Money, Lending and Banking Crises

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Abstract

This paper shows that the bank lending channel impacts on lending and on the risk of a banking crisis. The results show that a decrease in interest rates will decrease future bank lending and the likelihood of a banking crisis. This effect is dampened during recessionary periods in European countries. Policy implications are also provided. The detrimental effects of a lax monetary policy on a crisis are reduced directly by a highly capitalised financial sector and indirectly in an economy with highly liquid financial entities via lending growth.

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Keywords: Monetary Policy, Banking Crisis, Bank Lending Channel, Great Recession, Great Moderation

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1. Introduction

Some authors consider that the origin of the Global Financial Crisis (GFC) that began in 2007 was the monetary excess of previous years, as Taylor (2009) mentioned. The GFC led to the Great Recession, a period of low or negative global economic growth that occurs from 2007 to 2009. The Great Moderation started at the end of the oil crisis, when central banks followed the Taylor rule. This period is considered tostart in 1987 and to end in 2001, and is characterised by a positive and sustained world economic growth. The events of 2001-09-11 and the crisis of high-technology enterprises in the early 2000s led to an almost worldwide monetary policy change, with central banks not following the Taylor rule until 2006 (Taylor 2009). The cause was the forecast of a bank panic that never occurred. This paper denominates this period as the "laxity" or "lax period" from 2002 to 2006, when the lax monetary policy led to an excessive global economic growth. This lax monetary policy sparked a housing boom and a terrible bust. Many banking crises have been started by an incorrect monetary policy. Nonetheless, some authors disagree with the suggestions of Taylor. For instance, Bernanke[1] argues that the Taylor rule is too simple to take into account many factors that policymakers must consider in a complex, dynamic economy.

This paper analyses the effects of monetary policy on lending behaviour and on the risk of a banking crisis. Its contribution is to answer the following questions. First, is there any banking sector lending channel that impacts on both lending growth and the probability of a crisis? Second, was the impact of monetary policy on lending growth and on the risk of a banking crisis during and prior to the Great Recession in the Euro area different from the impact during the Great Moderation? In this paper, we will discover that the answer to the first question is that the bank lending channel does directly impact on a crisis via capitalisation, and indirectly via liquidity. Regarding the second question, the monetary policy during the Great Moderation did not impact on lending, while the duration of the lax policy and the Great Recession in the Euro area led to an

[1] https://www.brookings.edu/blog/ben-bernanke/2015/04/28/the-taylor-rule-a-benchmark-for-monetary-policy/

expansion on lending. Monetary policy during the Great Recession also caused an increase in the risk of a crisis.

The layout of the paper is as follows. Section 2 deals with the literature review of the topic. Section 3 explains the data and expands on the econometric model, using a dynamic panel data model estimated by the generalised method of moments (GMM) in two steps and a panel logit probability model. A non-balanced panel is used from 1987 to 2012 for 36 countries, all the European Union (EU) (27) and Organisation for Economic Cooperation and Development (OECD) countries with the exceptions of Switzerland, Cyprus, Romania and Malta. The methodology is presented in Section 4; Section 5 shows the results and introduces policymeasures. Section 6 contains a discussion on the main results, showing empirical evidence for one of the causes of the crisis, the lax monetary expansion of 2002–2005 that led to an increase in lending. Finally, conclusions are provided in section 7.

2. Literature review

According to Taylor (2009), one determinant of the Great Recession of 2007–2009 was the lax monetary policy of previous years. Popov (2016) finds that lax monetary conditions increase bank credit. Shirakawa (2013) explains how financial imbalances led to a banking crisis; he states that housing and credit bubbles burst in Europe and the United States, thus triggering a crisis. Ivashina and Scharfstein (2010) explain that the credit boom that peaked in 2007 started the GFC, which triggered the Great Recession.

As Assenmacher-Wesche and Gerlach (2010) discuss, the current crisis raises the issue of whether and how central banks should face the growing asset-price bubble. They should have curbed the increase in asset prices and the lending expansion. A more controversial aspect is whether central bankers should have addressed the build-up of the bubble. Many authors have argued that, since the rapid expansion of credit has encouraged the raising of asset prices, monetary policymakers

should have increased interest rates. Nevertheless, there is little consensus on whether that policy was beneficial to the economy and feasible and, as a result, two opposing approaches have emerged.

