The effect of nonperforming loans on credit expansion: do capital and profitability matter? Evidence from European banks*

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Abstract

We examine whether the effect of NPLs on bank credit growth differs depending upon the level of bank capital and profitability in a panel of up to 521 banks from 21 European countries. Our main finding is that there is a significant positive interaction effect of NPLs and bank capital and NPLs and profitability on the supply of bank credit. Thus, whether NPLs impede the monetary policy transmission mechanism depends substantially on whether or not banks are sufficiently capitalized and profitable. Policy actions aimed at reducing NPLs to sustain bank credit should protect bank capital and profitability if they are to be effective, including by supporting efforts that aim at returning NPLs to good standing.

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1 INTRODUCTION

The stock of non-performing loans (NPLs) on the balance sheets of European banks rose substantially following the 2008 financial crisis. This has been viewed widely as impairing these banks' capacity to lend and hence to have been a drag on economic activity in Europe, especially given the reliance on direct financing in most European economies. For example, Aiyar et al. (2016) argued that high NPLs have reduced bank profitability, increased bank funding costs and tied up bank capital, which negatively impacted on the supply of bank credit. The Council of the European Union (2017) argued that high NPLs have locked bank capital and funding into the financing of non-productive assets, which left less balance sheet space available for new lending, and that high NPLs cast doubts on the sustainability of individual banks (e.g., if provisions are inadequate, or by making it difficult for them to attract new capital), on the stability of the banking system (e.g., if affected banks are of systemic importance), and posed risks of cross-border spillovers. Reflecting these concerns, European policy makers have expended a great deal of energy in recent years on developing strategies to bring about a reduction in bank NPLs.[1] However, as Angelini (2018) has recently pointed out, this effort has taken place despite there being no clear theory suggesting that high levels of NPLs impair credit allocation, and in the face of scant empirical evidence that NPLs actually have such effects.

In principle, a high level of NPLs could affect the supply of credit in several ways. First, banks are subject to prudential regulations on capital and a high level of NPLs would translate into higher risk weights on bank loan portfolios in the calculation of regulatory capital, in response to which banks might decide to reduce the size of their balance sheet (Accornero et al., 2017). Second, high NPLs require greater loan loss provisions that, ceteris paribus, reduce bank profitability and capital resources available for lending (Balgova et al., 2016). Finally, banks with high NPLs might need to pay a risk premium on capital and other market sources of funding because NPLs are opaque, which makes them difficult to value; in turn, the higher funding costs might cause a

[1] Magnus et al. (2018) provide a summary and comparison of recent approaches to reducing NPLs by the European Parliament and the European Central Bank.

decline in credit supply (Angelini, 2018). But NPLs might have different implications for bank credit. First, they might change banks' attitude to risk-taking. For example, poorly capitalized banks may be more willing to lend to weak borrowers in a 'gamble for resurrection', particularly given the information asymmetry between managers and external stakeholders on the actual quality of the assets (Angelini 2018). Second, it is not clear whether the stock or the flow of NPLs is the more important factor in affecting bank credit. A higher level of NPLs is likely to be associated with permanently higher risk weights and higher funding costs, and since this relates to the overall solvency of the bank, it is likely to be more important in affecting risk-taking behavior. Hence, the impact of the level of NPLs on credit supply might depend on how well capitalized banks are—i.e., whether they have sufficient capital to offset contractionary pressures on bank credit expansion. On the other hand, an increase in NPLs seems likely to impact more immediately on banks' profit and loss accounts as banks adjust provisions to reduce exposure to possible loan defaults.[2] In this case, the effect of a change in NPLs on bank credit might differ across banks depending upon their profitability. In the absence of a clear theory suggesting that high levels or increasing rates of NPLs impair bank lending, we are forced to turn to empirical evidence to assess their impact. That is what we do in this paper. Specifically, we examine whether the effect of NPLs on bank credit differs depending on the level of banks' capital and profitability employing a panel of up to 521 banks from 21 European countries over the period 2007-17. Our main finding is that there is a significant interaction effect of NPLs on capital and profitability in the supply of credit by European banks. In particular, the levels of bank capital and profitability appear to have had a major dampening effect on the channels through which NPLs impact on the supply of bank credit. This result holds whether we consider the level or the change in the stock of NPLs, alternative definitions of bank credit, different measures of bank capital and profitability, and when we employ different estimation methodologies.

Our results contribute to the banking literature in two ways. First, they show that the interaction effect on credit growth of NPLs and bank capital and NPLs and profitability is statistically

[2] Of course, if the adjustment to provisions is large or prolonged such that the bank incurs losses, bank capital will be depleted and an increase in NPLs may have broadly the same implications for bank credit as a decline in capital.

significant, implying that the impact of NPLs on bank credit is indirect, working through the effects on capital and bank profitability. Second, our results suggest that policy actions aimed at reducing NPLs to sustain bank credit should complement actions that protect or increase bank capital and profitability if they are to be effective. For example, forcing banks to liquidate NPLs with the goal of boosting bank credit might be counterproductive if the action generates losses that reduce bank profitability and capital. Regulators might instead support policies that focus on returning NPLs to good standing.

The rest of the paper is organized as follows. In Section 2 we review the limited empirical evidence on the impact of NPLs on bank credit expansion. Section 3 describes our model, methodology and data. Our empirical results are presented in Section 4 and Section 5 concludes.

2 EMPIRICAL LITERATURE

There are only a few empirical studies of the impact of NPLs on bank credit and they do not provide clear-cut conclusions. Bending et al. (2014) study the effects of the evolution of NPLs on credit growth to the corporate sector using bank-level data from 16 European countries during 2004-13. They report that both the level and change in the ratio of NPLs to total assets are negatively correlated with the net growth in corporate and commercial loans one year later. Cucinelli (2015) examines the impact of NPLs on lending in a sample of 488 Italian banks during 2007-13 and reports that NPLs have a negative impact on the supply of bank loans. Eber and Minoiu (2016) examine changes in Eurozone banks' balances sheets in anticipation of the move of banking supervision from national regulators to the European Central Bank that took place in 2014 and was accompanied by a major stress test (the Comprehensive Assessment). Their objective was to determine how banks adjusted their balance sheets when they learned about the prospect of stricter supervision. The authors report that banks responded by decreasing leverage mainly through a reduction in securities, finding evidence of a contraction in lending only for banks with very low capital ratios and only for syndicated lending. Schivardi et al. (2017) employ a data set that covers almost all bank-firm relationships in Italy during 2004-13 and report

that during the Eurozone financial crisis under-capitalized banks were less likely to cut credit to non-viable firms, and that credit misallocation increased the failure rate of healthy firms and reduced the failure rate of non-viable firms. Finally, Accornero et al. (2017) study the influence of NPLs on the supply of bank credit to nonfinancial firms in Italy between 2008-15 and report that bank lending is not causally affected by the level of NPL ratios; rather, the negative correlation between NPL ratios and credit growth is mostly generated by changes in firms' conditions and contractions in their demand for credit.

Several related studies examine the impact of NPLs on the growth of output rather than bank credit. Because macroeconomic conditions can impact on the severity of the NPL problem, their approach has been to estimate vector autoregressive (VAR) models where the causal impact of NPLs relies on assumptions about the ordering of the variables within the VAR system. They typically find a negative and significant impact of rising NPL ratios on GDP growth and employment. For example, Espinoza and Prasad (2010) estimate a VAR system that includes a measure of NPLs and conclude that losses on banks' balance sheets lead to a strong, negative but temporary impact on the economy. Nkusu (2011) estimates the reaction of an economy to a sudden increase in the NPL ratio in a sample of 26 developed countries and finds that a 2.4 percentage point increase in the NPL ratio is associated with a fall in private borrowing and a 0.6 percentage point reduction in GDP growth within the first year, and that the strong negative impact persists for four years after the initial shock. Klein (2013) uses SVAR estimation and reports a negative impact of increases in NPL ratios on credit growth and employment in emerging Europe in the aftermath of the 2008-09 financial crisis. Finally, Balgova et al. (2016) study the relation between output growth and changes in NPL stocks using aggregate data in a panel of 100 countries between 1997-2014 and report that countries that actively reduced their NPLs typically experienced higher growth rates of output.

