding ratio by using funding from other long-term liabilities that are considered stable in the NSFR calculations. Furthermore, the variable for the net lending ratio is significant and positive. This suggests that banks with illiquid asset portfolios use more funding from liabilities with long maturities.

Table 6. Explaining the ratio of long-term liabilities (2005–2015).

	(1) Long-term funding	(2) Long-term funding	(3) Long-term funding	(4) Long-term funding
L.log(total assets)	1.646***	1.721***	1.678***	1.690***
	(9.228)	(10.549)	(10.033)	(9.238)
Δlog(total assets)	1.098	-0.959	-1.501	-2.167
	(0.462)	(-0.401)	(-0.622)	(-0.936)
L.Equity ratio	0.067	0.043	0.027	0.002
	(1.014)	(0.602)	(0.372)	(0.021)
Listed	1.245	0.510	0.731	0.568
	(1.427)	(0.644)	(0.907)	(0.684)
L.Net lending		0.212***	0.217***	0.188***
		(12.743)	(12.690)	(10.419)
Income		0.051	0.061	0.089
		(0.474)	(0.565)	(0.872)
GDP growth			0.593***	0.294
			(2.681)	(1.423)
Constant	-1.091	-12.297***	-13.580***	-11.723***
	(-0.465)	(-5.193)	(-5.786)	(-4.320)
Observations	1615	1570	1570	1570
R^2	0.08	0.21	0.22	0.29
Fixed country effects	No	No	No	Yes

The dependent variable is the ratio of long-term liabilities to total assets. The estimators are OLS. *Equity ratio* = ratio of equity to total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses. The results for the year dummies are omitted. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The results of the specifications explaining the equity ratio are shown in Table 7. The results indicate that large banks have less equity than do smaller banks. This result is significant in every specification. Furthermore, fast-growing banks have less equity than do other banks. This result is significant in every specification. Banks with a high net lending ratio have lower equity ratios than other banks. This may be an implication of a lower risk profile. The coefficient for listed commercial banks is significant in the first three specifications; however, including the country dummies leads to a non-significant result. Both high income and GDP growth have significant positive results. This implies that bank equity ratios decline during recessions.

Table 7. Explaining the equity ratio (2005–2015).

	(1) Equity ratio	(2) Equity ratio	(3) Equity ratio	(4) Equity ratio
L.log(total assets)	-1.626***	-1.166***	-1.155***	-1.029***
	(-19.804)	(-18.346)	(-17.931)	(-15.178)
Δlog(total assets)	-3.794***	-7.580***	-7.616***	-8.203***
	(-3.643)	(-7.433)	(-7.125)	(-7.581)
Listed	0.701**	0.616*	0.812**	0.355
	(2.032)	(1.898)	(2.538)	(1.069)
L.Net lending		-0.028***	-0.025***	-0.017**
		(-4.391)	(-3.871)	(-2.483)
Income		0.574***	0.634***	0.585***
		(9.406)	(9.741)	(8.950)
GDP growth			0.331***	0.261***
			(4.145)	(3.084)
Constant	23.809***	17.523***	15.864***	14.395***
	(29.625)	(20.705)	(14.144)	(13.205)
Observations	1821	1760	1760	1760
R^2	0.27	0.37	0.40	0.47
Fixed country effects	No	No	No	Yes

The dependent variable is the ratio of total equity to total assets. The estimators are OLS. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses. The results for the year dummies are omitted. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Finally, Table 8 shows the regression results for total stable funding, i.e., the sum of the equity ratio, long-term liabilities ratio and customer deposit funding ratio. The results suggest that large banks have significantly less funding from stable sources than do small banks. This result was also suggested by the descriptive statistics. This implies that even if banks have more funding from long-term liabilities, this does not compensate for lower customer deposit funding and equity ratios. The result for bank size is significant in every regression. Furthermore, the variable for the net lending ratio is significant and positive. This implies that banks have more stable funding profiles if they have illiquid asset portfolios. Moreover, banks have more stable funding if their income is high and the macroeconomic environment is favorable. Furthermore, many country dummies are statistically significant. The coefficients indicate that there are large differences across Western European countries in terms of the level of stable funding. The comparison group in the regression is Austria.

Table 8. Explaining total ASF (2005–2015).