The activist approach considers that banks should face financial imbalances with monetary policy. Their view is based on four empirical proposals. First, central banks can discover an asset-price bubble by searching financial imbalances. Second, those imbalances are useful to forecast the trend in inflation and output in a horizon of two or three years. Third, central banks can influence asset prices by monetary policy. Finally, the improvement in economic performance obtained by controlling asset prices exceeds the short-run costs of a decrease in inflation and Gross Domestic Product (GDP).

The other is the competing approach, also called "the wait-and-see approach" (Assenmacher-Wesche & Gerlach 2010), which holds that central banks do not have enough information to prevent these bubbles. Insteadof being concerned with asset prices, they focus on inflation and output when setting interest rates. Nonetheless, if asset prices fall sharply, central banks should reduce the interest rate to avoid a recession or an excessive drop in inflation. As Freedman et al. (2010) state, during the Great Recession, reserves and central banks reduced interest rates and used non-conventional policies, such as quantitative easing and qualitative or credit easing, to provide liquidity. Despite these measures, credit, as well as GDP and employment, remained tight.

Monetary policy is important to prevent banking crises. As Douch (2010) states, a typical finding in the literature is that monetary policy influences GDP with delay. Bank lending is an intermediary mechanism to transmit monetary policy (Goh & Yong 2007). Monetary shocks affect the level of output by changing interest rates, which alters the availability of bank loans. This leads to a drop in bank lending and involves cutbacks in investment and consumption; hence, lending behaviour has a direct relationship with monetary policy and GDP (see also Bernanke & Gertler 1995). In addition, monetary policy is usually only considered in terms of choosing a short-term nominal

interest rate target. Nevertheless, central bankers used other kinds of monetary policy during the recent financial crisis (Curdia and Woodford, 2011), for instance, changing the size of the balance sheet.

In the literature, loan growth is considered to be a determinant of the likelihood of a banking crisis, as Demirguc-Kunt and Detragiache (1998) state. They introduce the lags of change in real credit as a proxy of financial liberalisation. These authors include other relevant determinants of banking crises, such as the real short-term interest rate, inflation and rate of growth of real GDP to incorporate an indicator of macroeconomic variability. They also introduce the public administration surplus as a percentage of GDP to represent the government's financial needs. Beck et al. (2006) find that the risk of a crisis is increased by less banking competition. Hardy and Pazarbasioglu (1999) find that a good indicator of a banking crisis could be consumption expansion in the years prior to a crisis. For a thorough review of the determinants of a banking crisis see Boudriga and Ghardallou (2012) and Peña (2016). Büyükkarabacak and Valev (2010) use a logit panel data model due to the use of a binary dependent variable, and find that household credit expansions are a relevant predictor of banking crises. They apply a population averaged panel logit probability model because it allows them to use the Huber/White/Sandwich estimator of variance, which reduces the influence of outliers and produces valid standard errors.

Attention needs to be paid to the credit channel to control lending and monetary policy interactions (Bernanke & Blinder 1988). Through this channel, shifts in monetary policy lead to changes in bank lending. The influence of monetary policy on credit depends on bank-specific characteristics, the most important being liquidity and banking competition. Less liquid banks are more influenced by monetary contractions (Matousek & Sarantis 2009), while less market power (higher level of bank competition) has more influence on monetary policy (Fungáčová *et al.* 2014).

Many studies have analysed the effects of monetary policy on lending based on bank-specific characteristics (Peña 2015). Size, liquidity, capitalisation, credit risk, securitisation and bank market power are the main bank-specific characteristics used in the literature. Thus, small banks are more influenced by a tight monetary policy than big banks (Kashyap & Stein 1995a, 1995b and 2000; Kishan & Opiela 2000 and 2006; Altunbas *et al.* 2002 and 2009); poorly-capitalised banks respond more to monetary policy than well-capitalised banks (Kashyap & Stein 1995a and 1997; Peek & Rosengren 1995; Kishan & Opiela, 2000 and 2006; Altunbas *et al.* 2002 and 2009; Van den Heuvel, 2002; Gambacorta & Mistrulli 2004; Gambacorta 2005); less liquid banks feel more acutely the impact of monetary changes than more liquid banks (De Bondt 1999; Kashyap & Stein 2000; Ehrmann *et al.* 2001 and 2003; Gambacorta & Mistrulli 2004; Gambacorta 2005; Altunbas *et al.* 2009; Matousek & Sarantis 2009); banks with higher credit risk are more affected by monetary contractions than banks with lower credit risk (Altunbas *et al.* 2010; Bogoev 2010; Adelino & Ferreira 2014; Cantero-Saiz *et al.* 2014); less securitisation improves monetary policy (Loutskina & Strahan 2009; Altunbas *et al.* 2009; Gambacorta & Marques-Ibanez 2011); and, the higher the level of bank competition (less market power) the higher the influence of monetary policy (Adams & Amel 2005 and 2011; Gunji *et al.* 2009; Olivero *et al.* 2011a and 2011b; Turk-Ariss 2010; Brissimis, Delis and Iosifidi 2012; Fungáčová & Weill, 2013; Fungáčová, *et al.* 2014; Leroy 2014). Ehrmann *et al.* (2003) compare the structure of banking and financial markets in the euro area. They find that monetary policy does alter bank loan supply, with effects depending on the liquidity of individual banks. They use individual banking data and an empirical model that includes GDP and prices as explanatory variables, introducing some dynamics.