3 MODEL AND DATA

We test the hypothesis that the relationship between nonperforming loans and bank credit depends on the level of bank capital and profitability by estimating the following panel regression

$$Credit_{i,t} = \propto_i + \beta_0 Credit_{i,t-1} + \beta_1 NNPL_{i,t-1} + \beta_2 (NNPL * Capital)_{i,t-1} + \beta_3 (NNPL * Profit)_{i,t-1} + \gamma X_{i,t-1} + \delta_i \Delta GDP_{t-1} + \delta_2 \Delta Policy\ rate_{t-1} + \eta LSAPs + \theta Crisis + \vartheta_i + \varphi_t + \varepsilon_{i,t} \quad (1)$$

In equation (1), $Credit$ is the quarterly real rate of growth of net loans and advances plus unused credit commitments of bank i in period t. We include unused commitments because they increase total bank credit without new loans being granted (Ivashina and Scharfstein, 2010; Kim and Sohn, 2017). $NNPL$ is the ratio of net impaired loans (i.e., impaired loans net of loan loss provisions) to total loans; we follow Accornero et al. (2017), Bredl (2018) and Gulati et al. (2019) and employ net NPL ratios for reasons of parsimony.[3] $(NNPL * Capital)$ is the interaction of net nonperforming loans and bank capital; $(NNPL * Profit)$ is the interaction of net nonperforming loans and banks' return on assets; X is a vector of other bank-specific characteristics; and GDP and the $Policy\ rate$ are the quarterly growth rate of real GDP and the quarterly change in the central bank policy interest rate, respectively; $LSAPs$ is a 0-1 dummy variable equal to 1 when European central banks engaged in large scale asset purchases; $Crisis$ is a 0-1 dummy variable equal to 1 during 2007Q3 -2009Q2 to capture the worst effects of the financial crisis; and ϑ_i and φ_t are bank and time fixed effects, respectively.

We include five bank-specific variables in the vector X. The first two are bank capital, $Capital$, and bank profitability, $Profit$. Bank capital is measured the ratio of tier 1 capital to risk weighted assets, which is the regulator's measure of the core strength of a financial institution. Empirical studies on the relationship between bank capital and lending have had mixed results with higher capital requirements having been found to reduce lending (Francis and Osborne, 2009; Aiyar et

[3] However, our results are robust to introducing the gross NPL ratio and the loan provision ratio separately into the estimates. We provide a baseline estimate in this form in Appendix Table 1 where, as expected, the coefficients on both variables are negative and statistically significant.

al., 2014; Bridges, et al., 2014), to have no little or effect on lending (Ediz, et al., 1998), or to be associated with an increase in lending (Berrospide and Edge, 2010; Buch and Prieto, 2014; Altunbaş et al., 2016). Bank profitability is measured as the ratio of net income to total assets. According to the "pecking order theory of finance", because increasing extra capital is costly, it may be easier to accumulate capital via higher retained earnings (Flannery and Rangan, 2008). In contrast, greater profitability might also make capital requirements less binding so that banks are less averse to occasional losses through risk-taking (Calem and Rob, 1999; Perotti et al., 2011). The third variable is bank size, $Size$, measured as the logarithm of total bank assets. Large banks may have incentives to take more risk if there is a high expectation of a government bailout to prevent systemic risk (Afonso et al., 2014). However, risk may also decline for large banks because they are better able to diversify their portfolio, whereas small banks tend to pursue traditional banking (Demirgüç-Kunt and Huizinga, 2010). The fourth variable is bank liquidity, $Liquidity$, measured as the ratio of liquid assets to total assets, where greater liquidity is viewed as supportive of bank credit expansion (e.g., Kim and Sohn, 2017). The fifth variable is market funding, $Funding$, measured as the ratio of non-deposit liabilities to total assets, which supports credit expansion, though it may also increase default risk because it is a less stable source of funding than traditional deposits (Shleifer and Vishny, 2010). The final bank-specific variable is the ratio of unused loan commitments to total assets, $Commitments$, which is expected to impact positively on the growth of net loans and advances (Cornett et al., 2011) but where banks exposed to a higher level of commitments are likely to be less willing to expand total credit (Ivashina and Scharfstein, 2010; Kim and Sohn, 2017). Real GDP growth and the change in the central bank policy interest rate are included to capture the effects on bank lending of the business cycle and changes in monetary policy (Jiménez et al., 2012; Kaoru and Daisuke, 2014). The expected sign of the growth rate of real GDP is positive because of the procyclicality of bank lending and increased loan demand, and the effect of changes in the policy interest rate could be negative if increases in market rates reduce loan demand, or positive if monetary policy is procyclical. Finally, though the empirical evidence on the impact of LSAPs on bank credit is mixed, several studies suggest that they boosted credit, for example, through the impact of increasing

security yields in bank portfolios (Paludkiewicz, 2018; Rodnyansky and Darmouni, 2017) and by encouraging a relaxation of lending standards (Kurtszman et al., 2018). [4]

Our primary source of data for the bank-specific variables is BankScope, which provides us with balance sheet data for 521 banks from 21 European countries over the period 2007Q1 to 2017Q4. The GDP data are from the OECD's online macroeconomic database and the online databases of national statistics institutes. The policy interest rate and LSAPs data are from the central banks' online statistical databases. Summary country level data on average NPL ratios is provided in Table 1. The most striking features of the data are the wide variation in in NPLs across countries, the much wider dispersion in average gross NPL ratios than in net NPL ratios (reflecting differences in loan provisioning) and that gross NPLs are a poor indicator of the weakness of bank balance sheets because of loan provisioning. This appears to have been especially aggressive by banks where gross NPLs are especially high.[5] For example, banks in Bulgaria, Cyprus and the Ukraine had the highest level of gross NPL ratios on average, but among the lowest net NPL ratios. Variable definitions and their summary statistics are presented in Table 2 where bank specific variables are scaled by total assets.

We first run simple OLS and fixed time and bank effects estimates, but we suspect the results to be biased because of endogeneity. For example, NNPLs rise in countries and periods where economic activity stagnates and the demand for credit also tends to be weak, which means that a negative correlation between NNPLs and credit growth may mean very little. Moreover, bank credit might increase non-performing loans if, following a banking crisis, market discipline was weakened by intervention policies during the crisis such that banks would be monitored less and would have more opportunities to lower their lending standards (Vithessonthi, 2016). Another source of endogeneity is omitted variable bias, since we are cannot control for all the

[4] In our sample, LSAPs were carried out at various times by the Bank of England, the European Central Bank and the Central Bank of Sweden.
[5] The correlation coefficient between average gross and net NPLs in Table 1 is -0.02.

determinants of bank lending.[6] To mitigate endogeneity concerns, in the OLS and fixed effects estimates the independent variables are lagged one period. In addition, we present estimates based on an instrumental variables approach, system GMM (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). The dynamic panel GMM estimator potentially improves on OLS or traditional fixed-effects estimates because it allows us to include bank-fixed effects to account for (fixed) unobservable heterogeneity; it allows current NNPLs to be influenced by previous realizations of, or shocks to, past credit growth and, if the underlying economic process itself is dynamic (in our case, if current NNPLs are related to past credit growth) then it may be possible to use some combination of variables from the bank's history as valid instruments for current NNPLs to account for simultaneity. Thus, the methodology relies on a set of "internal" instruments contained within the panel itself—i.e., past values of NNPLs and credit growth can be used as instruments for current realizations of NNPLs, which eliminates the need for external instruments.

4 EMPIRICAL RESULTS

Before discussing the main regression results, we present baseline estimates that examine the linear relationship between bank lending and the bank-specific variables without the interaction of the NNPL ratio with the capital and profit ratios. In Table 3 we present results that include the level of NNPLs. We begin with a simple OLS panel regression controlling only for the financial crisis (column 1), then add fixed time and bank effects (column 2), then control for additional bank characteristics (column 3), and finally present the system GMM estimates (column 4). The impact of NNPLs on lending and unused commitments is consistent across the estimates, where the coefficient is negative and statistically significant. In terms of magnitudes, the results suggest that 1 percentage point increase in the NNPL ratio is associated with a reduction in the annualized real growth rate of credit of between 0.01–1.00 percentage points.[7] The coefficient on the crisis

[6] The error terms should contain the omitted variables. In case of correlation between one of those omitted variables and one of the regressors, the estimated coefficients are biased (correlation between error term and explanatory variables).

[7] The annualized short-term effect approximates β_1 x 4, and the annualized long-term effect approximates $\beta_1/(1-\beta_0)$ x 4.

variable is consistently statistically significant and negative and suggests that the crisis was associated with a fall in the annualized growth rate of credit of between 0.03-5.61 percentage points. The coefficients on the other bank-specific variables suggest that banks are more likely to expand credit when they are well capitalized, liquid, large, have access to market funding, and are less likely to lend if they have unused loan commitments. The coefficients on real GDP growth and central bank LSAPs are positive and significant suggesting that credit growth is procyclical and that LSAPs had some success in boosting bank credit. The policy interest rate variable is never statistically significant. In the system GMM results, the Arellano-Bond and Hansen test statistics indicate, respectively, that there is no second order serial correlation in the disturbances and that the instruments used are not correlated with the residuals.