	(1) ASF	(2) ASF	(3) ASF	(4) ASF
L.log(total assets)	-3.040***	-3.066***	-3.119***	-3.135***
	(-13.680)	(-12.881)	(-13.097)	(-12.176)
Δlog(total assets)	-2.873	-4.939	-4.700	-4.773
	(-0.821)	(-1.419)	(-1.329)	(-1.385)
Listed	-0.913	-1.577	-0.887	-1.389
	(-0.793)	(-1.437)	(-0.814)	(-1.207)
L.Net lending		0.235***	0.246***	0.256***
		(9.395)	(9.793)	(8.911)
Income		0.162	0.311*	0.287*
		(1.044)	(1.898)	(1.673)
GDP growth			1.372***	0.784***
			(5.670)	(3.017)
Belgium				5.908**
				(1.995)
Switzerland				15.640***
				(6.584)
Germany				9.661***
				(3.997)
Denmark				3.827*
				(1.682)
Spain				8.803***
				(3.821)
Finland				2.163
				(0.574)
France				-8.593***
				(-2.601)
United Kingdom				4.315
				(1.630)
Greece				8.280***
				(3.138)
Ireland				5.079*
				(1.678)
Iceland				11.906***
				(4.306)
Italy				4.053
				(1.412)
Luxembourg				12.225***
				(4.132)
Netherlands				13.067***
				(5.402)
Norway				7.717***
				(2.890)
Portugal				6.281**
				(2.555)
Sweden				2.853
				(1.109)
Constant	100.874***	88.647***	81.797***	76.123***
	(47.766)	(26.212)	(20.112)	(17.423)
Observations	1556	1537	1537	1537
R^2	0.14	0.23	0.25	0.34
Fixed country effects	No	No	No	Yes

The dependent variable is the ratio of total equity to total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses. The results for the year dummies are omitted. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

To check for the robustness of the results, the regressions are repeated for the subsamples consisting of the 2004–2009 and 2010–2015 periods, i.e., for the

subsamples before and after the new liquidity regulation was announced. The results typically remain the same and thereby confirm that large banks that have high equity ratios are less oriented toward customer deposit funding and have less stable funding profiles. Furthermore, estimating the OLS regression model with bank fixed effects yields similar results. These results are not reported to avoid repetition. In addition, a variable for short-term liabilities with a weight of 50% in the ASF was calculated using the Bankscope data. Including this variable in the proxy for ASF does not change the main results. Moreover, using a weight of 90% for customer deposits does not change the regression results.

Finally, because banks' decisions on liability types are not completely unrelated from each other, the regressions were repeated as seemingly unrelated regressions (SUR). In these regressions, a system of regression equations was designed from the regressions that explain the customer deposit funding ratio, long-term liabilities ratio and equity ratio (Specification 4 in Tables 5, 6 and 7). In the SUR, the error terms of the equations are assumed to be contemporarily correlated. However, the SUR results do not differ from those of OLS; therefore, to avoid repetition, these results are not reported.

3.2.2. Stakeholder banks

This section includes Western European stakeholder banks in the sample. Briefly, stakeholder banks are divided into cooperative and savings banks. Unlike commercial banks, stakeholder banks are not owned by shareholders. Profit maximization is neither the primary nor the exclusive aim of cooperative and savings banks because they maximize stakeholder value rather than shareholder value. Therefore, instead of maximizing profit, they maximize stakeholder value for a larger and more diversified group of subjects that represent diverse interests (Ayadi et al., 2010). The members of cooperative banks share ownership by a one member–one share rule. Similarly, in cooperative banks, power is divided equally among members. As for savings banks, they are further divided into private savings banks and publicly owned savings banks. They are either non-profit organizations (foundations) or they are owned by the government. Cooperative banks and savings banks have large market shares in certain Western European countries; together, the market share of stakeholder banks in Western Europe is approximately 20–25% of total assets.

The inclusion of the stakeholder banks in this study is motivated by the assumption that bank ownership types lead to different funding profiles. Groeneveld (2014) suggests that cooperative banks have business models that focus on retail banking. Similarly, Ayadi et al. (2009) suggest that savings banks have a traditional and retail-funded business model. Accordingly, the regressions are repeated for a sample that includes Western European stakeholder banks and commercial banks. We expect that cooperative banks and both types of savings

banks are more oriented toward customer deposit funding than commercial banks are.

