The Intertwining of Bank Credit and Bank Instability*

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Abstract

This paper aims to quantify the link between bank credit and bank instability while controlling for the financial and macroeconomic environment. The main identification assumption is to represent bank credit and bank instability as a system of simultaneous joint data generating processes whose error terms are correlated. We test the null hypotheses that bank credit positively affects bank instability -a vulnerability effect- and that bank instability has a negative effect on bank credit -a trauma effect-, using Seemingly Unrelated Regressions and 3SLS on a panel of EU countries from 1998 to 2012. We find a positive effect of credit to GDP on non-performing loans in the EU as a whole, in the Eurozone, in the core of the EU but not at its periphery, and a negative effect of non-performing loans on credit to GDP in all samples.

Keywords: Financial depth, bank stability, financial vulnerability, SUR model.

JEL Classification: E44; G20.

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1. Introduction

The objective of this paper is to assess the interrelationships between bank credit and bank instability in the European Union (EU). There are three motivations for this study. First, the global financial crisis has shed light on the intertwining between the growth of the banking and financial sectors (the financial deepening), financial deregulation (or the absence of regulation in the case of wholesale financial markets) and bank instability (see Gorton and Metrick, 2012). Second, the situation in the EU is specific: the EU, under the initiative of the European Commission, has adopted a banking union which gives the European Central Bank (ECB) a role of prudential supervisor for most banks in the EU. The ECB is *de facto* in charge of monitoring bank credit and bank stability. We focus on the potential heterogeneity of their interrelationships between Eurozone (EZ), core EU, periphery EU countries and Newcomers and we question the relevance of a "one-size-fits-all" reform of banking supervision in the EU. Third, although the determinants of bank credit, measured as the ratio of domestic credit to the private sector to GDP, and the determinants of non-performing loans (NPL) have been investigated separately in the empirical and theoretical literature (see *infra*), their cross-relationships have not been yet, to our knowledge.

The use of the share of NPL to gross loans as a proxy for bank instability is motivated by the outcomes of Cihak and Schaeck (2010). They find that the contemporaneous ratio of NPL to total loans provides relevant warning signals for systemic banking crisis. High levels of NPL constrain bank capital that could otherwise be used to increase lending. Aoki and Nikolov (2015) also show that the real effects of bubbles crucially depend on the identity of the bubble holder. Bubbles held by banks lead to a larger boom-bust cycle in credit and output compared to bubbles held by ordinary savers. High levels of NPL not only raise financing costs for SMEs, but also trigger financial crisis and have devastating real effects. It appears important to assess the intertwining of bank credit and NPL.

We limit our investigation to the period 1998-2012 for which banking, macroeconomic, and market data are available for most of the EU countries. Figure 1 shows a scatter plot of NPL to total gross loans and bank credit to GDP. The relationship is unclear and the unconditional correlation is -0.23. In contrast, the contribution of this paper is to assess the conditional correlation between bank credit and bank instability and to single out the effect of each of these two variables on the other. We impose a panel structure on data and control for time and country fixed effects, as well as financial and macroeconomic environment. The latter encompasses potential determinants of bank credit, as shown in the literature: GDP growth, inflation, and trade openness, and potential determinants of bank instability: long-term real interest rates, taxes on business, a financial regulation index and market capitalisation.

We test the following two null hypotheses: *(i)* there is a positive effect of bank credit on bank instability labelled a "vulnerability effect" and *(ii)* there is a negative effect of bank instability on bank credit that we label a "trauma effect". The first hypothesis stems from the increasing fragility and risks of marginal loans, whereas the second results from the potential deleveraging and reduced risk-taking of banks following a period of bank instability.

While estimating the link between bank credit and bank instability, we are confronted to two types of endogenous processes. The first is related to the joint determination of the two left-hand-side variables. Like price and quantity on a given market, bank credit and bank instability can be considered as the opposite sides of the same coin. To correct for their simultaneity, we represent bank credit and bank instability as a system of simultaneous joint

data generating processes estimated with Seemingly Unrelated Regressions (SUR) which takes into account that contemporaneous error terms are correlated and provides more efficient estimates than OLS. The second type of endogeneity relates to the right-hand-side variables and to the estimation of their causal effect. A potential omitted variable bias or reverse causality would make these variables and the error term correlated. This second type of endogeneity is handled with instrumental variables. We perform a three-stage least squares (3SLS) estimation which enables to combine the system estimation of SUR with the instrumental-variable method of 2SLS.

Despite the negative correlation between bank credit and bank instability, presented in Figure 1, we find a positive causal effect of the level of bank credit to GDP on the share of NPL, and a negative causal effect of NPL on bank credit. These results are robust to alternative bank instability variables, to the introduction of government debt,[1] to most EU subsamples, to non-linear specifications and to a 3-equation SUR model in which long-term interest rates are also considered endogenous. More precisely, we find the existence of a vulnerability effect in the EU as a whole, in the Eurozone, in the core of the EU but not at its periphery or for Newcomers, and of a trauma effect in all samples except for Newcomers. We also find some evidence of non-linearities between the two main variables. NPL have a non-linear effect on credit to GDP depending on the level of credit to GDP, while the effect of credit to GDP on NPL –the vulnerability effect– depends on the level of credit to GDP and is time contingent: this effect kicks in during crisis times.

In comparison with the intermediated-finance view discussed so far, we also investigate a market view, direct finance. The market view confirms the vulnerability effect in all subsamples except Core EU. The trauma effect is at work for EU core countries but vanishes for the full sample, the Eurozone and the EU periphery.

The rest of this paper is organized as follows. Section 2 reviews the literature. Section 3 describes the model, the empirical strategy and the hypotheses. Section 4 presents the data. Section 5 discusses the results. Section 6 concludes.

2. Related literature

The paper is at the crossroads of two strands of the literature. The first relates to bank credit and its determinants after the extension of the IS/LM model to banks by Bernanke and Blinder (1988). The following literature expanded on the analysis of monetary policy channels of transmission, whereas the bulk of empirical papers about bank credit devoted attention to its impact on economic growth (see Ang, 2008, for a survey). Only a few papers investigated bank credit determinants. Following Goodhart (1995), Hofmann (2004) shows that shocks to property prices could explain the persistence in financial cycles. In the vein of Kashyap and Stein (1995), Ashcraft (2006) studies the lending channel in the US economy and uses the affiliation with multibank holding companies to proxy financial constraints across banks. He finds that annual loan growth of affiliated banks is less sensitive to federal funds rates than non-affiliated banks. Altunbas et al. (2009) extend Ashcraft (2006)'s empirical model to the securitisation activities of European banks. They show that securitisation helps banks circumvent the impact of monetary policy. They also relate the growth of bank loans to bank risks and estimate the link between bank credit and loan loss

[1] The introduction of European government debts in the analysis can be interpreted as an indirect test of their link with banking risks. The contagion between sovereign default risk and bank vulnerability has been investigated by Bolton and Jeanne (2011), Caruana and Avdjiev (2012), Acharya and Steffen (2015) and Acharya et al. (2015).

provisions. The latter has the significant negative expected sign *vis-à-vis* the former. Cottarelli et al. (2005) study the bank credit growth in Central and Eastern European countries (CEECs) and test whether it could be attributed to a structural change of financial deepening. Their list of bank credit determinants includes public debt to GDP ratio, GDP per capita, an indicator of high inflation, an indicator of financial liberalization, and different institutional characteristics like accounting standards, legal origins and bank entry requirements. Except for the latter, all variables have the significant expected sign. Aisen and Franken (2010) explain real credit growth in 83 countries, with a distinction between, first, variables of economic performance, external shocks and policy stance; second, local characteristics of the credit market (like size, integration, and openness); and third, bank characteristics *per se* (like share of public ownership, bank leverage, and bank return on equity). GDP growth and changes in money market rate are the significant ones. After having taken into consideration possible interactions between regions, trading partners' GDP growth rate of emerging Asia can be added to the list of significant determinants. Chinn and Ito (2006) discuss the role of capital controls and institutions on bank credit, thus questioning the relationship between financial openness and financial development. Dell'Ariccia et al. (2016) identify three factors that trigger credit booms in 170 countries over the period 1970–2010: financial reforms and strong economic growth. At a micro level, Aiyar et al. (2014) investigate the supply of credit and its linkages with (and leakages towards) credit substitution channels via foreign affiliates and branches to comply with macro-prudential measures.