We noted earlier that the transmission from NPLs to bank credit might differ, at least in the short-term, depending upon whether the level or change in NPLs was under consideration, with the effect of the former likely to depend on how well capitalized banks are, and that of the latter on the profitability of banks. In Table 4, we present the results for the change in NNPLs. The results are presented in the same sequence as for the level of NNPLs reported in Table 3. The change in NNPLs has a statistically significant and negative impact on the growth of bank credit in each estimate with a percentage point increase in the change in the NNPL being associated with a reduction in the annualized real growth rate of credit of between 0.03–0.08 percentage points. The remaining bank-specific and other explanatory variables play broadly the same role as in the estimates for the level of NNPLs.

Next, we extend our baseline results to try to control for potential differences in the relationship between the quality of assets and credit that might be explained by developments in a bank's host country or by a bank's business model. A substantial financial crisis-related literature has separated European countries into three groups in analyzing the determinants and effect of the crisis: core euro countries: non-core euro countries; and non-euro countries (see, e.g., Baldwin

and Giavazzi, 2015).[8] In Table 5 we report fixed effects and system GMM results from adding to our baseline equation 0-1 dummy variables indicating whether a country belonged to one or other of these groups.[9] Only the coefficient on the dummy variable for euro-periphery countries is statistically significant and suggests that factors specific to these countries adversely impact credit growth. The possibilities include that GDP growth in these countries fell by substantially more than it did in the other country groups and/or that structural factors specific to euro periphery countries adversely impacted on credit.[10] We return to the possible role of the crisis and structural factors below. The impact of the inclusion of the country group dummies on the size of the coefficients of the remaining variables is negligible.

In Table 6 we report results from adding to the baseline equation dummy variables to indicate whether a bank falls into one of the eight categories of banks in our sample. The bank categories and the number and share of the total number of banks falling into each category are listed in Appendix Table 3. Commercial banks and cooperative banks dominate the sample, accounting for 38.3% and 17.3% of the total, respectively. In the estimates that include the level of NNPLs (columns 1 and 3), the coefficient on the dummies are negative and statistically significant for five (fixed effects) or four (GMM) of the eight categories, which accounts for between 80.4-89.0%of all banks and suggests that for the majority of banks in Europe the relationship between the quality of assets and credit was very similar. The conclusions from the results that report the change in NNPLs (columns 2 and 4) are broadly similar in terms of the effects, at least with respect to the GMM estimates. In addition, the impact of the inclusion of bank categories on the size and significance of the coefficients on the other variables in the estimates is negligible. We conclude

[8] One line of argument for this country grouping is that the adoption of euro itself was an important factor behind the crisis because the resulting financial integration provided easier access to foreign capital markets for euro-periphery countries, reduced the risk of lending to them and led to a significant lending bubble in in these countries (e.g., Lin and Treichel, 2012).

[9] The groups are: euro-core: Austria, Belgium, France, and Germany, and the Netherlands; euro-periphery: Greece, Italy, Portugal, Spain, and Ireland, Estonia, Finland, Lithuania, Latvia, Slovenia; non-euro: Bulgaria, Czech Republic, Croatia, Denmark, Hungary, Poland, Romania, Sweden, Switzerland and the United Kingdom.

[10] For example, OECD data indicate that average quarterly year-on-year real GDP growth during the financial crisis was -0.3 in the euro-core countries, -2.0 in the euro-periphery countries, and 0.3 in the non-euro countries in our sample.

that our results are representative of developments in European banking in general over the sample period and are not specific to particular countries or types of bank.

5.1 Interaction effect of NNPLs, capital, profitability and crisis on bank credit

The linear regression results reported in Tables 3 and 4 suggest that both the level and change in NNPLs impact negatively on bank credit expansion by European banks. However, we are mainly interested in whether the effect of NNPLs differs across banks depending on the level of banks' capital and profitability—that is, whether capital and profitability condition the impact of NNPLs on bank credit expansion. To illustrate any potential heterogeneity captured by the interaction variables, we present scatter plots of NPLs and the real growth of bank credit for banks with below- and above-average capital ratio (Figure 1) and below- and above-average profit ratios (Figure 2). In all cases the observations are clustered in the bottom left-hand corner of the figures and with a clear indication of a negative relationship between the series. Thus, the figures suggest quite similar behavior across banks in response to NPLs, notwithstanding different trends in their capital and profit ratios. In Table 7, we report regression results that include the interaction terms for the level of net nonperforming loans and capital and profits, ($NNPL * Capital$) and ($NNPL * Profit$), where the coefficients on these variables reflect the conditional effects of capital and profitability on NNPLs as they affect credit growth. Columns 1 and 2 show the results from the fixed effects estimates including the level and change in NNPLs, respectively, and columns 3 and 4 report the system GMM estimates. The effect on credit growth of both interaction terms is positive and statistically significant: a one standard deviation increase in the capital ratio reduces the negative effect of a 1 percentage point increase in NNPLs on credit growth by between 0.01-0.29 percentage points in a quarter, and a one standard deviation increase in the profitability ratio reduces the negative effect of a 1 percentage point increase in NNPLs on credit growth by between 0.08-0.60 percentage points.[11] Moreover, the magnitudes of the coefficients on each

[11] For example, in column 1 of Table 5: 0.01=0.005 (coefficient on the interaction term)*2.402(the standard deviation on the capital ratio reported in Table 2).

interaction term are sufficiently large to dampen substantially the impact of NNPLs on the growth of bank credit. In Table 8, we report estimates which include the change in the NNPL ratio in the interaction terms. The results are broadly in line with those for the level estimates. The coefficients on the interaction terms are positive and statistically significant and the magnitudes of the coefficients are sufficiently large to suggest that most or all of the adverse effect of a change in NNPLs on bank credit is offset. Thus, a one standard deviation increase in the capital ratio reduces the effect of a 1 percentage point increase in change in NNPLs on credit growth by between 0.27-0.37 percentage points in a quarter, and a one standard deviation increase in the profitability ratio reduces the effect of a 1 percentage point increase in the change in NNPLs on credit growth by between 0.03-0.15 percentage points. We view the results reported in Tables 7 and 8 as consistent with the levels of bank capital and profitability of European banks having been sufficient to have had a major dampening effect on the channels through which NPLs impact on the amount of credit extended. In addition, they are consistent with the financial crisis not having impacted significantly on the relationship between the quality of bank assets and credit growth.

Finally, a number of papers have highlighted a negative link between NPLs and GDP growth and the role of structural factors in the persistence of NPLs in some countries. The negative link between NPLs and GDP growth reflects the change in borrowers' debt servicing capacity when GDP growth increases or slows (e.g., Salas and Saurina, 2002; Kjosevski and Petkovski, 2017). Structural factors might include, for example, the level of efficiency and effectiveness of the judicial and legal system, especially with respect to insolvency frameworks as factors contributing to the increase in and persistence of NPL problems (European Systemic Risk Board, 2017, 2019; Aiyar et al., 2015; Consolo et al., 2018; Council of the European Union, 2017). We examine more closely the role of GDP growth and national structural factors in the relationship between the quality of bank assets and credit growth by reporting estimates that interact the financial crisis dummy with NNPLs and with the different country group dummies. These results are reported in Table 9. The coefficient on the financial crisis-NNPL interaction terms (columns 1, 2, 5 and 6) is statistically significant for the change in NNPL, suggesting that the crisis had an especially adverse

impact on the relationship between the quality of assets and credit growth. In the case of the crisis-country group interactions (columns 3,4,7 and 8), the coefficients are statistically significant only for the euro periphery countries indicating that factors particular to this group of countries—e.g., the efficiency and effectiveness of their legal and judicial systems—interacted with the crisis to adversely impact on the growth of bank credit. In all these estimates, the signs and statistical significance of the other bank-specific and other independent variables are broadly in line with the baseline estimates.