Moreover, the NSFR will allow regulators to assign high weights (up to 85%) to the interbank deposits that cooperative banks receive from other group members. For other banks, the corresponding weight is 0%. That is, at the discretion of national regulators, interbank deposits within a cooperative network can be given almost the same weight as customer deposits (90–95%). Therefore, the new regulation treats bank ownership types somewhat differently, which is why stakeholder banks are examined in a separate section.

Ayadi et al. (2010) argue that cooperative banks are often part of a network that has an integrated structure. Banks in a network cooperate both vertically and horizontally, and they have centralized services, such as product development. Furthermore, cooperative banks may have centralized liquidity management services. Fonteyne (2007) suggests that the vast majority of European cooperative banks are organized in a network, although the degree of networking varies from country to country.

As mentioned in the section describing the data, bank parent companies are preferred to regional member banks. This is because some cooperative banks use interbank funding from other group members to manage their liquidity. If the dataset consists of regional member banks instead of parent banks, the figures for cooperative banks change drastically; they suggest that cooperative banks use significantly more funding from interbank deposits than the three other bank ownership types. Therefore, the level of consolidation in the dataset is a fundamental explanatory factor of cooperative banks' funding structures.

Table 8 shows the descriptive statistics for the customer deposit funding ratio, the long-term liabilities ratio, the equity ratio and the ratio of total stable funding to total assets by bank ownership type. The figures show that there are significant differences across bank ownership types. The mean customer deposit funding ratio is highest for publicly owned savings banks and lowest for commercial banks. Cooperative banks have the second-highest mean. This suggests that the assumption that stakeholder banks are more deposit oriented holds because all stakeholder bank types use more customer deposit funding than do commercial banks.

Furthermore, the mean long-term liabilities ratio is very high for private savings banks. This ratio is lowest for cooperative banks and publicly owned savings banks. As for the equity ratio, the differences across bank ownership types are much smaller. However, they are significant and indicate that publicly owned savings banks have the least equity. The equity ratio is highest for cooperative banks. Finally, the ratio of total stable funding to total assets is the highest in private savings banks – despite the fact that their customer deposit funding ratio is the second lowest of the four types. Therefore, their level of stable funding is

high because of their high long-term liabilities ratios. Moreover, as implied by the other figures in Table 8, commercial banks have the least stable funding.

Table 8. Descriptive statistics by bank ownership type (2005–2015).

Commercial banks	Mean	S.D.	Min	Max	Median	N
Customer deposits	50.13	22.57	0.18	91.86	50.86	1746
Long-term liabilities	13.71	13.63	0.00	66.92	9.70	1664
Equity ratio	8.34	5.91	1.10	44.73	6.73	1797
Stable funding	70.83	18.97	7.47	99.46	73.53	1545
Cooperative banks	Mean	S.D.	Min	Max	Median	n
Customer deposits	57.10***	18.54	5.70	91.96	56.89	476
Long-term liabilities	16.49***	11.55	0.02	48.38	15.47	450
Equity ratio	7.78**	3.30	1.57	27.57	7.45	476
Stable funding	80.68***	13.71	16.38	98.36	83.49	449
Private savings banks	Mean	S.D.	Min	Max	Median	n
Customer deposits	55.91***	12.63	29.37	91.95	54.91	774
Long-term liabilities	22.64***	13.00	0.02	53.99	23.43	758
Equity ratio	8.58	3.87	1.21	28.78	7.75	766
Stable funding	86.62***	8.81	53.18	99.15	88.67	746
Publicly owned savings banks	Mean	S.D.	Min	Max	Median	n
Customer deposits	60.09***	9.56	43.91	81.31	58.41	69
Long-term liabilities	10.33**	6.05	0.15	26.69	11.34	65
Equity ratio	6.87**	1.42	3.68	9.57	6.81	69
Stable funding	77.52***	9.28	58.27	95.55	76.99	65
Full sample	Mean	S.D.	Min	Max	Median	n
Customer deposits	52.90	19.90	0.18	91.96	53.59	3065
Long-term liabilities	16.36	13.60	0.00	66.92	13.18	2937
Equity ratio	8.28	5.07	1.10	44.73	7.13	3108
Stable funding	76.76	17.28	7.47	99.46	80.87	2805