The second strand of the literature, on bank instability and its determinants, has developed along two different lines of reasoning[2]. The first one assumes that capitalism is intrinsically unstable (Minsky, 1995) and leads to leverage and credit booms and busts. The second one sticks to a general equilibrium approach and assumes that bank instability is caused by financial frictions (due to asymmetric information), hence by financial shocks and their propagation to the rest of the economy (Calomiris, 1995; Mishkin, 1999). The share of NPL in bank balance sheets has been shown to trigger the onset of a banking crisis (Reinhart and Rogoff, 2011). Louzis et al. (2012) study the macroeconomic and bank-specific determinants of NPL in Greece, and find that they mostly respond to GDP, unemployment, interest rates and public debt.

3. Model and Empirical Strategy

While assessing the link between bank credit and bank instability, we face the issue of their potential endogeneity. One solution, and this is the main identification assumption of this paper, consists in thinking the problem not in a single-equation space, but as a system of simultaneous equations that jointly determine both dependent variables. The two equations are therefore mechanically related as the contemporaneous errors associated with each dependent variable are correlated, which seems a reasonable assumption for these two data processes. The most basic form of joint-system estimation is Seemingly Unrelated Regressions (SUR), also called Zellner (1962)-efficient regressions, using feasible generalised least-squares (FGLS). When the two equations do not have the same set of explanatory variables and are not nested, it leads to more efficient estimates than estimating each

[2] Other measures of bank instability than NPL have been proposed. Loayza and Ranciere (2006) measure it as the standard deviation of the growth rate of the private credit to GDP ratio over non-overlapping 5-year averages. The ECB has developed a Composite Indicator of Systemic Stress (CISS) for the euro area. The International Monetary Fund (IMF) developed financial soundness indicators. At the micro level, several authors capture financial stability in the banking sector through the Z-score (Uhde and Heimeshoff, 2009; Fink et al., 2009), which measures the probability of default for a bank or a banking system.

individual equation separately with OLS because it takes into account the correlation between the error terms and therefore adds information on the error structure. Generally, the coefficients are only slightly different, but the standard errors are uniformly larger.

We estimate simultaneously the cross-effects of bank credit and bank instability using the following model, in which we assess the contribution of our variables of interest beyond contemporaneous financial and macro controls and past information captured by the lagged value of the dependent variables:

$$\begin{cases} S_{i,t} = \alpha_S + \beta_S S_{i,t-1} + \beta_{SF} F_{i,t} + \beta_{SF'} F_{i,t-1} + \beta_{SX} X_{i,t} + \beta_{SZ} Z_{i,t} + \varepsilon_{S,t} \\ F_{i,t} = \alpha_F + \beta_F F_{i,t-1} + \beta_{FS} S_{i,t} + \beta_{FS'} S_{i,t-1} + \beta_{FX} X_{i,t} + \beta_{FZ} Z_{i,t} + \varepsilon_{F,t} \end{cases} \quad (1)$$

where $S_{i,t}$ is the bank instability variable for country i, $F_{i,t}$ is the bank credit variable, $X_{i,t}$ is a vector of financial controls, namely long-term real interest rates, stock market capitalisation, taxes and a financial regulation variable, and $Z_{i,t}$ includes country and time fixed effects and the macroeconomic environment, namely real GDP, inflation and trade openness. Given the annual frequency of the data, and given that the lag between the time of loan disbursement and its possible classification as non-performing loan is at least 90 days, we include a contemporaneous relationship between bank credit and bank instability. Using this model, we test two hypotheses:

Hypothesis n°1: there is a positive effect of bank credit on bank instability labelled a "vulnerability effect".

This vulnerability effect stems from the increasing fragility and risks of marginal loans. This effect also arises from the dependence of loan-loss provisioning on the evolution of bank lending. Pool et al. (2015) show that banks reduce their loan-loss provisioning as a percentage of their total assets when bank lending increases, and therefore take on more risks. Gourinchas and Obstfeld (2012) show that rapid domestic credit expansion is a robust indicator of financial crises. One could expect a U-shaped relationship between bank credit and NPL. Until a threshold, bank credit will help develop an efficient market for loans while the marginal utility of bank loans will be positive. However, once a threshold is reached, the risk of marginal loans increases. One could also expect the occurrence of a relationship that takes a convex form between bank credit and NPL: the risk of marginal loans increases disproportionately with the supply of loans. We therefore test for possible non-linearities of this relationship.

Hypothesis n°2: there is a negative effect of bank instability on bank credit that we label a "trauma effect".

This effect results from the potential deleveraging and reduced risk-taking of banks following a period of bank instability. This is suggested by Adrian and Shin (2010, 2014) who theoretically document the procyclicality of the leverage of financial intermediaries. They show that financial intermediaries maintain a constant probability of default to shifts in the outcome distribution so it implies substantial deleveraging during downturns. This procyclicality may have been reinforced by regulatory measures. Brei and Gambacorta (2016) show that the risk-weighted regulatory capital ratio of Basel III is less procyclical than the previous liquidity ratio, that was mandatory during our period of analysis. Similarly to the first hypothesis, one can expect non-linearities in the effect of bank instability on bank credit: the deeper the crisis, the stronger the deleveraging and the negative effect on credit supply.

We include financial variables in the regression that could impinge on the relationships between bank credit and bank instability.[3] We expect a negative effect of long-term real interest rates (measuring financing costs) on bank credit. We assume that credit demand decreases and credit supply increases with interest rates. Fase (1995) reports results on bank credit for the Netherlands using nominal long-term interest rates. Alternatively, we focus on real long-term interest rates. We expect a positive correlation between the long-term real interest rate and bank instability: the latter materializes after real interest rates go up, hence weakening debtors' positions. A negative link between stock market capitalisation and bank credit would capture a substitution effect between bank intermediation and direct finance inducing a negative correlation between stock market capitalisation and bank instability as substitution could act as an insurance mechanism. We expect a positive link between taxes and bank credit and between taxes and bank instability. Following Keen and De Mooj (2012) and De Mooj, Keen and Orihara (2013), the corporate tax would violate the Modigliani-Miller theorem in the case of banking institutions: the high corporate tax induces recourse to borrowing (debt) to grasp the full benefit of interest payments' deduction, at the expense of equity. Finally, we control for the existence of a positive link between financial deregulation and bank credit and a positive link between financial deregulation and bank instability as deregulation may increase risk-taking. Chinn and Ito (2006) report a positive relationship between financial openness and financial development whereas Tressel and Detragiache (2008) show that financial liberalisation has a limited impact on financial development. Finally, Kaminsky and Schmukler (2008) show that financial liberalisation generates bank instability in the short run.

In addition, we control for the effect of macroeconomic variables like the GDP growth rate, the inflation rate, and trade openness on bank credit and financial stability. Hofmann (2004) shows that a shock to real GDP can increase credit, e.g. in Germany, Ireland or Finland; or it can have no effect, e.g. in the USA, UK and Japan. Louzis et al. (2012) report a negative impact of GDP growth on NPL. Finally, Gozgor (2014) provides evidence of a positive link between trade openness and bank credit.