3. Econometric model and data

It is assumed that bank lending of the previous period impacts on the current period, this can be easily checked by the significance of the lag of the dependent variable and the desirable econometric properties of the dynamic panel data model. This first empirical specification in section 4 is based

on Ehrmann *et al.* (2003), who use the GMM estimator suggested by Arellano and Bond (1991), due to the dynamics of bank lending. The key advantages of using this methodology are, first, the accuracy for the sample, because GMM models are accurate for samples with higher individuals than periods and when the number of periods is around 20 for unbalanced panels (Judson & Owen, 1999), as in this case. Second, the avoidance of endogeneity by lagging the variable (Blundell & Bond, 2000) and the achievement of efficiency and consistency (Ehrmann *et al.*, 2003) are relevant. A disadvantage from Ehrmann et al. (2003) model is that this paper uses aggregated data, instead of individual banking data. Additional variables are included, and some are modified. The model is estimated using the two-step *System GMM* method, and the robustness-check model applies *in differences GMM* method. The WC-robust estimator of Windmeijer (2005) is used, which is a bias-corrected robust estimator for two-step VCEs (variance-covariance matrix estimators) from GMM estimator. The following equation reflects interactions between monetary policy and a banking sector-specific characteristic:

$$\Delta \ln(L_{i,t}) = \sum_{j=1}^{l} a_j \Delta \ln(L_{i,t-j}) + \sum_{j=0}^{l} b_j r_t + \sum_{j=0}^{l} c_j X_{i,t} + \sum_{j=0}^{l} d_j r_t X_{i,t} + \sum_{j=0}^{l} e_j Y_{i,t} + \sum_{j=0}^{l} f_j Z_{i,t} + \varepsilon_{i,t} \qquad (1)$$

with i = 1, . . . , N and t = 1, . . . , T; where T is the number of temporal periods, N the number of countries, $L_{i,t}$ the loans, where *dlnloanpc* is the dependent variable, specified as the first difference of the logarithm of domestic credit in percentage, r_t is the monetary policy indicator, represented by the lending interest rate,[2] $X_{i,t}$ denotes the bank-specific characteristics of the country and $Y_{i,t}$ the economy-specific characteristics of the country (GDP growth, value of the stock exchange, inflation and investment). $Z_{i,t}$ are dummy variables.

[2] A complete pass-through from monetary policy to retail banking rates is assumed, as the literature usually implicitly assumes (Bernanke & Gertler, 1995; Bernanke & Gilchrist, 1999).

The presence of a bank lending channel should be seen in a significant coefficient for the interaction of bank-specific characteristics with changes in money supply controlled by the monetary authority. The bank-specific characteristics variables are *liquid*, liquidity; *capital,* capitalisation; and the Lerner index, *lerner,* lagged one year to avoid endogeneity and simultaneity problems. The regression also includes three economy-specific characteristics of the country (GDP growth rate, *gdpgr*; the value of the stock exchange, *stock*; and *investment*, which is gross capital growth) that allow us to capture cyclical movements and are useful to control demand effects and to isolate the monetary policy. Finally, temporal and geographical dummies are included to control possible effects of the economic crisis. Some combinations of interactions between the monetary policy indicator, *euroarea*, *GM*, *GR* or *laxity*are included.