Customer deposits = ratio of customer deposits to total assets. *Long-term liabilities* = ratio of long-term liabilities to total assets. *Equity ratio* = ratio of equity to total assets. *Stable funding* = sum of customer deposits, long-term liabilities and equity as a share of total assets. Asterisks show significance for mean comparison t-tests with a hypothesis that the mean is different from that of commercial banks. The ratios are expressed as percentages. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The econometric models in the specifications that examine bank ownership type are the same as Equation 1, with the exception that these specifications include dummies indicating the bank ownership type. The control group is commercial banks. Table 9 presents the results of the regressions that examine the customer deposit funding ratio. The coefficient for cooperative banks is significant in every specification. The coefficients for both types of savings banks are significant in the fourth specification with country dummies. Therefore, these results suggest that stakeholder banks use more customer deposit funding than do commercial banks. This pattern was also implied by the descriptive statistics. Furthermore,

the results for bank size and the equity ratio are similar to the sample that includes only Western European commercial banks.

Table 9. Explaining the customer deposit funding ratio by bank ownership type (2005–2015).

	(1) Customer deposits	(2) Customer deposits	(3) Customer deposits	(4) Customer deposits
Cooperative bank	2.229*	1.864	2.251*	3.588***
	(1.805)	(1.458)	(1.745)	(2.885)
Priv. savings bank	-1.883*	-2.489**	-2.486**	2.167*
	(-1.818)	(-2.197)	(-2.193)	(1.877)
Publ. savings bank	2.726*	2.008	1.750	3.671*
	(1.690)	(1.182)	(1.032)	(1.796)
L.log(total assets)	-3.943***	-4.062***	-4.078***	-4.570***
	(-20.590)	(-19.621)	(-19.774)	(-21.246)
Δlog(total assets)	1.938	2.185	1.364	2.117
	(0.605)	(0.642)	(0.398)	(0.642)
L.Equity ratio	-0.710***	-0.682***	-0.677***	-0.547***
	(-7.450)	(-6.939)	(-6.870)	(-5.248)
Listed	-4.333***	-3.955***	-3.698***	-2.742**
	(-3.648)	(-3.323)	(-3.086)	(-2.244)
L.Net lending		0.016	0.020	0.072***
		(0.628)	(0.790)	(2.583)
Income		-0.190	-0.192	-0.172
		(-0.965)	(-0.967)	(-0.863)
GDP growth			0.681***	0.416*
			(3.062)	(1.842)
Constant	91.839***	93.338***	91.467***	85.455***
	(31.837)	(23.663)	(22.519)	(20.116)
Observations	2766	2718	2718	2718
R^2	0.21	0.21	0.22	0.33
Fixed country effects	No	No	No	Yes

The dependent variable is the ratio of customer deposits to total assets. *Equity ratio* = ratio of equity to total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10 shows the results of the OLS regressions that explain the ratio of long-term liabilities to total assets. The result for cooperative banks is significant and positive in the first specification. However, the result is non-significant when more variables are included in the specification. Moreover, the result is significant and negative when the country dummies are included. This implies that cooperative banks have less funding from this source than do commercial banks. The result for private savings banks is significant and positive in every specification. However, the coefficient is much smaller in the fourth specification that includes country dummies. As for publicly owned savings banks, the results indicate that they have less funding from this source than do commercial banks.

Table 10. Explaining the long-term liabilities ratio by bank ownership type (2005–2015).

	(1) Long-term liabilities	(2) Long-term liabilities	(3) Long-term liabilities	(4) Long-term liabilities
Cooperative bank	3.932***	1.115	1.243	-1.411*
	(5.055)	(1.427)	(1.572)	(-1.769)
Priv. savings bank	11.612***	6.829***	6.823***	1.945**
	(15.972)	(8.876)	(8.882)	(2.334)
Publ. savings bank	-1.501	-4.473***	-4.567***	-3.037***
	(-1.550)	(-4.862)	(-4.939)	(-2.875)
L.log(total assets)	1.192***	1.453***	1.447***	1.627***
	(9.060)	(11.565)	(11.456)	(12.055)
Δlog(total assets)	3.246	1.126	0.845	-1.492
	(1.447)	(0.505)	(0.378)	(-0.693)
L.Equity ratio	-0.046	-0.114	-0.112	-0.197***
	(-0.683)	(-1.592)	(-1.578)	(-2.605)
Listed	1.565*	0.862	0.928	-0.118
	(1.957)	(1.151)	(1.234)	(-0.154)
L.Net lending		0.245***	0.246***	0.191***
		(15.675)	(15.664)	(11.374)
Income		0.160	0.161	0.186
		(1.310)	(1.317)	(1.565)
GDP growth			0.210	0.314**
			(1.274)	(1.975)
Constant	2.716	-13.111***	-13.676***	-11.277***
	(1.464)	(-6.555)	(-6.789)	(-5.341)
Observations	2655	2595	2595	2595
R^2	0.15	0.27	0.27	0.39
Fixed country effects	No	No	No	Yes