Two other issues, related to the onset of the global financial crisis and its European sequel, the sovereign-debt crisis, require some attention. First, the crisis has revealed the divergence between the Eurozone and the late newcomers in the EU, where the former have benefited from financial deepening for decades whereas the latter are in a process of financial development. The crisis has also revealed the gap between a core of EU countries and the periphery. These regional features may impinge on the relationship between bank credit and bank instability and require a specific investigation. Second, growing public debts may affect credit demand and crowd out some investments as well as it may deteriorate the balance sheets of banks and thus modify credit supply and increase risks in the banking and financial system. Therefore, we test the potential effects coming from fiscal variables by introducing government debt.

[3] Another potentially interesting variable would have been the degree of securitization, enabling to have credit to GDP and NPL corrected for securitization, so capturing all loans issued and not only those still on banks' balance sheet. Unfortunately, to our knowledge, data are not available for our sample.

4. Data

4.1. Dependent variables

We measure bank credit as the ratio of domestic credit to the private sector by deposit money banks and other financial institutions to GDP (in %) from the World Bank Global Financial Development Database (GFDD). We also use the deposit money banks' assets to GDP (%) as an alternative measure of bank deepening. For the stock market view, we substitute credit to GDP by the turnover ratio (see Beck and Levine, 2004). Bank instability is captured with an aggregate prudential ratio: the ratio of NPL to gross loans.[4] For the stock market view, we use a stock price volatility variable.

4.2. Explanatory variables

First, GDP growth, the inflation rate and trade openness are included to control for the macroeconomic environment. Second, we include financial variables to control for factors that could affect the two variables of interest. Credit costs are captured by long-term real interest rates. The substitution effect between direct and indirect finance is tested with the stock market capitalisation or with the stock market turnover ratio. We assess the link between bank credit, bank instability and taxes by using different measures of tax policies. Our benchmark measure is cyclically adjusted direct taxes on business. We also examine alternatively the ratio of total direct taxes to GDP, the ratio of capital taxes to GDP, and the ratio of cyclically adjusted taxes on production and imports to GDP. On the fiscal side, we consider the ratio of gross public debt to GDP. Finally, to isolate the effect of deregulation, we include an index of financial reform, or alternatively the level of bank regulatory capital to risk-weighted assets (%). All variables are described in Table A in the Appendix and descriptive statistics are presented in Table B.

4.3. Subsample definitions

There have been important evolutions in financial institutions due to liberalisation, innovation and globalisation, which have made differences between financial systems central to their analysis (Djankov et al., 2003). One important contribution in that respect is Bruno et al. (2012) who analyse the heterogeneity of financial systems through the lens of asset allocation among OECD countries. To shed light on the heterogeneity of the relationship between financial stability and bank credit into the EU, we decompose the sample into several subsamples. First, we distinguish the Eurozone (EZ), composed of the 12 first member states of the euro area, leaving aside Luxembourg where banking deepening is so strong as to make this small country an outlier.

Second, the sovereign debt crisis highlighted the fragmentation in the EU. We then disentangle member states that belong to the core of the EU and member states that are more at the periphery. This separation is based on the spread between the domestic long-term sovereign interest rates and the German long-term sovereign interest rate post-2007. We choose the value of 0.80% as a cut-off criterion. A few comments are worth mentioning. First, Spain and Italy are included in the periphery of the EU. Second, the UK is part of the core.[5] Third, the differences in the variables of the core EU and the EU periphery suggest that our

[4] A loan is classified as a NPL when the payments of interest and principal are past due by 90 days or more.

[5] Usually in the literature, the distinction between the core and the periphery focuses on the Eurozone. A study about the linkages between bank credit and bank instability requires the inclusion of more countries and especially the UK.

grouping is reasonable. On the one hand, NPL, taxes on business, inflation and growth are on average higher in the periphery than in the core. On the other hand, credits to GDP and market capitalization are on average higher in the core than in the periphery. For robustness purposes, we propose another sample (Core 2) to test whether the inclusion of countries in the core (such as Spain or Italy) would change the results.

Third, we analyse another sub-sample (Newcomers) based on the recent waves of European enlargement. The composition of these sub-samples is available in Table C in the appendix together with a comparison of the mean and standard deviation of the main variables for all countries, and all sub-samples (see Table D).

5. Results

5.1. Baseline

Starting with our first hypothesis of a vulnerability effect, Table 1 shows that bank credit is a positive and significant determinant of bank instability. This is also true with or without the controls, but their inclusion reduces the magnitude of the effects. When including them, the coefficient is equal to 0.22 and is significant at the 1% level. According to our second hypothesis of a trauma effect, Table 1 shows that bank instability (NPL in % of all loans) has a negative effect on bank credit (bank credit to GDP).[6] This is true with or without the financial and macro controls and the coefficient is equal to -0.15 and significant at the 1% level. Since all variables have been standardized to a normal distribution, this means that a 1-standard-deviation increase in NPL (namely, an increase of 5 percentage points of the share of NPL) reduces credit to GDP by 0.15 s.d. or 8 percentage points.[7] In both cases, the contemporaneous value of credit to GDP or NPL is not significant and suggests the existence of a dynamic process in the build-up of vulnerability and trauma effects.

We also assess in Table 1 the potential non-linear relations between bank credit and bank instability. We first introduce squared values of each variable of interest as an explanatory variable of the other (column 3). We find that NPL have the same linear effect on credit to GDP whatever the NPL level, while the effect of credit to GDP on NPL –the vulnerability effect– is larger for high values of the credit to GDP ratio. More precisely, the effect of credit to GDP is null and non-significant at one s.d. below the mean (36%) of the credit to GDP distribution whereas the effect is 0.55 and significant at the 1% level at one s.d. above the mean (151%) of its distribution. Second, we look at the cross-effects of each variable on the other by introducing an interaction term of the lagged dependent variable with the variable of interest (column 4). The effect of NPL on credit to GDP depends on the level of credit to GDP, whereas the effect of credit to GDP on NPL does not depend on the level of the share of NPL. For low values of credit to GDP, the effect of NPL on credit to GDP is -0.08 but non-significant, whereas for high values of credit to GDP, the effect of NPL on credit to GDP is negative (-0.20) and significant at the 1% level. It suggests that bank credit generates additional vulnerabilities. Finally, we consider the time-contingency of the effect and we interact the variable of interest with a dummy for the crisis taking the value 0 before 2007 and 1 from 2007 (column 5). NPL increase from 4.5% before 2007 to 5.2% after (with the s.d. decreasing from 5.3% to 4.4%) while bank credit increases from 78% before 2007 to 126%

[6] As a robustness test, we also introduced the deposit banks assets as measure of bank deepening and the size of bank's balance sheet. Results hold and are available from the authors upon request.

[7] Figure 1 suggests some potential outliers for NPL. For robustness purposes, we removed data points above 20%. The raw correlation is -0.18 in that case. Column 2 of Table 1 has been re-estimated using that sample. Coefficients and t-stats are similar. These estimates are available from the authors upon request.

after (with the s.d. increasing from 48% to 62%). The effect of NPL on credit to GDP has not been altered during the financial crisis (the marginal effect is not significant, and the overall effect after 2007 is -0.17 and significant at the 5% level), whereas the vulnerability effect appears to kick in during crisis times rather than during good times (the marginal effect is 0.52 and the overall effect after 2007 is 0.64 and significant at the 1% level). Interestingly, the crisis does not have an impact by itself. High levels of credit to GDP together with the occurrence of the crisis fuel bank instability.