The use of logit models is relevant to anticipate economic crises (Nocetti, 2006), therefore the paper estimates a logit model, based on Büyükkarabacak and Valev (2010). Other reasons for choosing this model are the same as Büyükkarabacak and Valev (2010) of Section 2. A disadvantage of this model is the existence of better methodologies to address heteroskedasticity, as the *probit* model. For this reason, a robustness-check model is estimated based on *probit* methodology. The variable *crisis* is the one we aim to explain. This dependent variable takes the value 1 if the country suffers a systemic banking crisis and 0 if not, and is based on World Bank and Laeven and Valencia (2010, p. 7), who provide the two conditions for taking the value 1: "Significant signs of financial distress in the banking system […]; and significant banking policy intervention measures in response to significant losses in the banking system." They consider that the first year that both criteria are met is considered the year when the banking crisis starts becoming systemic. The end of a crisis is defined the year before both real GDP growth and real credit growth are positive for at least two consecutive years (Laeven & Valencia, 2013). The model is estimated by a population-averaged panel logit model, according to Büyükkarabacak and Valev (2010).[3]

[3] These authors refer to Zeger et al. (1988), Neuhuas et al. (1991), and Wooldridge (2002) for a detailed description of the population-averaged model.

$$\text{logit Pr}(Y_{it}=1|X_{it})=\beta^{*}X_{it}$$

Where Y_{it} represents the variable *crisis*, X_{it} the explanatory variables, β^{*} the change in the logit of the proportion with $Y=1$ for an increase in X of a unit. The population-averaged method allows using the Huber/White/Sandwich estimator of variance. This estimator generates valid standard errors. Robust standard errors are obtained by the method of generalised estimating equations (GEE).

The determinants of financial crises included in this paper are: *gdppcgr*, the growth rate of the variable *gdppc* (GDP per capita); *lnc (t-2)*, the logarithm of domestic credit lagged two periods to avoid simultaneity and endogeneity problems (Büyükkarabacak& Valev, 2010); *surplus*; *inflation*; *consumption*; *interest*; and *liquid, lerner*, and *capital.*

For the source and further explanations of the variables, see Table 1. Table 2 show the main characteristics of the variables, Table 3 shows the full periods and countries of the sample, while in Appendix 1 appear the non-observations of the unbalanced panel. Table 4 shows the correlation matrix. As all correlations are near or lower than 0.5, we can state that there are no multicollinearity problems.

4. Methodology

The results represents the effects of the variables on bank lending (Table 5), and the effects on the presence of a banking crisis (Table 6). Models (1b) and (2b) are the definitive models. Model (1a) is the complete dynamic model estimated by the System GMM. The Sargan and A-B tests have been calculated with the above-stated model, but without WC-robustness, to test them. The econometric tests show that the models are not subject to serial correlation of order two (using the A-B test) and the instruments are valid (using the Sargan test). Model (2a) is the complete logit model that ensures the collective significance of the parameters with the Wald test. The differences among the three model estimations for each issue are: models (1a) and (2a) are the complete models considering the most relevant determinants for each dependent variable; models (1b) and (2b) are

obtained by consecutively excluding the non-significant variables of the general model until we obtain that model; models (1c) and (2c) are obtained by first considering general models as (1a) and (2a), but applying *in differences GMM* and a *probit* model respectively, eliminating the non-significant variables and obtaining the check model.

5. Results and policy implications

The results show that an increase in interest rates will decrease future bank lending and decrease the likelihood of a country experiencing a banking crisis. These effects are dampened during recessionary periods in European countries. Thefirst effect is also damped during the lax period. A decrease in the future likelihood of a country experiencing a banking crisis is also associated with lower per capita GDP growth, lower budget surplus, higher interaction of monetary policy and bank lending in previous periods, higher inflation and lower consumption. Furthermore, an increase on bank lending is also associated with higher GPD growth and lower value of listed companies.

In this section, the two questions in section 1 are answered. First, there is one channel of monetary transmission to decrease the monetary policy effect on bank lending, via increasing liquidity, found on the economic and statistical significant positive coefficient of the interaction term for *interest* and *liquid (t-1)* in Table 5. There is also a transmission mechanism from monetary policy to prevent a crisis, namely higher capitalisation, as we find in the significant and positive coefficient of the interaction of *interest* with *capital*, as shown in the models in Table 6. Second, monetary policy has generally led to decrease bank lending and the likelihood of banking crisis, as the negative coefficient of *interest* shows in Tables 5 and 6, while this effect is damped by the monetary policy in the years prior to the Great Recession, involving an indirect or direct increase in bank lending, and in the risk of a banking crunch in European countries, as we can see in the positive sign of the coefficient of *interest*laxity* in Table 5 and of *euroarea*interest*GR* in Tables 5 and 6. In addition, the impact of monetary policy on credit has reduced the likelihood of a banking crisis during the sample

period, as we can see in the significant and negative coefficient of the interaction of lending and the policy indicator in model (2b) and (2c) in Table 6. Therefore, there was a different impact of monetary policy on bank lending during the Great Moderation than during and prior the Great Recession. These results are economic and statistical significant.