The dependent variable is the ratio of long-term liabilities to total assets. *Equity ratio* = ratio of equity to total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The results concerning the equity ratio are shown in Table 11. The results in the first specification show significant differences in the equity ratio by bank ownership type. However, the coefficients for cooperative banks and private savings banks are non-significant when control variables for income and net lending are included. Furthermore, the result for cooperative banks in the fourth specification with country dummies suggests that they have, on average, slightly higher equity ratio than three other bank ownership types.

Table 11. Explaining equity ratio by the bank ownership type (2005–2015).

	(1) Equity ratio	(2) Equity ratio	(3) Equity ratio	(4) Equity ratio
Cooperative bank	-0.770***	0.045	0.077	0.521*
	(-2.992)	(0.168)	(0.284)	(1.920)
Priv. savings bank	-0.979***	0.008	0.009	0.045
	(-4.076)	(0.031)	(0.035)	(0.138)
Publ. savings bank	-2.123***	-0.683**	-0.703**	-0.367
	(-6.079)	(-2.003)	(-2.061)	(-0.842)
L.log(total assets)	-1.127***	-0.860***	-0.862***	-0.826***
	(-22.293)	(-19.077)	(-19.149)	(-17.243)
Δlog(total assets)	-0.736	-3.433***	-3.481***	-4.517***
	(-0.782)	(-3.800)	(-3.856)	(-5.060)
Listed	0.252	0.314	0.332	0.148
	(0.835)	(1.065)	(1.124)	(0.492)
L.Net lending		-0.008*	-0.008	-0.010*
		(-1.688)	(-1.631)	(-1.783)
Income		0.538***	0.538***	0.526***
		(9.729)	(9.739)	(9.665)
GDP growth			0.054	0.158***
			(1.012)	(2.802)
Constant	18.237***	12.774***	12.639***	12.004***
	(28.232)	(16.154)	(15.438)	(14.774)
Observations	2840	2764	2764	2764
R^2	0.24	0.32	0.32	0.39
Fixed country effects	No	No	No	Yes

The dependent variable is the ratio of total equity to total assets. *Equity ratio* = ratio of equity to total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Furthermore, Table 12 shows the results of the specifications that explain total stable funding, i.e., the sum of customer deposits, long-term liabilities and equity as a share of total assets. The results show that cooperative banks and private savings banks have significantly more stable funding than do commercial banks. Regarding publicly owned savings banks, they have a significant result in the first specification. However, the result is non-significant when more variables are included in the specification. Therefore, the results suggest that publicly owned savings banks do not have more stable funding profiles than do commercial banks. Furthermore, the coefficients for cooperative banks and private savings banks are much higher in the first specification than in the second specification that includes control variables for net lending and income. Moreover, excluding the variable for income (results not reported) does not change this result. This suggests that net lending, i.e., the liquidity of the asset portfolio, is an important determinant of bank funding structures.

Taken together, many of the differences among bank ownership types can be explained by bank-specific variables and/or by country dummies. However, the results suggest that cooperative banks have more stable funding than do commercial banks, mostly because cooperative banks have higher customer deposit funding ratios. As for private savings banks, in addition to higher

customer deposit funding ratios, they have more funding from other long-term liabilities than do commercial banks. Consequently, they have more stable funding than do the three other bank ownership types. Furthermore, the stability of the funding profile of a publicly owned savings bank does not, on average, differ significantly from that of a commercial bank. This is contrary to expectations. Finally, similarly to the regressions using the sample of commercial banks, the regressions examining bank ownership types were repeated using SUR estimations. These results do not differ from those of OLS; therefore, they are left unreported.