Finally, we also test for a 3-equation SUR model which includes long-term interest rates as a third simultaneous variable. Although we have been interested so far in the relationship between bank credit and bank instability with long-term interest rates included in the set of explanatory variables, one can view long-term interest rates as another variable whose determination is simultaneous to bank credit and bank instability. Credit demand depends directly on interest rates and the evolution of interest rates can trigger loan defaults as the subprime crisis showed. Column 6 in Table 1 provides estimates of the equation for the two main variables of interest and shows that they are not modified by this assumption. For the sake of parsimony, we therefore pursue the rest of the analysis with a 2-equation SUR model.[8]

5.2. Estimating causal effects

So far, we have jointly estimated a set of equations assuming that they have no endogenous regressors. However, it is likely that the different variables on the right-hand-side of equations are endogenous. Using three-stage least squares (3SLS or SUR-IV) enables to combine the system estimation of SUR with the instrumental variables method of 2SLS so as to get a consistent estimator of equations with endogenous regressors. The 3SLS estimator works in 3 steps: 1. we calculate fitted values of the endogenous variables based on the reduced-form regressions on the exogenous variables as in 2SLS, 2. we estimate the individual equations by 2SLS, using their fitted values in place of the endogenous regressors, 3. we estimate the system of equations jointly by Generalized Least Squares.

Identification depends on two main assumptions: the instrument does not itself appear in the equation, and the instrument does appear in another equation that influences the endogenous regressor. This means that there needs to be one omitted exogenous variable for each included endogenous variable. There are two ways to assess the relevance of our instrumental variables. They should explain a significant share of the variation in the endogenous regressor, and they should be exogenous to the dependent variables, or in other words, they should not be correlated with the dependent variables except through their effects on the endogenous regressors. To check for the relevance of the instrumental variables, we provide the R^2 of the regression of the 3SLS residuals on the instruments (the Sargan test equivalent). It is noteworthy that they confirm the validity of the six instruments described below.

We start by instrumenting both endogenous variables together (column 1) and then we instrument each of them separately (columns 2 and 3). For parsimony, we remove the contemporaneous terms of each endogenous variable that are not significant (see previous subsection). We instrument NPL by the Composite Indicator of Systemic Stress (CISS), stock

[8] Relaxing our main identification assumption and performing individual panel estimations (pooled OLS, fixed- and random-effects) rather than joint ones over the entire sample of countries does not alter our main conclusion: both vulnerability and trauma effects hold. These estimates are available from the authors upon request.

market volatility and the Saint Louis Fed Financial Stress Index (STLFSI) (columns 1 and 3), while we instrument credit to GDP by assets to GDP, turnover ratio and market capitalisation (columns 1 and 2).[9] NPL are shown to be influenced by macroeconomic and bank-specific factors like the 'too-big-to-fail' presumption (Louzis et al., 2012). A model of non-performing loan determination would then also include an index of systemic risk, a volatility index or an index of financial stress. Similarly, the theoretical model of the degree of bank credit would nest the demand side of the credit market and also draw on the supply side, hence on the liquidity and depth of the financial system. These unobservable structural characteristics are proxied by assets to GDP, turnover ratio or market capitalisation. While our instruments are not highly correlated, the consistency of the estimated results across the 3 different instruments for each instrumented variable supports the validity of the instrumental variable approach to estimate causal effects of credit to GDP or NPL one on the other.

Results of estimations with SUR-IV are reported in Table 2. They point to robust interrelationships between bank credit and bank instability and to robust correlations to macro control variables, GDP growth in the equation of credit to GDP and GDP growth and inflation in the equation of NPL. In this latter equation, the correlations to the long-term interest rate and to taxes on business are also robust. There is a negative causal impact of NPL on credit to GDP and a positive causal impact of credit to GDP on NPL, suggesting that the "trauma" and "vulnerability" effects put forward in the previous section are indeed at work.

While confirming the previous estimates, it is worth noticing that both effects are of higher magnitude with 3SLS than with a SUR model only. Since our baseline results are robust to IV estimation, the rest of the analysis is performed with the SUR model so as to provide the most conservative results, i.e. with lower bound estimates rather than upper bound ones.

5.3. Discussion on sub-samples and different controls

SUR estimates for subgroups of countries (Table 3) confirm the trauma effect for the Eurozone, and EU core and periphery countries; the effect is more than four times higher in core than periphery countries. Interestingly, there is a divergence for the vulnerability effect between the Eurozone and core countries on one side and periphery countries and newcomers on the other side: bank credit has no incidence on bank instability in the latter. This may proceed from different stages of bank credit development between the core and the periphery of the EU and shed light on the threshold impact of credit to GDP ratios on bank instability discussed in section 5.1.

The coefficients associated to the lagged values of the dependent variables are in all cases very significant and account for the persistence of these processes. We also find in Tables 1 to 3, that long-term real interest rates have no impact on credit to GDP and a positive impact on NPL, a correlation which we also find in the Eurozone countries and in the periphery countries but not in the core ones. One possible interpretation of these impacts may be that

[9] The CISS includes 15 raw measures, mainly of market-based financial stress, which are split equally into five categories, namely the financial intermediaries sector, money markets, equity markets, bond markets and foreign exchange markets. The CISS places relatively more weight on situations in which stress prevails simultaneously in several market segments. It is unit-free and constrained to lie within the unit interval (see Hollo et al., 2012). The STLFSI is constructed on US data, but because financial markets are much integrated, at least much more than labour, goods or credit markets, we assume that this index could act as another relevant proxy for instability on financial markets in Europe.

long-term real interest rates have both positive effects on the supply side of credits and negative effects on the demand side that offset each other and explain the absence of any impact on the bank credit to GDP ratio. High interest rates would reveal the fragility of the weakest debtors (which are in the EU periphery), increase the share of NPL and trigger bank instability. The substitution effect between bank intermediation and financial markets does not appear in the data: stock market capitalisation has no significant impact on bank credit. In addition, stock market capitalisation has no effect on NPL. Both results are confirmed for subgroups. It appears that direct taxes on business are negatively correlated to bank instability, but this result seems mainly driven by core countries. Finally, the index of financial reform is neither correlated with bank credit nor with bank instability. This is true for all subsamples of countries. The former result is consistent with Tressel and Detragiache (2008).

We find evidence that the GDP growth rate is negatively correlated to the credit to GDP ratio and to NPL. The former result might be related to different degrees of bank credit development in the EU and might therefore be related to the convergence effect: most developed economies in the EU share the most developed banking and financial systems; hence, these developed countries with relatively low GDP growth rates would show the most dynamic credit to GDP ratio, whereas least-developed ones would have the least dynamic. This argument is confirmed after the core and the periphery countries are tested separately: the GDP growth rate has an impact on credit to GDP ratios in the (least-financialised) periphery, but not in the (most-financialised) core (Table 3). The negative impact of the growth rate on NPL would also match the argument of the convergence effect: the pace of growth in the least-developed-least financialised countries would not produce the same increase in risk-taking by banks and on financial markets as in the most-developed-most-financialised economies. In a highly financialised area, the smaller economic growth rate would be synonymous of riskier credit, generating a rise in NPL.[10] The relative magnitude of the coefficients in Table 3 sheds some light on this issue though parameters are not statistically different. Evidence on the positive impact of inflation on bank instability is strong, but driven only by periphery countries. The absence of an effect of inflation on bank instability in the Eurozone is consistent with Blot et al. (2015) who find that there is no stable and clear link between financial stability and price stability in the Eurozone. Finally, trade openness is not correlated to credit to GDP or bank instability.[11]

5.4. Introducing government debt

We enlarge, in Table 4, the scope of common determinants of bank credit and bank instability to government debt. First, our previous results about the vulnerability effect still hold. Second, it appears that public debt to GDP ratios have a positive effect on bank instability in the EZ and core EU countries.[12] However, if we decompose this effect into normal times and crisis times, it seems that government debt impinges on bank instability during crisis whereas the effect is null (EZ and core EU countries) or even negative (all countries or periphery EU countries) in normal times. This is consistent with the analysis of Caruana and Avdjiev (2012) and with the home bias in periphery countries that Acharya and Steffen (2015) reveal. A growing debt sustained by a home bias may reduce international

[10] The effect may also stem from the variation of loan-loss provisioning due to bank lending dynamics (see Pool et al., 2015).