We can also contribute some policies: first, a rule-based policy would be better than a discretionary one because the follow-up of Taylor's rule could improve the avoidance of a banking crisis, as we see in the lack of impact on the lending growth during the years when that rule was followed (the "Great Moderation") and the impact (directly or indirectly via bank lending) on the risk of a crisis by the years when or where central banks and reserves did not follow that rule (the years of lax monetary policy, and, in the Euro area, the years of the Great Recession), as shown by the positive coefficients of interest*laxity in Table 5, and the positive coefficients of euroarea*interest*GR in Tables 5 and 6, while the coefficient euroarea*interest*GM in Table 5 is not significative. Second, a monetary policy that is more independent from (or encourages less) lending growth would mitigate the probability of a crisis because the desirable effect of monetary policy on the risk of a banking crisis is damped by the interaction of monetary policy with lending growth, as suggested by the opposite sign of the coefficients interest and interest*loan(t-2) in Table 6. Third, as monetary policy is less effective in liquid and well-capitalised banks, policymakers should stimulate bank liquidity and promote capitalisation in order to sterilise monetary policy and avoid non-desirable banking responses to monetary policy as lending growth or banking crises, as the positive coefficients of interest*liquid(t-1) in Table 5 and interest*capital in Table 6 shows.

6. Discussion of the results

Tables 5 and 6 are used to interpret the results. In this section, we discuss two main issues: the impact of monetary policy on lending and its channels, and the evidence of some of the causes of banking crises.

6.1. Impact of the monetary policy on lending

A positive influence of a monetary shock on lending can be observed. As mentioned in the introduction, after the events of 2001-09-11 and the crisis in the early 2000s, monetary policy expanded due to the forecast of a bank panic that never occurred. According to some authors, this monetary expansion did not follow the Taylor rule, which is useful to avoid business cycles and crises. This positive monetary shock from 2002 to 2005 encouraged bank lending, as the significant and positive sign of the interaction between *interest* and *laxity* indicates in models (1b) and (1c) in Table 4. The lending rise led to a sharp increase in economic growth over natural growth, more than the growth expected by the literature. Since then, a vicious circle has been generated: economic growth also encouraged lending. It has been commented that the rise in lending (and the expansion of real estate and complex funds) was an important cause of the GFC, and we show in this paper that the monetary shocks of 2002-2005 were a first step in the perverse chain. While the Great Moderation followed Taylor's rule, and hence monetary policy had no impact on lending (no impact from the interaction between monetary policy and GM in Table 5), the monetary policy of the Great Recession led to an additional rise in lending in the countries in the Euro area (significant and positive sign of the interaction of the policy indicator and *GR*). One bank lending channel was also found: via liquidity (the impacts of monetary policy on lending will decrease in a country with a more liquid banking sector).

6.2. Evidence of some causes of the financial crisis

The monetary policy in the sample has reduced the probability of a banking crisis, as the negative sign of the monetary policy indicator in Table 6 shows. We see that the bank lending channels impact positively and significantly on the likelihood of a banking crisis, but indirectly—interaction between monetary policy and lending growth impacts positively and significantly on the risk of a crisis (positive and significant coefficient of *interest*lnloan (t-2)*). Nonetheless, bank lending channels also impact directly—a positive and significant effect of the interaction between the policy indicator and *capital* is found. The results show that monetary policy caused an increase in the likelihood of

a crisis via low capitalisation. Furthermore, the monetary policy in the Euro area during the Great Recession damaged the banking sector, thus encouraging a crisis.

7. Conclusions

This paper analyses how monetary policy, measured as lending interest rate, influences bank credit supply, and how monetary policy and lending impact banking crises. This paper also examines whether lax monetary expansions prior to the Great Recession influenced the rise in lending, which caused the crisis, as some authors suggest. Furthermore, we study the impact of bank lending channels on credit and crises.