5.2. Robustness tests

In this section, we examine whether our key results are robust to different definitions of bank credit, capital and profitability. First, our definition of bank credit as bank loans and advances plus unused commitments could be criticized for not fully reflecting banks intentions in terms of credit supply, in that the amount of loans can be increased from the conversion of unused commitments regardless of banks' willingness to do so (Kim and Sohn, 2017). As a first robustness test we exclude loan commitments from bank credit so that our dependent variable becomes bank loans and advances. Second, our use of the Tier 1 capital ratio could be criticized because banks have considerable discretion over the assignment of risk weights, allowing them to "overstate" the amount of capital they have in play relative to the risks being take (Admati and Hellwig, 2013). As a second robustness test, we replace the tier 1 ratio as an independent variable by the ratio of equity capital to total assets, which arguably is a better measure of the amount of capital that banks have at risk relative to their activities. Third, we take account of the possibility that banks may target different measures of performance. For example, many European banks are widely thought to target return on equity to demonstrate how efficiently they are using shareholders' funds (Ralph, 2015). Accordingly, our third robustness test is to replace the return on assets with the return on equity as the measure of bank profitability. Estimates using these alternative variables are reported in Table 10 for the level of the NNPL ratio and Table 11 for the change in the NNPL ratio. The change in definitions has little impact on the outcomes. In the case of the level of NNPLs, when bank credit is defined more narrowly as loans and advances (columns

1 and 2 of Table 10), bank capital dampens almost all of the adverse effect of NNPLs (i.e., the positive coefficient on $NNPL * Capital$ is about 88% of the value of the negative coefficient on NNPLs) and bank profitability more than offsets the adverse effect on credit of NNPLs (i.e., the positive coefficient on $NNPL * Profits$ is larger than that the negative coefficient on NNPLs). In these estimates, a one standard deviation increase in the capital ratio reduces the negative effect of a 1 percentage point increase in NNPLs on credit growth by 0.49 percentage points in a quarter, and a one standard deviation increase in the profitability ratio reduces the negative effect of a 1 percentage point increase in NNPLs on credit growth by 0.81 percentage points. When bank capital is defined as the ratio of equity to total assets (column 3), the coefficient on the interaction term remains positive but the size of the coefficient is reduced such that capital dampens around 8.5% (0.044/0.512) of the adverse impact of NNPLs on bank credit. This suggests that it is the banks' position vis-à-vis regulatory (tier 1) capital that is the key determinant of credit growth when they are faced with high NNPLs. Finally, when profits are defined by the return on equity (column 4), the interaction term remains positive and statistically significant with the magnitude of the coefficient indicating that profitability can dampen about 49% of the adverse impact of NNPLs on bank credit growth. The results for the impact on credit growth of a change in NNPLs are reported in Table 11 and are even more supportive of capital and profits having a potentially dampening or neutralizing effect on the adverse impact of NNPLs: the magnitudes of the coefficients on the interaction terms for capital and for profits are both substantially larger than those for NNPLs when the narrow definition of credit is employed (columns 1 and 2); the positive coefficient on the capital interaction term when capital is defined more broadly (column 3) overwhelms the negative coefficient on NNPLs; and when profitability is defined as return on equity, about 77% (0.342/0.444) of the adverse impact of NNPLs on bank credit is neutralized. Accordingly, the robustness tests confirm that whether both NNPLs and the change in NNPLs have an adverse impact on bank credit expansion depends on the level of capital and profitability of the bank affected.

5 CONCLUSIONS

In this paper, we examine whether the effect of NPLs on bank credit depends on the level of bank capital and profitability employing a panel of up to 521 banks from 21 European countries over the period 2007-17. Our results suggest that there is a significant interaction effect of NPLs on capital and profitability in the supply of credit by European banks. In particular, their levels of capital and profitability appear to have been sufficient to have had at least a major dampening effect on the channels through which NPLs impact bank credit. This result holds whether we consider the level or the change in the stock of NPLs, alternative definitions of bank credit, different measures of bank capital and profitability, and when we control for potential differences in country characteristics and employ different estimation methodologies. The results suggest that the impact of NPLs on bank credit is largely indirect, working through the effects on capital and bank profitability. The key policy implication of our result is that actions aimed at reducing nonperforming loans to sustain bank lending should protect bank capital and profitability if they are to be effective. In particular, forcing banks to liquidate nonperforming loans with the goal of boosting bank credit might be counterproductive if the liquidation generates losses that reduce bank profitability and capital. This argues for complementary policies that aim at returning nonperforming loans to good standing.

REFERENCES

Accornero, M., Alessandri, P., Carpinelli, L., & Sorrentino, A.M. (2017). Non-performing loans and the supply of bank credit: evidence from Italy. Bank of Italy Occasional Paper No. 374.

Admati, A., Hellwig, M., 2013. *The bankers' new clothes: What's wrong with banking and what to do about it*. University Press, Princeton.

Afonso, G., Santos, J., & Traina, J. (2014). Do "too-big-to-fail" banks take on more risk? *Federal Reserve Bank of New York Economic Policy Review*, *20*, 41-58.

Aiyar, S., Bergthaler, W., Garrido, J.M., Ilyina, A., Jobst, A., Kang, K., Kovtun, D., Liu, Y., Monaghan, D., & Moretti, M. (2016). A strategy for resolving Europe's problem loans. International Monetary Fund Staff Discussion Note No. SDN/15/90.

Aiyar, S., Calomiris, C.W., & Wieladek, T. (2014). Does macropru leak? Evidence from a UK policy experiment. *Journal of Money, Credit and Banking*, *46*, 181–214.

Altunbaş, Y., Di Tommaso, C., & Thornton, J. (2016). Do better-capitalized banks lend less? Evidence from European banks. *Finance Research Letters*, *17*, 246-250.

Angelini, P. (2018). Do high levels of NPLs impair banks' credit allocation? Bank of Italy Notes on Financial Stability and Supervision No. 11.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58, 277–297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-component models. *Journal of Econometrics*, 68, 29–51.

Baldwin, R., & Giavazzi, F. (2015). The Eurozone crisis: a consensus view of the causes and a few possible remedies. A VoxEU.org eBook. Available at: https://voxeu.org/sites/default/files/file/reboot_upload_1.pdf

Balgova, M., Nies, M., & Plekhanov, A. (2016). The economic impact of reducing non-performing loans. EBRD Working Paper No. 193.

Bending, T., Berndt, M., Betz, F., Brutscher, P., Nelvin, O., Revoltella, D., Slacik, T., & Wolski, M. (2014). *Unlocking lending in Europe*. European Investment Bank. Available at:

http://www.eib.org/attachments/efs/economic_report_unlocking_lending_in_europe_en.pdf

Berrospide, J.M., & Edge, R.M. (2010). The effects of bank capital on lending: what do we know, and what does it mean? *International Journal of Central Banking*, *6*, 187–204.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87, 115-143.

Bredl, S. (2018). The role of non-performing loans for bank lending rates. Deutsche Bundesbank Discussion Paper No 52.

Bridges, J., Gregory, D., Nielsen, M., Pezzini, S., Radia, A., & Spaltro, M. (2014). The impact of capital requirements on bank lending. *Bank of England Working Paper 486*.

Buch, C.M., & Prieto, E. (2014). Do better capitalized banks lend less? Long-run panel evidence from Germany. *International Finance*, *17*, 123.

Calem, P., & Rob, R. (1999). The impact of capital-based regulation on bank risk-taking. *Journal of Financial Intermediation*, *8*, 317 – 352.

Consolo, A., Malfa, F., & Pierluigi, B. (2018). Insolvency frameworks and private debt: an empirical investigation. European Central Bank Working Paper No 2189.

Cornett, M.M., McNutt, J.J., Strahan, P.E., & Tehranian, H. (2011). Liquidity risk management and credit supply in the financial crisis. *Journal of Financial Economics*, *101*, 297-132.

Council of the European Union (2017). *Report of the FSC Subgroup on Non-Performing Loans*. Brussels, May 31. Downloadable at: http://data.consilium.europa.eu/doc/document/ST-9854-2017-INIT/en/pdf

Cucinelli, D. (2015). The impact of non-performing loans on bank lending behavior: evidence from the Italian banking sector. *Eurasian Journal of Business and Economics*, *8*, 59-71.

Demirgüç-Kunt, A., & Huizinga, H. (2010). Bank activity and funding strategies: the impact on risk and returns. *Journal of Financial Economics*, *98*, 626–650.

Eber, M., & Minoiu, C. (2016). How do banks adjust to stricter supervision? Available at: https://ssrn.com/abstract=2662502

Ediz, T, Michael, I., & Perraudin, W. (1998). The impact of capital requirements on UK bank behavior. *Federal Reserve Bank of New York Economic Policy Review*, *4*, 15–22.

European Systemic Risk Board. (2019). Macroprudential approaches to nonperforming loans. Frankfurt am Main.

European Systemic Risk Board. (2017). Resolving non-performing loans in Europe. Frankfurt am Main.

Espinoza, R., & Prasad, A. (2010). Non-performing loans in the GCC banking system and their macroeconomic effects. IMF Working Paper No. 10/224.

Flannery, M. J. & Rangan, K. P., 2008. What caused the bank capital build-up of the 1990s? *Review of Finance 12*(2), 391-429.

Francis, W., & Osborne, M. (2009). Bank regulation, capital and credit supply: measuring the impact of prudential standards. Financial Services Authority Occasional Paper No. 36.

Gulati, R., Goswami, A. & Kumar, S. (2019). What drives credit risk in the Indian banking industry? An empirical investigation. *Economic Systems*, 43, pages 42-62.

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

Jiménez, G., Ongena, S., Peydró, J-L., & Saurina, J. (2102). Credit supply and monetary policy: identifying the bank balance-sheet channel with loan applications. *American Economic Review,* 102, 2301–2326.