Table 12. Explaining total stable funding (2005–2015).

	(1) Stable funding	(2) Stable funding	(3) Stable funding	(4) Stable funding
Cooperative bank	6.613***	3.150***	3.742***	3.151***
	(6.462)	(2.967)	(3.490)	(2.901)
Priv. savings bank	10.069***	4.341***	4.307***	4.653***
	(11.467)	(4.546)	(4.538)	(4.887)
Publ. savings bank	2.521*	-1.201	-1.635	1.220
	(1.697)	(-0.763)	(-1.042)	(0.698)
L.log(total assets)	-2.797***	-2.552***	-2.586***	-2.788***
	(-17.411)	(-15.068)	(-15.340)	(-15.103)
Δlog(total assets)	0.636	-2.392	-3.447	-4.871
	(0.212)	(-0.779)	(-1.121)	(-1.600)
Listed	-2.023*	-2.621***	-2.342**	-2.544**
	(-1.911)	(-2.589)	(-2.319)	(-2.410)
L.Net lending		0.268***	0.273***	0.271***
		(12.037)	(12.290)	(10.579)
Income		0.197	0.199	0.318
		(1.119)	(1.129)	(1.630)
GDP growth			0.969***	0.783***
			(5.893)	(4.196)
Constant	96.408***	79.623***	77.142***	73.460***
	(42.416)	(23.964)	(22.606)	(20.012)
Observations	2583	2546	2546	2546
R^2	0.29	0.37	0.38	0.43
Fixed country effects	No	No	No	Yes

The dependent variable is the ratio of total stable funding to total assets, i.e., the sum of customer deposits, other long-term liabilities and equity as a share of total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4. DISCUSSION

The results suggest that banks that receive large amounts of funding from customer deposits are substantially smaller than banks that receive lesser amounts. This finding implies that the traditional funding source – deposits – is favored mainly by small banks. Furthermore, this finding may imply that other sources of bank funding are not equally available to small and large banks.

Moreover, the regression results show that large banks utilize more funding from other long-term liabilities than do smaller banks, which implies that these banks at least partially fill the gap caused by a lower customer deposit funding ratio by using more funding from other long-term liabilities. In addition, the equity ratios of large banks are lower than those of smaller banks. Nonetheless, the largest difference in funding profiles between large and small banks is in the amount of customer deposit funding. As a result, large banks receive less funding from stable sources than do smaller banks. Hong et al. (2014) and Dietrich et al. (2014) suggest that on average, large banks have lower NSFRs than smaller banks. Thus, this study suggests that one explanation for this result is that large banks do not utilize customer deposit funding as much as small banks do. Consequently, they have lower ASFs than do smaller banks.

Provided that large banks can increase the stability of their funding, the new regulation will have significant effects on the stability of the Western European banking sector because the most unstable banks are large and thereby systemically important banks. However, because large banks fund their assets from sources other than customer deposits, the NSFR is likely to cause challenges in their maturity transformation. This conclusion is similar to that reached by DeYoung and Jang (2016), who argue that meeting the NSFR minimum standard will be expensive for many large banks. Furthermore, cross-country differences in the mean amount of stable funding are notable, which implies that the new regulation will cause different challenges for the banking sectors of different Western European countries (as King, 2013 suggests).

Furthermore, the regression results suggest that banks with high equity ratios have lower customer deposit funding ratios than do banks with low equity ratios[8], which supports the hypothesis that well-capitalized banks willingly take on more liquidity risk because they can borrow funds when necessary. Because the NSFR is designed to complement the existing capital regulations, an important implication of this result is that higher equity levels do not imply an increase in the stability of the overall funding structure. Indeed, these two requirements are partial trade-offs, which also implies that even if banks have low customer deposit funding ratios, they have large equity buffers and are therefore better able to withstand capital shocks. Furthermore, the results show that banks fund illiquid assets through sticky liabilities; as the net lending ratio increases, the stability of the liabilities increases. This result is in accordance with that of DeYoung and Jang (2016), who show that banks implicitly set targets for structural liquidity.