The following policy measures could be proposed: a well-capitalised and liquid banking sector could reduce the risk of a crunch in the sector (directly or indirectly through lending growth), and the follow-up of Taylor's rule could improve the avoidance of a banking crisis.

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Table 1. Description of the variables.

Variable	Definition	Source	Variable	Definition	Source
GM	Binary dummy, equal to 1 where the year is included on the period of the Great Moderation: 1987–2001, 0 otherwise.	Own elaboration	*euroarea*	Binary dummy, equal to 1 where and when the Euro is the common currency, 0 otherwise	Own elaboration
gdpgr	Rate of growth of the GDP at market prices (annual %), based on constant 2010 U.S. dollars.	http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG	*laxity*	Binary dummy, equal to 1 where the year is included on the period of the "laxity": 2002–2006, 0 otherwise	Own elaboration
gdppc	GDP per capita (current US$) is gross domestic product divided by midyear population.	http://data.worldbank.org/indicator/NY.GDP.PCAP.CD	*stock*	Market value of listed domestic companies (% of GDP), which is the share price times the number of shares outstanding for listed domestic companies. Data are end of year values.	http://data.worldbank.org/indicator/CM.MKT.LCAP.GD.ZS
GR	Binary dummy, equal to 1 where the year is included on the period of the Great Recession 2007–2009, 0 otherwise	Own elaboration	*liquid*	Liquid assets to deposits and short term funding (%) is the ratio of the value of liquid assets to short-term funding plus total deposits.	http://databank.worldbank.org/data/reports.aspx?source=global-financial-development
capital	Bank capital to assets ratio (%), which is the ratio of bank capital and reserves to total assets.	http://data.worldbank.org/indicator/FB.BNK.CAPA.ZS	*cons*	Private consumption (% of GDP) is the market value of all goods and services, purchased by households and nonprofit institutions.	http://data.worldbank.org/indicator/NE.CON.TETC.ZS
lerner †	The Lerner Index is a measure of market power in the banking market. An increase in the Lerner index indicates a deterioration of the competitive conduct of financial intermediaries.	http://databank.worldbank.org/data/reports.aspx?source=global-financial-development	*surplus*	Cash surplus/deficit (% of GDP) is revenue(including grants) minus expense, minus net acquisition of nonfinancial assets. This cash surplus or deficit is closest to the earlier overall budget balance	http://databank.worldbank.org/data/Views/Metadata/MetadataWidget.aspx?Name=Cash%20surplus/deficit%20(%%20of%20GDP)&Code=GC.BAL.CASH.GD.ZS&Type=S&ReqType=Metadata&ddlSelectedValue='TUN&ReportID=4001&ReportType=Table
interest	The lending interest rate (%) is the retail bank rate that usually meets the short- and medium-term financing needs of the private sector.	http://data.worldbank.org/indicator/FR.INR.LEND	*inflation*	Inflation, consumer prices (annual %), as measured by the consumer price index using the Laspeyres formula.	http://data.worldbank.org/indicator/FP.CPI.TOTL.ZG
crisis	Binary dummy, Crisis=1 if there is a systemic banking crisis, crisis=0 otherwise	http://databank.worldbank.org/data/reports.aspx?source=global-financial-development	*invest*	Gross domestic investment consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.	https://data.worldbank.org/indicator/NE.GDI.TOTL.ZS

† A rise in the Lerner index shows a deterioration in the competitive conduct of financial intermediaries.

Table 2. Statistical descriptors.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
crisis	936	0.3076923	0.4617852	0	1
gdpgr	895	2.729328	3.889565	-32.11857	21.82889
stock	832	54.8372	46.55807	0.0198936	479.8116
liquid	425	7.839397	9.143413	0.2296138	60.94282
capital	440	7.077273	2.454837	2.7	17.4
lerner	535	0.1851031	0.1177539	-1.60869	0.503105
interest	712	14.77073	42.687	0.5	824.56
inv	916	22.78574	4.690971	9.042185	41.2353
euroarea	936	0.1901709	0.3926457	0	1
GM	936	0.5769231	0.4943115	0	1
laxity	936	0.1923077	0.3943242	0	1
GR	936	0.1153846	0.3196563	0	1
gdppc	921	22370.72	17279.9	1063.076	112028.6
surplus	575	-1.545591	4.351303	-29.42016	20.00958
inflation	869	10.39638	47.66664	-4.479938	1058.374
cons	902	56.84153	7.279113	31.41163	74.04452

Table 3. Countries and years in the sample.