Kaoru, H., & Daisuke, M. (2014). Business cycles, monetary policy, and bank lending: identifying the bank balance sheet channel with firm-bank match-level loan data. RIETI Discussion Paper Series 14-E-026. Downloadable at: https://pdfs.semanticscholar.org/49b1/e37d40f203c6e711ef310f2f66980e1fafd0.pdf

Kim, D., & Sohn, W. (2017). The effect of bank capital on lending: does liquidity matter? *Journal of Banking & Finance*, *77*, 95-107.

Kjosevski, J. & Petkovski, M. (2017). Non-performing loans in Baltic states: determinants and macroeconomic effects. *Baltic Journal of Economics,* 17, 25-44.

Klein, N., (2013). Non-performing loans in CESEE: determinants and impact on macroeconomic performance. IMF Working Paper No. 13/72.

Kurtzman, R.J., Luck, S., & Zimmerman, T. (2018). Did QE Lead Banks to Relax Their Lending Standards? Evidence from the Federal Reserve's LSAPs. Journal of Banking & Finance, in

press. Available at: https://www.sciencedirect.com/science/article/pii/S0378426618301778.

Lin, J. Y. & Treichel, V. (2012). The crisis in the Euro zone: did the euro contribute to the evolution of the crisis? World Bank Policy Research Working Paper 6127.

Magnus, M., Deslandes, J., & Dias, G. (2018). Non-performing loans in the Banking Union Stocktaking and challenges. Directorate-General for Internal Policies, Economic Governance Support Unit, European Parliament. Downloadable at: http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/614491/IPOL_BRI(2018)614491_EN.pdf

Nkusu, N. (2011). Non-performing loans and macrofinancial vulnerabilities in advanced economies. IMF Working Paper No. 11/161.

Paludkiewicz, K. (2018) Unconventional Monetary Policy, Bank Lending, and Security Holdings: The Yield-Induced Portfolio Rebalancing Channel. Deutsche Bundesbank Discussion Paper No. 22/2018 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3234186

Perotti, P., Ratnovski, L., & Vlahu, R. (2011). Capital regulation and tail risk. *International Journal of Central Banking, 7*, 123-163.

Ralph. O. (2015). Why banks come back to return on equity. *Financial Times*, November 16.

Rodnyansky, A., & Darmouni, O.M. (2017). The Effects of Quantitative Easing on Bank Lending Behavior. *The Review of Financial Studies*, 30, 3858–3887.

Salas, V., & Saurina, J. (2002). Credit risk in two institutional regimes: Spanish commercial and savings banks. *Journal of Financial Services Research*, 22, 203-224.

Shleifer, A., & *Vishny, R.W.* (*2010).* Unstable banking. *Journal of Financial Economics, 97*, 306-318.

Schivardi, F., Sette, E., & Tabellini, G. (2017). Credit misallocation during the European financial crisis. Bank of Italy Working paper No. 1139.

Vithessonthi, C. (2016). Deflation, bank credit growth, and non-performing loans: Evidence from Japan. *International Review of Financial Analysis*, *45*, 295-305.

TABLE 1
Non-performing bank loans by country, 2007Q1 to 2017Q4.

	NPLs				NNPLs	ΔNNPLs
	Mean	Minimum	Maximum	Standard deviation	Mean	
Austria	8.42	0.01	49.14	8.97	2.93	1.64
Belgium	3.83	0.10	14.14	3.75	2.83	0.04
Bulgaria	13.76	0.00	58.35	15.32	3.48	0.16
Cyprus	12.18	0.05	42.56	10.61	5.43	0.10
Czech Republic	5.44	0.11	17.58	3.87	3.28	0.07
Denmark	7.37	0.06	42.79	7.16	2.82	0.72
Germany	7.90	0.02	52.30	11.53	2.77	0.58
Estonia	18.07	5.56	34.62	6.24	1.90	0.51
Spain	9.93	0.00	72.24	10.71	3.54	0.39
Finland	5.90	0.62	13.05	4.64	4.76	0.30
France	5.98	0.00	61.92	7.55	2.86	0.08
United Kingdom	9.62	0.00	80.5	13.73	2.81	0.56
Greece	12.57	0.84	45.18	12.57	3.64	0.27
Croatia	15.42	2.36	26.82	3.75	1.52	0.24
Hungary	8.70	0.21	28.95	7.73	2.66	0.15
Ireland	9.27	0.77	34.92	8.97	2.30	0.04
Italy	13.38	0.03	74.12	12.31	2.82	0.23
Lithuania	15.74	1.19	57.53	16.77	2.42	0.14
Luxembourg	5.17	0.00	28.47	6.21	1.98	2.20
Latvia	19.53	0.00	27.85	7.25	3.85	0.25
Malta	8.33	2.68	19.20	5.25	3.47	0.02
Netherlands	6.45	0.00	34.62	5.12	2.96	0.23
Poland	9.52	1.16	44.63	7.98	3.78	0.10
Portugal	10.5	0.22	61.31	11.53	2.50	0.30
Romania	9.40	0.03	88.58	9.82	2.48	0.25
Sweden	3.43	0.02	15.81	4.94	1.40	0.14
Slovenia	17.4	1.74	49.77	11.83	2.93	0.09
Slovakia	5.48	0.07	17.1	3.75	4.75	0.17

Notes. NPLs is the ratio of impaired loans to total loans; NNPLs is the ratio of impaired loans less loan provisions to total loans; ΔNNPLs is the average quarterly change in NNPLs
Source: BankScope and author calculations.

TABLE 2.
Variable definitions and summary statistics

Variable	Description	Mean	Median	Standard deviation	Maximum	Minimum
Credit	Quarterly real growth rate of net loans and advances plus unused loans commitments	1.003	1.014	0.219	1.818	0.204
NNPL	Ratio of impaired loans less provisions to total loans	2.917	2.278	2.463	9.998	-8.779
ΔNNPL	Changed in impaired loans less provisions ratio	0.039	0.000	0.986	0.955	-1.000
Provisions	Ratio of loan loss provisions to total gross loans	1.202	0.407	3.600	4.583	0.102
Capital	Ratio of Tier 1 capital to risk weighted assets	12.069	12.569	2.402	0.384	18.244
Liquidity	Ratio of liquid assets (cash and balances with central bank, due from other financial institutions, trading securities, available-for-sale securities, other securities, and unearned income from securities) to total assets	22.024	16.239	19.069	59.508	0.000
Size	Logarithm of total assets	16.027	16.092	2.216	22.004	8.438
Funding	Ratio of non-deposit liabilities to total assets	34.743	30.804	2.437	57.481	0.879
Commitments	Ratio of unused commitments to total assets	8.420	6.564	9.700	67.972	0.000
Profit	Ratio of net income to total average assets	0.724	0.462	3.346	27.203	0.162
GDP	Average quarterly growth rate of real GDP	0.471	0.469	5.260	5.600	-0.350
Policy rate	Change in quarterly average central bank policy rate	-0.031	0.000	0.176	4.500	-2.000
Crisis	Dummy variable equal to 1 2007Q3 to 2009Q2 and 0 otherwise					
LSAPs	Dummy variable equal to 1 when central bank undertook large-scale asset purchases					
Countries	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, and Slovakia					

Note: The sample period is 2007Q1 to 2017Q4. All bank-specific variables are from BankScope. Data for real GDP are from the OECD macroeconomic database; the central bank policy interest rate and large-scale asset purchases data are from the online databases of the central banks.

TABLE 3
Net nonperforming loans and the growth of bank credit—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

	OLS	Fixed bank and time effects		System GMM
$Credit_{t-1}$	0.968***	0.088***	0.943***	0.841***
	(0.002)	(0.011)	(0.012)	(0.016)
$NNPLs_{t-1}$	-0.003**	-0.006**	-0.250**	-0.206**
	(0.001)	(0.003)	(0.109)	(0.103)
$Capital_{t-1}$			0.019***	0.096***
			(0.003)	(0.036)
$Liquidity_{t-1}$			0.004**	0.021**
			(0.002)	(0.010)
$Size_{t-1}$			0.670***	0.669***
			(0.028)	(0.197)
$Funding_{t-1}$			0.003***	0.004**
			(0.001)	(0.002)
$Commitments_{t-1}$			-0.028	0.054
			(0.256)	(0.283)
$Profits_{t-1}$			0.051	0.071
			(0.058)	(0.104)
GDP_{t-1}			0.032***	0.027***
			(0.004)	(0.009)
Policy $rate_{t-1}$			0.067	-4.281
			(0.058)	(6.495)
$LSAPs_{t-1}$			0.045**	0.048**
			(0.022)	(0.021)
Crisis	-0.009*	-0.008***	-0.725**	-1.402***
	(0.005)	(0.002)	(0.310)	(0.093)
Intercept	0.303***	9.282***	1.008**	9.642**
	(0.020)	(0.118)	(0.460)	(3.697)
R-squared	0.145	0.136	0.131	
Arellano-Bond test for AR(*2)*				0.243
Hansen test				0.546
No. of panels	494	494	480	377
Observations	21242	21242	20161	20161