[11] This result is confirmed when replacing trade openness by an index measuring countries' degree of capital account openness, defined by Chinn and Ito (2006).

[12] For simplicity, we only present results for all countries, EZ, core and periphery countries. Results for core 2 and Newcomers are available upon request. Sub-sample choices do not affect our main results.

financial contagion risks. Meanwhile, the trauma effect is no longer statistically significant in the Eurozone and EU core countries, and public debt to GDP ratios are negatively correlated to bank credit except in periphery EU countries. This supports the argument of a possible direct crowding-out effect in the core or of an indirect one in the periphery through the positive effect of higher public debt on bank instability which may push banks to reduce their supply of credits and to deleverage.

5.5. The stock market view of financialisation

Until then, we have only taken into account one dimension of financialisation, the intermediated finance: the credit view, whereas another dimension, the direct finance: the stock market view, could also be analysed. It is worth noting that in the EU the two views are not interchangeable as they do not capture the same relationships because of a selection bias: households and small and mid-sized corporations do not have the same access to financial markets as large corporations. As Beck and Levine (2004) pointed out, financial deepening can be measured by the turnover ratio which proxies the depth and liquidity of stock markets. In parallel, financial instability can be captured by stock market volatility.

Table 5 reports the estimates with this new set of variables. The opposite effects between bank instability (now financial instability) and bank credit (now turnover ratio) are still captured with some subsample limitations though. On the one hand, the turnover ratio positively affects stock market volatility, except in core EU countries. This suggests that, except for the EU core, the vulnerability effect is not contingent on the definition of financialisation, whether it depends on banks or on financial markets. On the other hand, stock market volatility has a negative effect on the depth and liquidity of financial markets (the turnover ratio) in the EU core only, confirming there a trauma effect. The specificity of the EU core results may stem from its high level of financial development.

6. Conclusion

We represent bank credit and bank instability as a system of simultaneous joint data generating processes (estimated with Seemingly Unrelated Regressions) whose error terms are correlated and find that bank credit positively affects bank instability –the vulnerability effect– and bank instability negatively affects bank credit –the trauma effect–. We find evidence of some non-linearities between the two variables. NPL have a non-linear effect on credit to GDP depending on the level of credit to GDP, while the effect of credit to GDP on NPL –the vulnerability effect– depends on the level of credit to GDP and is time contingent: this effect kicks in during crisis times. In addition, we show that the existence of vulnerability and trauma effects are not exclusively related to a credit view of financialisation. Endorsing a market view of financialisation gives similar outcomes, except for the EU core: a positive effect of financial deepening –measured by the turnover ratio– on financial instability –measured by stock market volatility- and a negative effect of stock market volatility on the turnover ratio.

The existence of a vulnerability effect in the EU as a whole, in the Eurozone, in the core of the EU but not at its periphery, and of a trauma effect in all samples raises some policy recommendations. First, the existence of both effects confirms the requirement to control and supervise the supply of bank credits in the Eurozone and core countries of the EU. According to our results, monitoring bank credits, via policies which remain to be discussed –e.g. a change in capital adequacy ratios-, would alleviate the risks of bank instability. Second, in the EU periphery countries, the variations in long-term interest rates and inflation

play a strong role in the rise of bank instability: hence, supervising bank credits in the periphery, within the Banking union, should be complemented with macroeconomic policies aimed at achieving low and stable inflation and long-term interest rates.

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Figure 1 – Bank credit and Bank instability (Source: GFDD)

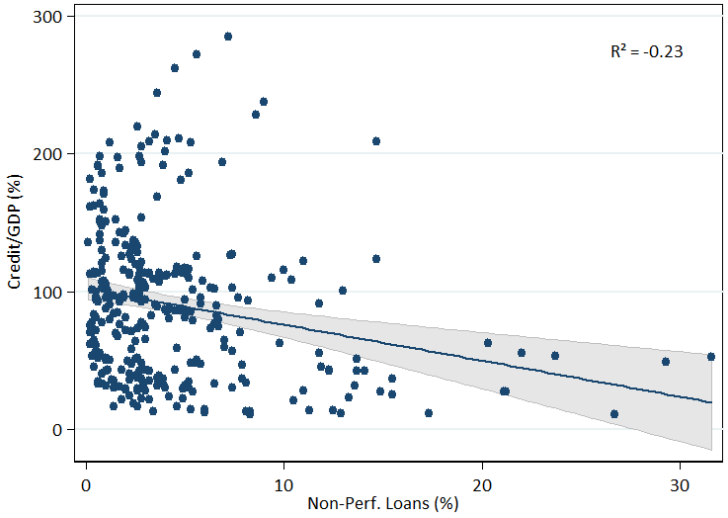

Table 1: Benchmark

	(1) All	(2) All	(3) All	(4) All	(5) All	(6) All
	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.
Lag Dep. Var.	0.75***	0.70***	0.60***	0.70***	0.61***	0.65***
	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Credit/GDP	0.38***	-0.02	-0.07	0.00	-0.06	0.05
	[0.10]	[0.11]	[0.10]	[0.11]	[0.10]	[0.11]
$Credit/GDP_{t-1}$	-0.03	0.24**	0.34***	0.22*	0.12	0.15
	[0.11]	[0.11]	[0.11]	[0.11]	[0.11]	[0.11]
$\Sigma Credit/GDP_{(t+t-1)}$	0.35***	0.22***	0.27***	0.22***	0.06	0.20***
	[0.06]	[0.07]	[0.06]	[0.07]	[0.07]	[0.07]
$(Credit/GDP_{t-1})^2$			0.22***			
			[0.05]			
Interaction				0.03		
				[0.04]		
$Credit/GDP_{t-1}$ * Crisis					0.52***	
					[0.11]	
Crisis					-0.01	
					[0.13]	
LT Real IR		0.19***	0.16***	0.18***	0.21***	0.41***
		[0.06]	[0.06]	[0.07]	[0.06]	[0.07]
Market Cap.		0.03	0.03	0.03	0.04	0.05
		[0.05]	[0.04]	[0.05]	[0.04]	[0.05]
Tax. Business		-0.10**	-0.05	-0.09**	-0.08**	-0.09**
		[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Fin. Reform		-0.09	-0.21	-0.12	-0.38	0.05
		[0.50]	[0.48]	[0.50]	[0.48]	[0.50]
GDP growth		-0.29***	-0.28***	-0.30***	-0.28***	-0.26***
		[0.05]	[0.05]	[0.06]	[0.05]	[0.06]
Inflation		0.15**	0.10*	0.14**	0.14***	0.32***
		[0.06]	[0.06]	[0.06]	[0.06]	[0.07]
Trade Open.		-0.04	-0.06	-0.03	-0.04	0.00
		[0.05]	[0.05]	[0.05]	[0.05]	[0.06]
	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP
Lag Dep. Var.	0.86***	0.86***	0.86***	0.86***	0.85***	0.86***
	[0.03]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Non-Perf L.	0.12***	-0.01	0.00	0.00	0.00	0.02
	[0.03]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
$Non\text{-}Perf\ L._{t-1}$	-0.25***	-0.14***	-0.16***	-0.14***	-0.11**	-0.13***
	[0.03]	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
$\Sigma Non\text{-}Perf\ L._{(t+t-1)}$	-0.12***	-0.15***	-0.16***	-0.14***	-0.12**	-0.11***
	[0.03]	[0.03]	[0.04]	[0.03]	[0.05]	[0.04]
$(Non\text{-}Perf\ L._{t-1})^2$			0.03			
			[0.03]			
Interaction				-0.07**		
				[0.03]		
$Non\text{-}Perf\ L._{t-1}$ * Crisis					-0.06	
					[0.07]	
Crisis					0.11	
					[0.11]	
LT Real IR		0.01	0.01	0.02	0.00	-0.06
		[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Market Cap.		0.03	0.03	0.03	0.03	0.03
		[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Tax. Business		0.02	0.01	0.01	0.01	0.01
		[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Fin. Reform		-0.46	-0.43	-0.36	-0.37	-0.41
		[0.35]	[0.35]	[0.35]	[0.35]	[0.35]
GDP growth		-0.14***	-0.13***	-0.12***	-0.12***	-0.12***
		[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Inflation		0.00	-0.01	0.01	-0.01	-0.08*
		[0.04]	[0.04]	[0.04]	[0.04]	[0.05]
Trade Open.		0.03	0.02	0.02	0.01	0
		[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Country/Time/Cst	Yes	Yes	Yes	Yes	Yes	Yes
3-equation model	No	No	No	No	No	Yes
N	275	182	182	182	182	179
R^2_1	0.61	0.75	0.78	0.75	0.78	0.74
R^2_2	0.89	0.89	0.89	0.89	0.89	0.89