Years: 52	*Countries: 36*
1987-2012	Australia, Austria, Belgium, Bulgaria, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Israel, Italy, Japan, Korea, Luxembourg, Latvia, Mexico, Lithuania, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Turkey, United Kingdom, United States.

Table 4. Correlation matrix of independent variables.

	gdpgr	*stock*	*liquid*	*capital*	*lerner*	*interest*	*investment*
gdpgr	1						
stock	0.0323	1					
liquid	0.1849	-0.4909	1				
capital	0.0768	-0.3543	0.2322	1			
lerner	0.0867	-0.0196	-0.0077	0.0226	1		
interest	-0.0588	-0.1708	0.1919	0.3059	0.0623	1	
investment	0.5339	-0.1422	0.248	0.0932	0.1721	0.1449	1
euroarea	-0.1391	0.1538	-0.3758	-0.4025	-0.1971	-0.2696	-0.2986
GM	0.0716	0.0864	-0.0756	-0.0252	-0.0339	0.1672	-0.0838
laxity	0.3106	0.0499	0.0715	-0.0769	-0.0271	-0.1339	0.0616
GR	-0.3709	-0.0817	-0.0378	-0.0328	0.0101	0.0936	0.131
gdppc	-0.2411	0.6706	-0.4881	-0.3905	-0.0108	-0.2106	-0.3255
surplus	0.4314	0.3259	-0.1865	-0.1786	0.0374	0.0757	0.4168
inflation	0.1349	-0.3094	0.2437	0.3237	0.1263	0.5646	0.4306
consumption	0.0624	-0.1397	-0.0078	0.4968	0.1349	0.183	0.0724

	euroarea	*GM*	*laxity*	*GR*	*gdppc*	*surplus*	*inflation*	*consumption*
euroarea	1							
GM	0.1703	1						
laxity	-0.0129	-0.4339	1					
GR	-0.0305	-0.2354	-0.5652	1				
gdppc	0.2993	-0.1865	-0.0788	0.2122	1			
surplus	0.0596	0.1849	0.1326	-0.0922	-0.0047	1		
inflation	-0.2423	0.0942	-0.1382	0.1818	-0.3112	0.1265	1	
consumption	-0.3187	-0.0474	-0.0098	0.0138	-0.2654	-0.216	0.1671	1

Table 5. Estimated models I.

Dependent variable: *dlnloanpc*	**1a Initial model**	**1b Definitive model (GMM System)**	**1c Check model (GMM in differences)**
dlnloanpc (t-1)	0.074	0.1392***	0.1678***
gdpgr	1.639**	1.7405***	1.6822***
interest	-5.786	-1.7729***	-1.9753***
stock	0.075	0.1294***	
liquid (t-1)	0.034		
capital (t-1)	-0.646		
lerner (t-1)	-48.114		
*interest*liquid (t-1)*	0.088	0.083***	0.091***
*interest*capital (t-1)*	0.386		
*interest*lerner (t-1)*	10.139		
invest	0.484		
*euroarea*interest*GM*	0.201		
*interest*laxity*	1.141	0.762**	0.596**
*euroarea*interest*GR*	3.346	2.619**	1.930***
Number of observations	196	219	219
Number of instruments	36	21	21
Sargan test (2nd step; p-value)	0.6753	0.8658	0.2193
A-B test MA (1), MA (2) (p-value)	0.0081, 0.8956	0.0066, 0.9517	0.0072, 0.9086

* Significance level of 10%, ** significance level of 5%, *** significance level of 1%

Table 6. Estimated models II.

Dependent variable: *crisis*	**1a Initial model**	**1b Definitive model (logit)**	**1c Check model (probit)**
gdppcgr	-0.236*	-0.213***	-0.11**
lnloan (t-2)	0.232		
surplus	-0.387*	-0.344**	-0.188**
inflation	0.31**	0.319**	0.157**
cons	-0.17	-0.051**	-0.027***
interest	-2.224**	-2.153***	-1.085***
interest lnloan (t-2)*	0.044*	0.057**	0.027**
interest liquid*	0.001		
*interest*capital*	0.124***	0.064***	0.035***
*interest*lerner*	-0.163		
*euroarea*interest*GR*	0.72***	0.587***	0.326***
Number of observations	193	258	258
Number of groups	27	32	32
Wald (p-value)	0	0	0

* Significance level of 10%, ** significance level of 5%, *** significance level of 1%