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. ***, **, and * indicate statistical significance at the 1, 5 and 10% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

TABLE 4

Change in net nonperforming loans and the growth of bank credit—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

	OLS	Fixed bank and time effects		System GMM
$Credit_{t-1}$	0.968***	0.088***	0.849***	0.622***
	(0.002)	(0.011)	(0.004)	(0.062)
$\Delta NNPLs_{t-1}$	-0.013**	-0.007**	-0.014***	-0.021**
	(0.006)	(0.004)	(0.005)	(0.010)
$Capital_{t-1}$			0.014***	0.016***
			(0.004)	(0.004)
$Liquidity_{t-1}$			0.002***	0.073***
			(0.000)	(0.017)
$Size_{t-1}$			0.642***	0.623***
			(0.004)	(0.080)
$Funding_{t-1}$			-0.012	0.067
			(0.011)	(0.060)
$Commitments_{t-1}$			0.039	0.012
			(0.025)	(0.157)
$Profits_{t-1}$			0.031***	1.169***
			(0.003)	(0.247)
GDP_{t-1}			0.004***	0.094***
			(0.001)	(0.030)
$Policy\ rate_{t-1}$			0.230***	0.564***
			(0.022)	(0.133)
Crisis	-0.010**	-0.001***	-0.093***	-0.366***
	(0.005)	(0.000)	(0.008)	(0.073)
$LSAPs_{t-1}$			0.026**	0.014***
			(0.010)	(0.003)
Intercept	0.312***	9.293***	-0.882***	-0.441
	(0.020)	(0.115)	(0.043)	(0.844)
R-squared	0.139	0.178		
Arellano-Bond test for AR(*2)*				0.242
Hansen test				0.535
No. of panels	495	495		480
Observations	20781	20781		20143

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. ***, **, and * indicate statistical significance at the 1 and 5% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

TABLE 5
Net nonperforming loans and the growth of bank credit with country group dummies—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

	Fixed bank and time effects		System GMM	
Credit $_{t-1}$	0.939***	0.847***	0.719***	0.340***
	(0.018)	(0.021)	(0.021)	(0.031)
NNPLs $_{t-1}$	-0.216***		-0.285***	
	(0.013)		(0.064)	
ΔNNPLs $_{t-1}$		-0.016*		-0.017**
		(0.009)		(0.008)
Capital $_{t-1}$	0.023***	0.011***	0.098***	0.014**
	(0.005)	(0.001)	(0.027)	(0.006)
Liquidity $_{t-1}$	0.004*	0.002**	0.026**	0.014***
	(0.002)	(0.001)	(0.013)	(0.004)
Size $_{t-1}$	0.621***	0.145***	0.451***	0.650***
	(0.015)	(0.020)	(0.125)	(0.042)
Funding $_{t-1}$	0.127	-0.009	1.641	-0.422
	(0.094)	(0.014)	(1.134)	(0.274)
Commitments $_{t-1}$	0.041	-0.409***	0.445**	-0.397***
	(0.180)	(0.075)	(0.187)	(0.058)
Profits $_{t-1}$	0.022	0.002	0.000	0.013
	(0.042)	(0.008)	(0.068)	(0.020)
GDP $_{t-1}$	0.035***	0.004***	0.061**	-0.005
	(0.006)	(0.001)	(0.027)	(0.017)
Policy rate $_{t-1}$	0.018	0.229***	1.055	0.700***
	(0.045)	(0.075)	(3.660)	(0.075)
LSAPs $_{t-1}$	0.046***	0.027***	0.494***	0.645***
	(0.015)	(0.008)	(0.134	(0.173)
Crisis	-0.760***	-0.093***	-0.729**	-0.541***
	(0.020)	(0.011)	(0.366)	(0.052)
Euro-core countries	0.009	-0.015	-0.267	0.270
	(0.132)	(0.032)	(0.254)	(0.926)
Euro-periphery countries	-0.231**	0.005	-0.276**	0.225
	(0.110)	(0.023)	(0.140)	(0.853)
Non-euro countries	0.009	0.023	-0.329	0.065
	(0.108)	(0.020)	(0.234)	(0.875)
Intercept	0.009	-0.913***	8.583**	-5.317***
	(0.132)	(0.147)	(3.447)	(0.994)
R-squared	0.195	0.165		
Arellano-Bond test for AR(*2)*			0.534	0.343
Hansen test			0.232	0.532
No. of panels	480	495	480	480
Observations	20160	20871	20160	20151

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. ***, **, and * indicate statistical significance at the 1, 5 and 10% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

TABLE 6

Net nonperforming loans, bank business models, and the growth of bank credit—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

	Fixed bank and time effects		System GMM	
Credit $_{t-1}$	0.939***	0.846***	0.647***	0.326***
	(0.003)	(0.004)	(0.024)	(0.033)
NNPLs $_{t-1}$	-0.216***		-0.131*	
	(0.012)		(0.069)	
ΔNNPLs $_{t-1}$		-0.016***		-0.013***
		(0.004)		(0.002)
Capital $_{t-1}$	0.021***	0.011***	0.095***	0.015*
	(0.003)	(0.002)	(0.029)	(0.009)
Liquidity $_{t-1}$	0.004*	0.002***	0.027**	0.012***
	(0.002)	(0.000)	(0.013)	(0.004)
Size $_{t-1}$	0.636***	0.145***	0.478***	0.689***
	(0.017)	(0.004)	(0.150)	(0.052)
Funding $_{t-1}$	0.085	-0.000	0.065	-0.466
	(0.099)	(0.012)	(1.336)	(0.305)
Commitments $_{t-1}$	0.018	-0.408***	0.712***	-0.426***
	(0.154)	(0.025)	(0.197)	(0.063)
Profits $_{t-1}$	0.014	0.003	-0.037	0.012
	(0.031)	(0.003)	(0.070)	(0.021)
GDP$_{t-1}$	0.035***	0.004***	0.077**	-0.003
	(0.005)	(0.001)	(0.035)	(0.019)
Policy rate $_{t-1}$	0.025	0.231***	0.556	0.722***
	(0.155)	(0.021)	(3.619)	(0.078)
LSAPs $_{t-1}$	0.048***	0.027***	0.759***	0.794***
	(0.014)	(0.010)	(0.147)	(0.203)
Crisis	-0.761***	-0.093***	-0.741**	-0.523***
	(0.062)	(0.008)	(0.366)	(0.055
Bank holding company	-0.528***	0.005	-0.676***	0.779*
	(0.145)	(0.019)	(0.138)	(0.427)
Commercial bank	-0.229**	0.027*	-0.413***	0.779**
	(0.116)	(0.015)	(0.109)	(0.344)
Cooperative bank	-0.267**	-0.009	-0.322**	1.237***
	(0.127)	(0.016)	(0.131)	(0.430)
Investment bank	-0.236**	-0.051**	-0.685***	0.508
	(0.111)	(0.024)	(0.179)	(0.517)
Private bank	-0.116	0.008	-0.207	0.818
	(0.189)	(0.025)	(0.249)	(0.609)
Mortgage bank	-0.251	-0.017	1.100	1.202
	(0.157)	(0.021)	(1.910)	(0.778)
Savings bank	-0.345**	0.009	-0.257	1.465**
	(0.150)	(0.019)	(0.156)	(0.518)
Public bank	-0.336	-0.032	-1.444	0.592
	(0.362)	(0.023)	(2.185)	(0.586)
Intercept	1.293***	-0.913***	2.186	-6.674***
	(0.329)	(0.047)	(2.947)	(0.859)
R-squared	0.182	0.177		
Arellano-Bond test for AR(*2*)			0.423	0.643
Hansen test			0.222	0.525
No. of panels	480	495	480	480
Observations	20160	20781	20160	20151

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. ***, **, and * indicate statistical significance at the 1, 5 and 10% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

TABLE 7

Net nonperforming loans and the growth of bank credit with capital, profit interactions—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