Turning to asset growth and its role in customer deposit funding, the regression results show that bank growth has no significant effect on customer deposit funding. This result is different from that of Demirgüç-Kunt (2010). However,

[8]This result remains unchanged when the dependent variable is the sum of customer deposits and other long-term liabilities as a share of total assets, i.e., total stable funding, excluding equity.

fast-growing banks have lower equity ratios than do other banks, and furthermore, listed banks do not differ significantly from other banks in customer deposit funding. Likewise, listed banks do not have less equity than other banks. In addition, the regression results show that the equity ratio is significantly related to GDP growth and bank income. Finally, ASF is positively related to GDP growth, i.e., it decreases in recessions. Therefore, one reason for Hong et al.'s (2014) result that the NSFR decreases in recessions is that the nominator (ASF) positively relates to GDP growth. Moreover, bank growth is not significantly related to ASF. In addition, high income increases ASF.

The regression results concerning bank ownership type suggest that stakeholder banks use more customer deposit funding than do commercial banks. This result has an important implication because Cornett et al. (2011) show that from 2006–2009, banks that relied on core, i.e., stable, deposit funding engaged in more lending relative to banks that were more dependent on wholesale funding. Similarly, Dagher and Kazimov (2015) show that banks that relied on wholesale funding curtailed lending more during the 2008–2009 financial crisis than did retail-funded banks. Likewise, Kapan and Minoui (2014) examine an international sample of banks from 2006–2010; they show that banks that were more reliant on wholesale funding curtailed their lending during the 2007–2008 crisis more than other banks. In addition, de Haan and van den End (2013) show that in the case of a negative liquidity shock, banks particularly curtail wholesale lending.

Furthermore, Ferri et al. (2014) and Meriläinen (2016) show that stakeholder bank lending growth is less cyclical than that of commercial banks. The results of this study suggest that one factor affecting stakeholder banks' less-cyclical lending pattern is their deposit-oriented funding profile. As, Cornett et al. (2011), among others, show, banks that use more funding from core deposits curtail lending less during economic slowdowns. Therefore, stakeholder banks can continue lending during recessions because their liabilities consist mostly of customer deposits. Moreover, this result implies that Western European stakeholder banks already fulfill the objectives of the NSFR aims. Furthermore, this implies that the NSFR will decrease the procyclicality of the financial sector if it shifts funding toward customer deposits.

However, the observed more-stable funding profile does not hold for publicly owned savings banks. The regressions explaining total stable funding indicate that these banks do not differ significantly from commercial banks. Publicly owned savings banks have more funding from customer deposits, but their ratios of long-term liabilities to total assets are, on average, lower than those of commercial banks. As a result, there are no significant differences in total stable funding among banks. Therefore, the regression results for publicly owned savings banks suggest that the assumed stability of stakeholder banks' funding profiles is not as obvious as it first seems.

These results raise the question of why. The regression results show that publicly owned savings banks have the highest customer deposit funding ratio. However, this ratio is offset by their long-term liabilities ratio, which is, on average, the lowest among the four ownership types. Moreover, publicly owned savings banks' equity ratio is not significantly higher than that of commercial banks. Regarding funding from equity, publicly owned savings banks have the municipalities as their 'owners'. Ayadi et al. (2009) argue that these banks are rarely in the position to inject new equity to savings banks. Furthermore, savings banks cannot raise equity by issuing new shares. Therefore, their main source of new equity is retained profits.

Moreover, Ayadi et al. (2009) suggest that publicly owned savings banks in Germany have central banks within the savings bank group. These banks are called Landesbankens, and one of their functions is to act as a central bank or a clearinghouse for the savings banks in the region. Furthermore, Ayadi et al. (2009) argue that in Austria, the savings banks system is more centralized than that in Germany. Therefore, it is built around a central institution – the Erste Group – and it is possible that other long-term funding sources, such as, e.g., bond funding, are allocated to German publicly owned savings banks through Landesbankens and – in the case of Austrian publicly owned savings banks – through Erste Group. Thus, these banks may have more stable funding than do commercial banks, even if the regression results do not suggest that. Unfortunately, we have no data available for these entities to examine this subject.

The results for cooperative banks are dependent on the consolidation of the data. For example, if data for bank group members (regional banks) are used instead of data for group parent banks, cooperative banks have significantly less stable funding than commercial banks (results presented in the appendix). Furthermore, there are no significant differences between commercial banks and cooperative banks in the use of customer deposit funding when data on regional member banks is preferred to data on group parents. Consequently, the funding profiles of cooperative banks are less stable than those of commercial banks.