APPENDIX 1

Periods with no observations for each country and variable †

Country/variable	*liquidity*	*capital*	*surplus*	*lerner* ‡	*stock*	*interest*	*lnloan*
Australia	1987-2000	1987-1999	1987-1998	1987-1995,2011	1987		
Austria	1987-1998	1987-1999	1987-1994	1987-1995	1987	1987-1997, 2000-2012	1998
Belgium	1987-1998	1987-1999, 2012	1987-1994	1987-1995	1987	2010-2012	1998
Bulgaria	1987-1994	1987-1999	1987-1989	1987-2000	1987-1994	1987-1990	1987-1990
Canada	1987-2000, 2009-2012	1987-1999	1987-1990	1987-1995,2011	1987		2009-2012
Chile	1987-1996	1987-1999	1987-2001	1987-1995,2011	1987		
Czech Republic	1987-2000	1987-1999	1987-1992	1987-1995	1987-1993	1987-1992	1987-1992
Denmark	1987-1999	1987-2000	1987-1994	1987-1995,2011	1987	2003-2012	
Estonia	1987-1990	1987-1999	1987-1994	1987-1995,2011	1987-1996	1987-1991	1987-1994
Finland	1987-1998	1987-1999	1987-1994	1987-1995, 2001-2002,2011	1987	2005-2012	
France	1987-1998	1987-1999, 2012	1987-1994	1987-1995	1987	2005-2012	1998
Germany	1987-1998	1987-1999	1987-1994	1987-1995,2011	1987	2003-2012	
Greece	1987-2000	1987-1999, 2012	1987-1994	1987-1995,2011	1987	2004-2012	
Hungary	1987-2000	1987-1999, 2006-2007	1987-1994	1987-1995	1987-1990	1987-1988	
Ireland	1987-1998, 2000	1987-1999	1987-1994	1987-1995,2011	1987-1994	2006-2012	
Island	1987-2000	1987-1999, 2008, 2012	1987-1997	1987-1995,2011	1987-1993		
Israel	1987-2012	1987-1999	1987-1999	1987-1995,2011	1987		2010-2012
Italy	1987-1998	1987-1999, 2012	1987-1994	1987-1995,2011	1987		
Japan	1987-2000	1987-1999, 2012	1987-2004	1987-1995	1987		
Korea	1987-2000	1987-1999, 2006-2007	1987-1989, 2012	1987-1995	1987		
Luxembourg	1987-1998	1987-1999	1987-1998	1987-1995	1987	1999-2012	1993, 1998-1999
Latvia	1987-2000	1987-1999	1987-1993	1987-1995	1987-1994	1987-1992	1987-1992
Mexico	1987-2000	1987-1999	1987-1989, 2001-2012	1987-2011	1987	1987-1992	
Lithuania	1987-2000	1987-1999	1987-1999	1987-1995,2011	1987-1994, 2011-2012	1987-1992, 2011-2012	1987-1992
Netherlands	1987-1998	1987-1999	1987-1994	1987-1995,2011	1987		1998
New Zealand	1987-2012	1987-2006	1987-2000	1987-1994,2011	1987	1987-1998	2011-2012
Norway	1987-2012	1987-1999, 2012	1987-1999	1987-1995,2011	1987	2010-2012	2007-2012
Poland	1987-2003	1987-1999	1987-2000	1987-1995	1987-1990	2006-2012	
Portugal	1987-1998	1987-1999	1987-1994	1987-1995	1987	2000-2012	
Slovak Republic	1987-2000, 2009-2012	1987-1999	1987-2002	1987-1995	1987-1993	1987-1992, 2009-2012	1987-1992, 2009-2012
Slovenia	1987-1990	1987-1999, 2011-2012	1987-1994	1987-1995	1987-1993	1987-1990, 2010-2012	1987-1990
Spain	1987-1998	1987-1999, 2012	1987-1994	1987-1995	1987	2003-2012	
Sweden	1987-2000	1987-2000, 2010-2012	1987-1994	1987-1995	1987	2006-2012	
Turkey	1987-2000	1987-1999	1987-2007	1987-1995,2011	1987	1987-2012	
United Kingdom	1987-2012	1987-1999, 2012	1987-1994	1987-1995	1987		
United States	1987-2000	1987-1999	1987-2000	1987-1995	1987		

†The other variables have observations for all periods and individuals, with the exception of crisis, with available data only for 1987-2011.

‡This variable has also no observations for 2012.