	OLS fixed bank and time effects		System GMM	
Credit $_{t-1}$	0.032***	0.032***	0.794***	0.750***
	(0.009)	(0.009)	(0.032)	(0.027)
NNPLs $_{t-1}$	-0.016***	-0.010***	-0.286***	-0.200***
	(0.002)	(0.003)	(0.085)	(0.044)
(NNPLs*Capital) $_{t-1}$	0.005**		0.120***	
	(0.002)		(0.025)	
(NNPLs*Profit) $_{t-1}$		0.024**		0.197**
		(0.012)		(0.078)
Capital $_{t-1}$	0.046**	0.040*	0.185**	0.092**
	(0.023)	(0.022)	(0.076)	(0.037)
Liquidity $_{t-1}$	0.009***	0.008**	0.026**	0.026*
	(0.003)	(0.004)	(0.012)	(0.016)
Size $_{t-1}$	0.527***	0.329**	0.347*	0.425**
	(0.145)	(0.145)	(0.190)	(0.178)
Funding $_{t-1}$	0.324**	0.298**	0.554***	0.440***
	(0.140)	(0.140)	(0.173)	(0.154)
Commitments $_{t-1}$	-0.063	-0.045	-0.138**	-0.085*
	(0.369)	(0.369)	(0.054)	(0.050)
Profits $_{t-1}$	0.091**	0.170**	0.161**	0.637**
	(0.043)	(0.067)	(0.065)	(0.263)
GDP $_{t-1}$	0.004**	0.004**	0.056***	0.084***
	(0.002)	(0.002)	(0.003)	(0.018)
Policy rate $_{t-1}$	0.013	0.012	-0.497	-0.977
	(0.112)	(0.112)	(0.813)	(4.653)
LSAPs $_{t-1}$	0.081**	0.081**	0.473**	0.220**
	(0.033)	(0.034)	(0.227)	(0.105)
Crisis	-0.095**	-0.095**	-1.739**	-1.601**
	(0.044)	(0.044)	(0.847)	(0.794)
Intercept	7.384***	7.257***	-1.830	1.758
	(2.539)	(2.538)	(3.864)	(3.215)
R-squared	0.153	0.143		
Arellano-Bond test for AR(2)			0.321	0.442
Hansen test			0.664	0.362
No. of panels	480	480	480	480
Observations	20160	20160	20160	20160

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. ***, **, and * indicate statistical significance at the 1, 5 and 10% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

TABLE 8

Change in net nonperforming loans and the growth of bank credit with capital and profit interactions—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

	OLS fixed bank and time effects		System GMM	
$Credit_{t-1}$	0.070***	0.070***	0.586***	0.584***
	(0.007)	(0.007)	(0.050)	(0.063)
$\Delta NNPLs_{t-1}$	-0.104***	-0.034***	-0.172**	-0.045***
	(0.006)	(0.006)	(0.070)	(0.014)
$(\Delta NNPLs*Capital)_{t-1}$	0.113**		0.154***	
	(0.035)		(0.055)	
$(\Delta NNPLs*Profit)_{t-1}$		0.009**		0.046**
		(0.004)		(0.019)
$Capital_{t-1}$	-0.002	-0.002	-0.003	-0.001
	(0.002)	(0.002)	(0.003)	(0.004)
$Liquidity_{t-1}$	0.004***	0.004***	0.048***	0.028*
	(0.001)	(0.001)	(0.010)	(0.015)
$Size_{t-1}$	0.228***	0.228**	0.217***	0.239***
	(0.020)	(0.020)	(0.063)	(0.079)
$Funding_{t-1}$	0.143***	0.144***	0.164***	0.162***
	(0.041)	(0.041)	(0.047)	(0.059)
$Commitments_{t-1}$	-0.035	-0.036	0.567	1.387
	(0.064)	(0.064)	(0.826)	(1.060)
$Profits_{t-1}$	-0.008	-0.010	0.230	0.280
	(0.007)	(0.007)	(0.144)	(0.188)
GDP_{t-1}	0.002**	0.003***	0.055**	0.061**
	(0.001)	(0.001)	(0.022)	(0.028)
$Policy\ rate_{t-1}$	-0.191	-0.191	-0.588	-0.795
	(0.170)	(0.172)	(0.926)	(1.380)
$LSAPs_{t-1}$	0.054***	0.054***	0.768***	1.100***
	(0.008)	(0.008)	(0.204)	(0.287)
Crisis	-0.165***	-0.166***	-0.408***	-0.409***
	(0.006)	(0.006)	(0.054)	(0.069)
Intercept	8.974***	8.975***	-1.531**	-1.913**
	(0.355)	(0.355)	(0.678)	(0.862)
R-squared	0.155	0.161		
Arellano-Bond test for AR(2)			0.532	0.676
Hansen test			0.655	0.522
No. of panels	480	480	480	480
Observations	20151	20151	20143	20143

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. ***and ** indicate statistical significance at the 1, 5 and 10% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

TABLE 9
Nonperforming loans and the growth of bank credit with country group and crisis interactions—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

	OLS fixed bank and time effects				System GMM			
Credit $_{t-1}$	0.032***	0.072***	0.939***	0.938***	0.736***	0.584***	0.715***	0.741***
	(0.009)	(0.007)	(0.003)	(0.003)	(0.029)	(0.063)	(0.021)	(0.021)
NNPLs $_{t-1}$	-0.017***		-0.215***		-0.103***		-0.342***	
	(0.004)		(0.012)		(0.039)		(0.075)	
ΔNNPLs $_{t-1}$		-0.105***		-0.046***		-0.203***		-0.692***
		(0.004)		(0.002)		(0.018)		(0.127)
(NNPLs*Crisis) $_{t-1}$	-0.001				0.081			
	(0.001)				(0.118)			
(ΔNNPLs*Crisis) $_{t-1}$		-0.002*				-0.045***		
		(0.001)				(0.013)		
(Crisis*euro core)$_{t-1}$			-0.064	-0.062			-2.716	1.800
			(0.610)	(0.622)			(17.408)	(1.729)
(Crisis*euro periphery) $_{t-1}$			-0.170***	-0.070			-0.127***	1.361
			(0.061)	(0.603)			(0.013)	(1.587)
(Crisis*non-euro)$_{t-1}$			-0.024	-0.023			-4.786	1.679
			(0.595)	(0.607)			(16.432)	(1.618)
Capital $_{t-1}$	0.040*	-0.002	0.023***	0.014***	-0.007	-0.002	0.092***	0.018***
	(0.022)	(0.002)	(0.003)	(0.003)	(0.039)	(0.004)	(0.027)	(0.008)
Liquidity $_{t-1}$	0.009**	0.004***	0.004*	0.004*	0.045***	0.027*	0.024*	0.027**
	(0.004)	(0.001)	(0.002)	(0.002)	(0.017)	(0.015)	(0.014)	(0.014)
Size $_{t-1}$	0.428***	0.229***	0.623***	0.623***	0.463**	0.237***	0.495***	0.606***
	(0.145)	(0.020)	(0.016)	(0.016)	(0.184)	(0.080)	(0.130)	(0.131)
Funding $_{t-1}$	0.302**	0.143***	0.114	0.113	0.399**	0.165***	1.878*	-0.961
	(0.140)	(0.041)	(0.096)	(0.098)	(0.163)	(0.0599)	(1.110)	(1.081)
Commitments $_{t-1}$	-0.050	-0.034	0.036	-0.434***	-0.104*	1.369	0.494	-0.544***
	(0.369)	(0.064)	(0.152)	(0.155)	(0.060)	(1.064)	(2.011)	(0.208)
Profits $_{t-1}$	0.093**	-0.008	0.032	0.032	0.348***	0.291	0.009	-0.012
	(0.043)	(0.007)	(0.031)	(0.032)	(0.078)	(0.188)	(0.070)	(0.072)
GDP $_{t-1}$	0.004***	0.002**	0.035***	0.006***	0.085***	0.059**	0.058***	0.133**
	(0.001)	(0.001)	(0.005)	(0.002)	(0.019)	(0.028)	(0.023)	(0.066)
Policy rate $_{t-1}$	0.021	-0.191	0.025	0.228**	-0.636	-0.801	0.215	0.789**
	(0.113)	(0.170)	(0.155)	(0.101)	(0.511)	(1.382)	(3.772)	(0.390)
LSAPs $_{t-1}$	0.078***	0.054***	0.047***	0.051***	0.137**	1.126***	0.563***	0.369**
	(0.024)	(0.008)	(0.014)	(0.009)	(0.062)	(0.284)	(0.156)	(0.179)
Crisis	-0.113**	-0.165***	-0.115***	-0.117***	-2.710**	-0.409***	-0.850***	-0.580***
	(0.055)	(0.006)	(0.005)	(0.016)	(1.157)	(0.069)	(0.323)	(0.171)
Euro-core countries			-0.040	-0.028			-3.454	-0.292
			(0.378)	(0.390)			(2.591)	(2.594)
Euro-periphery countries			-0.239***	0.258			-0.293***	-0.111
			(0.068)	(0.379)			(0.040)	(2.441)
Non-euro countries			-0.032	-0.012			-0.395	-0.339
			(0.369)	(0.380)			(0.241)	(2.373)
Intercept	7.209***	8.947***	0.799	0.740		-1.897**	9.407**	0.736
	(2.539)	(0.356)	(0.487)	(0.499)		(0.865)	(3.675)	(3.688)
R-squared	0.165	0.172	0.214	0.201				
Arellano-Bond test for AR(2)		8.947*** (0.356)			0.224	0.989	0.754	0.655
Hansen test					0.543	0.332	0.922	0.877
No. of panels	480	480	480	495	480	480	480	480
Observations	20160	20151	20160	20781	20160	20143	20160	20151