Standard errors in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01 Estimated from equation (1). All variables are standardized to a normal distribution by country. The interaction term is between the lag of the dependent variable and credit/GDP in the upper panel, and non-performing loans in the lower panel. In column (6), the SUR model is estimated with 3 dependent variables: non-performing loans, credit/GDP, and long-term interest rates, and the overall model is augmented with short-term interest rates. For sake of simplicity, the 3rd equation for long-term interest rates and the parameters for short-term interest rate are not shown here. They are available from the authors upon request.

Table 2: SUR-IV 3SLS estimation

	(1)	(2)	(3)
	All	All	All
Instrumented	Credit/GDP Non-Perf L.	Credit/GDP	Non-Perf L.
Instruments	CISS / Asset/GDP Volat / Turnover STLFSI / Market Cap.	Asset/GDP Turnover Market Cap.	CISS Volat STLFSI
	Non-Perf L.	Non-Perf L.	Non-Perf L.
Lag Dep. Var.	0.70***	0.70***	0.70***
	[0.04]	[0.04]	[0.04]
$Credit/GDP_{t-1}$	0.22***	0.22***	0.22***
	[0.06]	[0.06]	[0.06]
LT Real IR	0.19***	0.19***	0.19***
	[0.06]	[0.06]	[0.06]
Market Cap.	0.03	0.03	0.03
	[0.05]	[0.05]	[0.05]
Tax. Business	-0.10**	-0.10**	-0.10**
	[0.04]	[0.04]	[0.04]
Fin. Reform	-0.08	-0.08	-0.08
	[0.50]	[0.50]	[0.50]
GDP growth	-0.29***	-0.29***	-0.29***
	[0.05]	[0.05]	[0.05]
Inflation	0.15**	0.15**	0.15**
	[0.06]	[0.06]	[0.06]
Trade Open.	-0.04	-0.04	-0.04
	[0.05]	[0.05]	[0.05]
	Regression of 3SLS residuals on instruments		
R^2	0.12	0.03	0.06
	Credit/GDP	Credit/GDP	Credit/GDP
Lag Dep. Var.	0.86***	0.86***	0.86***
	[0.04]	[0.04]	[0.04]
$Non\text{-}Perf\ L._{t-1}$	-0.15***	-0.15***	-0.15***
	[0.03]	[0.03]	[0.03]
LT Real IR	0.01	0.01	0.01
	[0.05]	[0.05]	[0.05]
Market Cap.	0.03	0.03	0.03
	[0.03]	[0.03]	[0.03]
Tax. Business	0.02	0.02	0.02
	[0.03]	[0.03]	[0.03]
Fin. Reform	-0.46	-0.46	-0.46
	[0.35]	[0.35]	[0.35]
GDP growth	-0.14***	-0.14***	-0.14***
	[0.04]	[0.04]	[0.04]
Inflation	-0.01	-0.01	-0.01
	[0.04]	[0.04]	[0.04]
Trade Open.	0.03	0.03	0.03
	[0.04]	[0.04]	[0.04]
	Regression of 3SLS residuals on instruments		
R^2	0.08	0.03	0.06
Country/Time/Cst	Yes	Yes	Yes
N	182	182	182

Standard errors in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01 Estimated from equation (1). All variables are standardized to a normal distribution by country.

Table 3: Geographical zones

	(1) All	(2) EZ	(3) Core	(4) Core 2	(5) Periphery	(6) Newcomers
	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.
Lag Dep. Var.	0.70***	0.69***	0.58***	0.66***	0.75***	0.50***
	[0.05]	[0.06]	[0.07]	[0.05]	[0.07]	[0.15]
Credit/GDP	-0.02	-0.10	-0.44***	-0.24**	0.43**	1.03***
	[0.11]	[0.15]	[0.13]	[0.12]	[0.20]	[0.40]
$Credit/GDP_{t-1}$	0.24**	0.40**	0.66***	0.48***	-0.31	-0.97**
	[0.11]	[0.16]	[0.13]	[0.12]	[0.22]	[0.41]
$\Sigma Credit/GDP_{(t+t-1)}$	0.22***	0.30***	0.22***	0.24***	0.13	0.07
	[0.07]	[0.08]	[0.08]	[0.07]	[0.12]	[0.11]
LT Real IR	0.19***	0.22***	-0.03	0.11	0.28***	0.40**
	[0.06]	[0.08]	[0.17]	[0.10]	[0.08]	[0.17]
Market Cap.	0.03	0.01	0.07	0.01	0.00	0.03
	[0.05]	[0.06]	[0.07]	[0.06]	[0.06]	[0.07]
Tax. Business	-0.10**	-0.04	-0.19***	-0.11**	-0.10*	-0.32***
	[0.04]	[0.05]	[0.07]	[0.06]	[0.06]	[0.12]
Fin. Reform	-0.09	0.64	0.34	0.84	0.06	-4.99***
	[0.50]	[0.56]	[0.74]	[0.67]	[0.73]	[1.73]
GDP growth	-0.29***	-0.27***	-0.43***	-0.36***	-0.25***	-0.43***
	[0.05]	[0.07]	[0.07]	[0.06]	[0.08]	[0.14]
Inflation	0.15**	0.10	0.09	0.12	0.18**	0.14
	[0.06]	[0.07]	[0.11]	[0.08]	[0.07]	[0.20]
Trade Open.	-0.04	-0.01	0.02	-0.02	-0.04	0.11
	[0.05]	[0.06]	[0.10]	[0.08]	[0.06]	[0.14]
	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP
Lag Dep. Var.	0.86***	0.94***	0.94***	0.88***	0.89***	0.98***
	[0.05]	[0.05]	[0.06]	[0.06]	[0.06]	[0.05]
Non-Perf L.	-0.01	-0.03	-0.28***	-0.14**	0.11**	0.21***
	[0.05]	[0.05]	[0.08]	[0.07]	[0.05]	[0.08]
$Non\text{-}Perf\ L._{t-1}$	-0.14***	-0.10**	0.02	-0.03	-0.18***	-0.32***
	[0.05]	[0.05]	[0.07]	[0.06]	[0.05]	[0.05]
$\Sigma Non\text{-}Perf\ L._{(t+t-1)}$	-0.15***	-0.13***	-0.26***	-0.17***	-0.06*	-0.11
	[0.03]	[0.03]	[0.06]	[0.04]	[0.04]	[0.08]
LT Real IR	0.01	0.03	-0.03	0.06	-0.04	-0.13
	[0.05]	[0.05]	[0.13]	[0.07]	[0.04]	[0.08]
Market Cap.	0.03	0.06*	0.03	0.03	0.04	-0.05
	[0.03]	[0.03]	[0.05]	[0.04]	[0.03]	[0.03]
Tax. Business	0.02	0.05	-0.07	-0.03	0.06**	0.01
	[0.03]	[0.03]	[0.06]	[0.04]	[0.03]	[0.06]
Fin. Reform	-0.46	-0.11	0.04	0.13	-0.14	0.65
	[0.35]	[0.33]	[0.59]	[0.52]	[0.37]	[0.90]
GDP growth	-0.14***	-0.21***	-0.30***	-0.22***	0.02	0.21***
	[0.04]	[0.04]	[0.06]	[0.05]	[0.04]	[0.06]
Inflation	-0.00	-0.00	0.01	0.03	0.00	0.05
	[0.04]	[0.04]	[0.09]	[0.06]	[0.04]	[0.09]
Trade Open.	0.03	0.06*	0.05	0.05	0.01	0.01
	[0.04]	[0.04]	[0.08]	[0.06]	[0.03]	[0.06]
Country/Time/Cst	Yes	Yes	Yes	Yes	Yes	Yes
N	182.00	126.00	92.00	118.00	90.00	27.00
R^2_1	0.75	0.78	0.74	0.76	0.82	0.90
R^2_2	0.89	0.92	0.86	0.88	0.95	0.98

Standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Estimated from equation (1). All variables are standardized to a normal distribution by country.