This study highlights an important political aspect: the stability of cooperative bank funding is dependent on whether their interbank deposits are classified as stable or unstable liabilities. Currently, national regulators are allowed to assign these liabilities high weights (up to 85%) in NSFR calculations. Balancing this requirement is crucial because improper weights may give cooperative banks a competitive advantage/disadvantage. Furthermore, cooperative banks are market leaders in certain Western European countries. Thus, the funding structures of cooperative banks play a large role in the funding stability of the overall banking system in these countries and in Western Europe as a whole. Further research should therefore consider the stability of interbank funding among the cooperative bank group members. In particular, research is needed to

determine how 'sticky' these liabilities are relative to customer deposits and equity.

5. CONCLUSIONS

This study examined Western European banks' funding profiles for the 2005–2015 period. In particular, this study investigated stable sources of bank funding; customer deposits, equity and long-term liabilities. In the context of an upcoming liquidity regulation known as the NSFR, these liabilities are seen as the most stable funding sources. Using panel regressions to examine the determinants of bank funding structures, this study contributes to the growing literature on structural liquidity.

The results suggest that smaller banks use more customer deposit funding. Therefore, the funding profiles of large banks are, on average, less stable than those of smaller banks. However, banks that have larger equity buffers use less customer deposit funding than banks that obtain less funding from equity. Moreover, banks with illiquid asset portfolios have more stable funding than other banks. In addition, average cross-country differences in the amount of stable funding are large.

The results concerning bank ownership type show that, as expected, stakeholder banks favor more customer deposit funding than do commercial banks. Moreover, the results suggest that, on average, private savings banks have the most stable funding profiles. Although the results suggest that the funding profiles of stakeholder banks are more stable than those of commercial banks, the results do not suggest a significant difference between publicly owned savings banks and commercial banks. In addition, the result for cooperative banks depends on the level of consolidation of the data, as these banks use interbank funding from other group members to manage their liquidity. Consequently, if data on group members is preferred to data on group parents, then the funding profiles of cooperative banks are less stable than those of commercial banks.

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Appendix

Table A.1. Explaining liabilities by bank ownership type (2005–2015).

	(1) Customer deposits	(2) Long-term liabilities	(3) Equity ratio	(4) Stable funding
Cooperative bank	1.504	-2.679***	0.649***	-3.254***
	(1.186)	(-3.472)	(2.843)	(-2.725)
Priv. savings bank	3.374***	2.360***	-0.222	3.139***
	(2.737)	(2.917)	(-0.758)	(3.084)
Publ. savings bank	5.436***	-4.558***	-0.185	2.816*
	(2.680)	(-4.246)	(-0.448)	(1.778)
L.log(total assets)	-4.995***	1.601***	-0.881***	-2.592***
	(-25.969)	(13.059)	(-19.128)	(-14.115)
Δlog(total assets)	0.406	-1.710	-6.191***	-4.064
	(0.132)	(-0.847)	(-7.602)	(-1.299)
L.Equity ratio	-0.859***	-0.300***		
	(-10.148)	(-4.483)		
Listed	-0.886	-0.318	0.037	-3.994***
	(-0.772)	(-0.432)	(0.135)	(-3.632)
L.Net lending	0.026	0.139***	-0.008*	0.194***
	(1.156)	(9.337)	(-1.703)	(8.156)
Income	0.018	0.382**	0.595***	0.457**
	(0.111)	(2.552)	(11.829)	(2.502)
GDP growth	0.438*	0.191	0.147***	0.680***
	(1.904)	(1.375)	(2.633)	(3.545)
Constant	91.398***	-5.450***	12.236***	74.105***
	(26.815)	(-2.873)	(15.786)	(21.397)
Observations	3555	3105	3636	3055
R^2	0.38	0.43	0.44	0.49
Fixed country effects	Yes	Yes	Yes	Yes

The dependent variables are (1) ratio of customer deposits to total assets, (2) ratio of long-term liabilities to total assets, (3) ratio of total equity to total assets, and (4) total stable funding, i.e., the sum of customer deposits, long-term liabilities and the ratio of equity to total assets. *Listed* = publicly listed commercial bank. *Net lending* = ratio of net loans to total assets. *Income* = ratio of total income to lagged total assets. All ratios are expressed as percentages. *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.