Table 4: Introducing government debt

	(1) All	(2) EZ	(3) Core	(4) Periphery	(5) All	(6) EZ	(7) Core	(8) Periphery
	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.	Non-Perf L.
Lag Dep. Var.	0.03	0.03	-0.34**	0.46**	-0.02	-0.09	-0.33***	0.14
	[0.11]	[0.15]	[0.13]	[0.20]	[0.10]	[0.15]	[0.12]	[0.21]
Credit/GDP	0.20*	0.30*	0.57***	-0.37	0.21**	0.37**	0.54***	-0.17
	[0.11]	[0.16]	[0.14]	[0.23]	[0.10]	[0.16]	[0.13]	[0.21]
$Credit/GDP_{t-1}$	0.68***	0.66***	0.57***	0.77***	0.65***	0.67***	0.55***	0.71***
	[0.05]	[0.06]	[0.07]	[0.07]	[0.05]	[0.06]	[0.07]	[0.07]
$\Sigma Credit/GDP_{(t+t-1)}$	0.24***	0.33***	0.23***	0.09	0.19***	0.28***	0.21***	-0.03
	[0.07]	[0.08]	[0.08]	[0.13]	[0.06]	[0.08]	[0.07]	[0.12]
Gov. Debt	0.08	0.13*	0.07	-0.09	-0.22***	-0.17	-0.20*	-0.48***
	[0.06]	[0.07]	[0.07]	[0.10]	[0.08]	[0.14]	[0.10]	[0.13]
Gov. Debt * Crisis					0.47***	0.38**	0.44***	0.63***
					[0.10]	[0.15]	[0.13]	[0.15]
Crisis					0.36***	0.33	0.37*	0.43**
					[0.14]	[0.20]	[0.21]	[0.19]
LT Real IR	0.17***	0.18**	-0.01	0.32***	0.21***	0.18**	0.03	0.31***
	[0.07]	[0.08]	[0.17]	[0.09]	[0.06]	[0.08]	[0.18]	[0.08]
Market Cap.	0.03	0.03	0.08	-0.01	0.03	0	0.04	0.00
	[0.05]	[0.06]	[0.07]	[0.06]	[0.04]	[0.06]	[0.07]	[0.05]
Tax. Business	-0.09**	-0.04	-0.20***	-0.11*	-0.09**	-0.02	-0.22***	-0.08
	[0.04]	[0.05]	[0.07]	[0.06]	[0.04]	[0.05]	[0.07]	[0.05]
Fin. Reform	-0.07	0.68	0.4	0.06	0.1	0.65	0.24	0.4
	[0.50]	[0.55]	[0.74]	[0.73]	[0.47]	[0.54]	[0.69]	[0.67]
GDP growth	-0.29***	-0.27***	-0.41***	-0.25***	-0.26***	-0.27***	-0.37***	-0.20***
	[0.05]	[0.07]	[0.07]	[0.08]	[0.05]	[0.07]	[0.07]	[0.08]
Inflation	0.14**	0.1	0.1	0.18***	0.14**	0.08	0.12	0.12*
	[0.06]	[0.06]	[0.11]	[0.07]	[0.06]	[0.06]	[0.12]	[0.07]
Trade Open.	-0.03	-0.01	0.04	-0.02	-0.03	-0.01	0.08	0
	[0.05]	[0.06]	[0.10]	[0.07]	[0.05]	[0.06]	[0.10]	[0.06]
	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP	Credit/GDP
Lag Dep. Var.	0.84***	0.91***	0.92***	0.92***	0.83***	0.90***	0.92***	0.87***
	[0.05]	[0.05]	[0.06]	[0.06]	[0.05]	[0.05]	[0.06]	[0.06]
Non-Perf L.	0.02	0.01	-0.20**	0.12**	-0.01	-0.03	-0.23***	0.04
	[0.05]	[0.05]	[0.08]	[0.05]	[0.05]	[0.05]	[0.08]	[0.05]
$Non\text{-}Perf\ L._{t-1}$	-0.13***	-0.09**	0.02	-0.19***	-0.10**	-0.06	0.03	-0.12**
	[0.05]	[0.05]	[0.07]	[0.05]	[0.05]	[0.05]	[0.07]	[0.05]
$\Sigma Non\text{-}Perf\ L._{(t+t-1)}$	-0.11***	-0.09**	-0.19***	-0.07*	-0.11***	-0.09**	-0.19***	-0.09**
	[0.04]	[0.04]	[0.06]	[0.04]	[0.04]	[0.04]	[0.06]	[0.04]
Gov. Debt	-0.09**	-0.10**	-0.13**	0.06	-0.12**	-0.22***	-0.19**	0
	[0.04]	[0.04]	[0.05]	[0.05]	[0.06]	[0.08]	[0.08]	[0.07]
Gov. Debt * Crisis					0.03	0.15*	0.08	0.06
					[0.07]	[0.09]	[0.11]	[0.08]
Crisis					0.19*	0.22*	0.18	0.36***
					[0.10]	[0.12]	[0.18]	[0.09]
LT Real IR	0.03	0.05	-0.06	-0.07	0.02	0.04	-0.09	-0.04
	[0.05]	[0.05]	[0.13]	[0.05]	[0.05]	[0.05]	[0.15]	[0.04]
Market Cap.	0.02	0.04	0	0.05	0.02	0.02	-0.01	0.04
	[0.03]	[0.03]	[0.05]	[0.03]	[0.03]	[0.04]	[0.06]	[0.03]
Tax. Business	0.01	0.04	-0.04	0.07**	0.01	0.04	-0.04	0.05*
	[0.03]	[0.03]	[0.06]	[0.03]	[0.03]	[0.03]	[0.06]	[0.03]
Fin. Reform	-0.44	-0.16	-0.1	-0.14	-0.38	-0.13	-0.11	-0.04
	[0.34]	[0.32]	[0.57]	[0.37]	[0.34]	[0.32]	[0.57]	[0.34]
GDP growth	-0.13***	-0.19***	-0.27***	0.03	-0.12***	-0.18***	-0.27***	0.05
	[0.04]	[0.04]	[0.06]	[0.04]	[0.04]	[0.04]	[0.06]	[0.04]
Inflation	-0.01	-0.01	-0.03	-0.01	-0.01	-0.01	-0.05	0
	[0.04]	[0.04]	[0.09]	[0.04]	[0.04]	[0.04]	[0.10]	[0.03]
Trade Open.	0.02	0.06	-0.01	0	0.01	0.04	-0.01	-0.03
	[0.04]	[0.04]	[0.08]	[0.03]	[0.04]	[0.04]	[0.08]	[0.03]
Country/Time/Cst	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	182	126	92	90	182	126	92	90
R^2_1	0.75	0.78	0.75	0.82	0.78	0.79	0.78	0.85
R^2_2	0.89	0.93	0.87	0.95	0.89	0.93	0.87	0.96

Standard errors in brackets. * p < 0.1, ** p < 0.05, *** p < 0.01 Estimated from equation (1). All variables are standardized to a normal distribution by country.

Table 5: Stock market view of financialisation

	(1) All	(2) EZ	(3) Core	(4) Periphery
	Volat	Volat	Volat	Volat
Lag Dep. Var.	0.53***	0.55***	0.50***	0.51***
	[0.04]	[0.05]	[0.07]	[0.06]
Turnover	0.05	0.07	-0.12	0.16***
	[0.05]	[0.06]	[0.09]	[0.06]
$Turnover_{t-1}$	0.23***	0.21***	0.15	0.32***
	[0.05]	[0.06]	[0.10]	[0.06]
$\Sigma Turnover_{(t+t-1)}$	0.28***	0.27***	0.03	0.48***
	[0.05]	[0.06]	[0.10]	[0.07]
LT Real IR	0.13*	0.15*	0.46**	0.08
	[0.07]	[0.09]	[0.18]	[0.08]
Credit/GDP	0.07	0.06	0.01	0.27**
	[0.07]	[0.09]	[0.08]	[0.13]
Tax. Business	-0.02	0.01	-0.02	-0.1
	[0.05]	[0.06]	[0.07]	[0.07]
Fin. Reform	0.02	-0.15	0.18	0.21
	[0.58]	[0.65]	[0.89]	[0.84]
GDP growth	-0.51***	-0.59***	-0.57***	-0.43***
	[0.06]	[0.08]	[0.08]	[0.09]
Inflation	0	-0.02	0.32***	-0.16**
	[0.06]	[0.07]	[0.12]	[0.08]
Trade Open.	-0.06	0.01	-0.06	-0.07
	[0.07]	[0.08]	[0.12]	[0.07]
	Turnover	Turnover	Turnover	Turnover
Lag Dep. Var.	0.48***	0.45***	0.47***	0.22*
	[0.07]	[0.08]	[0.10]	[0.12]
Volat	0.08	0.12	-0.15	0.44***
	[0.09]	[0.12]	[0.11]	[0.17]
$Volat_{t-1}$	-0.17**	-0.21**	-0.1	-0.24*
	[0.08]	[0.09]	[0.09]	[0.13]
$\Sigma Volat_{(t+t-1)}$	-0.08	-0.09	-0.25***	0.20
	[0.07]	[0.09]	[0.09]	[0.13]
LT Real IR	0.1	0.06	0.39*	0
	[0.10]	[0.12]	[0.20]	[0.14]
Credit/GDP	-0.03	0.02	0.07	-0.21
	[0.09]	[0.12]	[0.09]	[0.22]
Tax. Business	0.12*	0.14*	0.14*	0.25**
	[0.07]	[0.08]	[0.08]	[0.11]
Fin. Reform	0.06	0.08	-0.3	-1.02
	[0.77]	[0.89]	[0.98]	[1.40]
GDP growth	0.34***	0.41***	0.21*	0.52***
	[0.09]	[0.12]	[0.11]	[0.15]
Inflation	0.09	0.01	0.35***	-0.01
	[0.08]	[0.10]	[0.13]	[0.13]
Trade Open.	-0.04	-0.06	-0.11	-0.07
	[0.09]	[0.11]	[0.13]	[0.12]
Country/Time/Cst	Yes	Yes	Yes	Yes
N	200	138	107	93
R^2_1	0.67	0.71	0.68	0.75
R^2_2	0.42	0.39	0.58	0.34

Standard errors in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Estimated from equation (1). All variables are All variables are standardized to a normal distribution by country.

APPENDIX

Table A: Data Description and Sources

Abbreviation	Description	Source	Frequency
Credit/GDP	Private credit by deposit money banks and other financial institutions to GDP (%)	GFDD	annual
Non-Perf L.	Bank non-performing loans to gross loans (%)	GFDD	annual
Asset/GDP	Deposit money banks' assets to GDP (%)	GFDD	annual
Turnover	Stock market turnover ratio (%)	GFDD	annual
CISS (composite indicator of systemic stress)	Index comprising the five most important segments of a financial system: bank and non-bank financial intermediaries sector, money markets, securities markets and foreign exchange markets.	ECB	Weekly aggregated to annual
STLFSI	St. Louis Fed Financial Stress Index	FRED	annual
Volat	Stock price volatility (%)	GFDD	annual
LT Real IR	Real long term interest rates (difference between long term interest rates and inflation)	Authors calculation using OECD & WDI	annual
Market Cap.	Market capitalisation of listed companies (% of GDP)	WDI	annual
Tax. Business	Cyclically adjusted direct taxes on business (% of GDP)	OECD	annual
Gov. Debt	Gross public debt, Maastricht criterion, as % of GDP	OECD	annual
Fin. Reform	Index of financial reform	IMF	annual
Inflation	Inflation, consumer prices (annual %)	WDI	annual
GDP growth	GDP growth (annual %)	WDI	annual
Trade Open.	Trade (% of GDP)	WDI	annual

Table B: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Main variables					
Credit/GDP	344	93.12	57.61	6.38	284.62
Non-Perf L.	343	4.75	5.01	0.10	31.60
Financial controls					
LT Real IR	277	2.30	2.03	-1.72	21.00
Market Cap.	405	53.80	47.05	2.41	323.66
Tax. Business	278	0.21	0.55	0.01	3.44
Fin. Reform	330	0.92	0.08	0.49	1.00
Macro controls					
Inflation	405	3.68	5.16	-4.48	59.10
GDP growth	405	2.55	3.68	-17.95	12.23
Trade Open.	397	110.09	52.52	46.64	333.53

Table C: Subsamples composition

Eurozone (EZ)	Core	Core 2	Newcomers	Periphery
Austria	Austria	Austria	Bulgaria	Bulgaria
Belgium	Belgium	Belgium	Cyprus	Cyprus
Germany	Germany	Germany	Czech	czech republic
Spain	Denmark	Denmark	Estonia	Estonia
Finland	Finland	Finland	Hungary	Spain
France	France	France	Lithuania	Greece
Greece	Luxembourg	Luxembourg	Latvia	Hungary
Ireland	Netherlands	Netherlands	Malta	Ireland
Italy	Sweden	Sweden	Poland	Italy
Netherlands	United Kingdom	United Kingdom	Romania	Lithuania
Portugal		Italy	Slovenia	Latvia
		Spain	Slovakia	Malta
				Poland
				Portugal
				Romania
				Slovenia
				Slovakia

Table D: Mean of the main variables for the different subsamples

	All		Core		Core 2		Periphery		Newcomers	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Non-Perf L. (%)	4.78	3.01	2.19	1.22	2.68	2.22	6.30	2.69	6.95	6.32
Credit/GDP (% of GDP)	91.35	50.87	116.01	30.12	115.34	41.34	76.85	54.90	62.93	59.06
LT Real IR	2.28	0.58	2.16	0.30	2.15	1.31	2.42	0.76	2.09	1.67
Market Cap. (% of GDP)	53.80	40.65	91.05	39.90	86.05	49.74	31.89	19.83	22.32	17.91
Tax. Business (% of GDP)	0.20	0.53	0.08	0.11	0.07	0.10	0.31	0.70	0.65	0.98
Fin. Reform (index)	0.92	0.07	0.95	0.06	0.95	0.06	0.90	0.08	0.89	0.10
Inflation (annual %)	3.68	3.32	1.90	0.30	1.86	2.54	4.72	3.81	3.37	4.33
GDP growth (annual %)	2.55	1.13	1.96	0.65	2.00	0.96	2.91	1.20	5.57	7.21
Trade Open. (% of GDP)	110.40	50.76	112.37	66.18	102.85	65.17	109.24	39.03	120.98	32.78