Notes: Estimates are unbalanced panel regressions with bank and time fixed effects. ***, **, and * indicate statistical significance at the 1, 5 and 10% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

TABLE 10

Robustness tests: system GMM estimates for the level of net nonperforming loans and the growth of bank credit

	Dependent variable: quarterly real growth rate in net loans and advances only		Dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments	
			Capital defined as equity/total assets	Profitability defined as return on equity
Credit $_{t-1}$	0.095***	0.114***	0.122***	0.267***
	(0.020)	(0.020)	(0.018)	(0.012)
NNPLs $_{t-1}$	-0.237***	-0.676**	-0.512**	-0.287**
	(0.035)	(0.274)	(0.210)	(0.115)
(NNPLs*Capital) $_{t-1}$	0.203***		0.044*	
	(0.030)		(0.026)	
(NNPLS*Profit) $_{t-1}$		0.241***		0.141***
		(0.092)		(0.033)
Capital $_{t-1}$	0.639***	0.172**	0.208**	0.407***
	(0.096)	(0.070)	(0.102)	(0.038)
Liquidity $_{t-1}$	0.103***	0.098***	0.094***	0.073***
	(0.015)	(0.015)	(0.020)	(0.006)
Size $_{t-1}$	0.616*	0.968***	-0.175	0.362***
	(0.349)	(0.366)	(0.296)	(0.122)
Funding $_{t-1}$	1.323***	1.071***	1.024***	0.658***
	(0.262)	(0.271)	(0.209)	(0.112)
Commitments $_{t-1}$	0.2704***	0.3105***	0.243***	0.415***
	(0.049)	(0.0518)	(0.038)	(0.121)
Profit $_{t-1}$	0.228**	0.307***	0.310***	0.186***
	(0.104)	(0.115)	(0.114)	(0.065)
GDP $_{t-1}$	0.364**	0.331**	0.201*	0.206***
	(0.145)	(0.153)	(0.116)	(0.074)
Policy rate $_{t-1}$	7.817	9.831	5.926	-2.000
	(6.473)	(6.735)	(5.622)	(3.933)
LSAPs $_{t-1}$	0.218***	0.279***	0.174***	0.596***
	(0.029)	(0.029)	(0.022)	(0.079)
Crisis	-0.297**	-0.274**	-0.232**	-0.775**
	(0.120)	(0.121)	(0.105)	(0.303)
Intercept	0.655	-2.880	-9.999	-6.512**
	(6.084)	(6.320)	(6.259)	(2.596)
Arellano-Bond test for AR(2)	0.422	0.232	0.525	0.746
Hansen test	0.424	0.525	0.474	0.343
No. of panels	317	317	269	316
Observations	13004	13004	11031	12963

Notes. Estimates are unbalanced panel regressions. ***, **, and * indicate statistical significance at the 1, 5 and 10% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

TABLE 11
Robustness tests: system GMM estimates for the change in net nonperforming loans and the growth of bank credit

	Dependent variable: quarterly real growth rate in loans and advances only		Dependent variable: quarterly real growth rate in loans and advances plus unused commitments	
			Capital defined as equity/total assets	Profitability defined as return on equity
Credit $_{t-1}$	0.277***	0.268***	0.277***	0.275***
	(0.018)	(0.017)	(0.018)	(0.022)
ΔNNPLs $_{t-1}$	-1.165***	-0.517***	-0.447**	-0.444***
	(0.077)	(0.039)	(0.211)	(0.078)
(ΔNNPLs*Capital) $_{t-1}$	1.944***		-0.099	
	(0.628)		(0.094)	
(ΔNNPLS*Profit) $_{t-1}$		0.801***		0.342***
		(0.256)		(0.091)
Capital $_{t-1}$	0.151***	0.184***	0.109**	0.158***
	(0.048)	(0.046)	(0.055)	(0.057)
Liquidity $_{t-1}$	0.080***	0.044***	0.064***	0.073***
	(0.020)	(0.015)	(0.020)	(0.022)
Size $_{t-1}$	0.069	0.160	-0.093	-0.318
	(0.169)	(0.162)	(0.179)	(0.232)
Funding $_{t-1}$	3.424*	1.246	1.583	2.362
	(1.752)	(1.734)	(1.597)	(2.139)
Commitments $_{t-1}$	0.825***	0.856***	0.716***	0.886***
	(0.162)	(0.156)	(0.157)	(0.209)
Profit $_{t-1}$	0.138*	0.182*	0.119*	0.807*
	(0.071)	(0.094)	(0.072)	(0.414)
GDP$_{t-1}$	0.233***	0.226***	0.217***	0.194**
	(0.073)	(0.070)	(0.070)	(0.092)
Policy rate $_{t-1}$	0.729***	0.577***	0.658***	0.623*
	(0.214)	(0.204)	(0.226)	(0.334)
LSAPs $_{t-1}$	0.487***	0.398***	0.369***	0.479**
	(0.129)	(0.122)	(0.134)	(0.197)
Crisis	-0.572**	-0.597***	-0.765***	-0.805**
	(0.273)	(0.155)	(0.211)	(0.405)
Intercept	-3.218	-3.882	3.348	5.318
	(3.256)	(3.094)	(3.823)	(4.681)
Arellano-Bond test for AR(2)	0.422	0.232	0.525	0.746
Hansen test	0.424	0.525	0.474	0.343
No. of panels	317	317	269	316
Observations	13004	13004	11031	12963

Note. Estimates are unbalanced panel regressions. ***, **, and * indicate statistical significance at the 1, 5 and 10% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

APPENDIX TABLE 1

Gross nonperforming loans and the growth of bank credit—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

$Credit_{t-1}$	0.070***	0.070***
	(0.007)	(0.007)
$NPLs_{t-1}$	-0.202***	
	(0.002)	
$\Delta NPLs_{t-1}$		-0.008**
		(0.004)
$Provisions_{t-1}$	-0.012***	-0.004**
	(0.002)	(0.002)
$Capital_{t-1}$	0.022***	0.022***
	(0.002)	(0.002)
$Liquidity_{t-1}$	0.004***	0.004***
	(0.001)	(0.001)
$Size_{t-1}$	0.627***	0.628***
	(0.020)	(0.020)
$Funding_{t-1}$	0.004**	0.043
	(0.002)	(0.041)
$Commitments_{t-1}$	-0.037	-0.035
	(0.064)	(0.064)
$Profits_{t-1}$	-0.008	0.037***
	(0.007)	(0.007)
GDP_{t-1}	0.040***	0.004**
	(0.001)	(0.001)
$Policy\ rate_{t-1}$	0.185	0.191***
	(0.160)	(0.017)
$LRAPs_{t-1}$	0.051***	0.054***
	(0.008)	(0.008)
Crisis	-0.166***	-0.165***
	(0.006)	(0.006)
Intercept	9.005***	8.974***
	(0.351)	(0.355)
R-squared	0.158	0.163
No. of panels	480	480
Observations	20,172	19,694

Notes. Estimates are unbalanced panel regressions with bank and time fixed effects. ***and **indicate statistical significance at the 1 and 5% levels, respectively. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

APPENDIX TABLE 2

Net nonperforming loans and the growth of bank credit—dependent variable: quarterly real growth rate of net loans advances plus unused loan commitments

$NNPLs_{t-1}$	-0.206***	
	(0.004)	
$\Delta NNPLs_{t-1}$		-0.015***
		(0.004)
$Capital_{t-1}$	0.013***	0.012***
	(0.002)	(0.002)
$Liquidity_{t-1}$	0.004***	0.004***
	(0.001)	(0.001)
$Size_{t-1}$	0.625***	0.625***
	(0.020)	(0.020)
$Funding_{t-1}$	0.018	0.021
	(0.040)	(0.041)
$Commitments_{t-1}$	0.004	0.005
	(0.064)	(0.064)
$Profits_{t-1}$	-0.006	0.036***
	(0.007)	(0.007)
GDP_{t-1}	0.030***	0.004***
	(0.001)	(0.001)
$Policy\ rate_{t-1}$	0.181	0.187***
	(0.160)	(0.017)
$LSAPs_{t-1}$	0.054***	0.057***
	(0.008)	(0.008)
Crisis	-0.172***	-0.172***
	(0.006)	(0.006)
Intercept	9.731***	9.740***
	(0.343)	(0.347)
R-squared	0.148	0.138
No. of panels	480	480
Observations	20,172	19,694

Notes. Estimates are unbalanced panel regressions with bank and time fixed effects. *** indicate statistical significance at the 1% level. The Arellano-Bond test reports *p* -values for the null hypothesis that the errors in the first difference regression exhibit no second order serial correlation. The Hansen test reports *p* -values for the null hypothesis that the instruments used are not correlated with the error term.

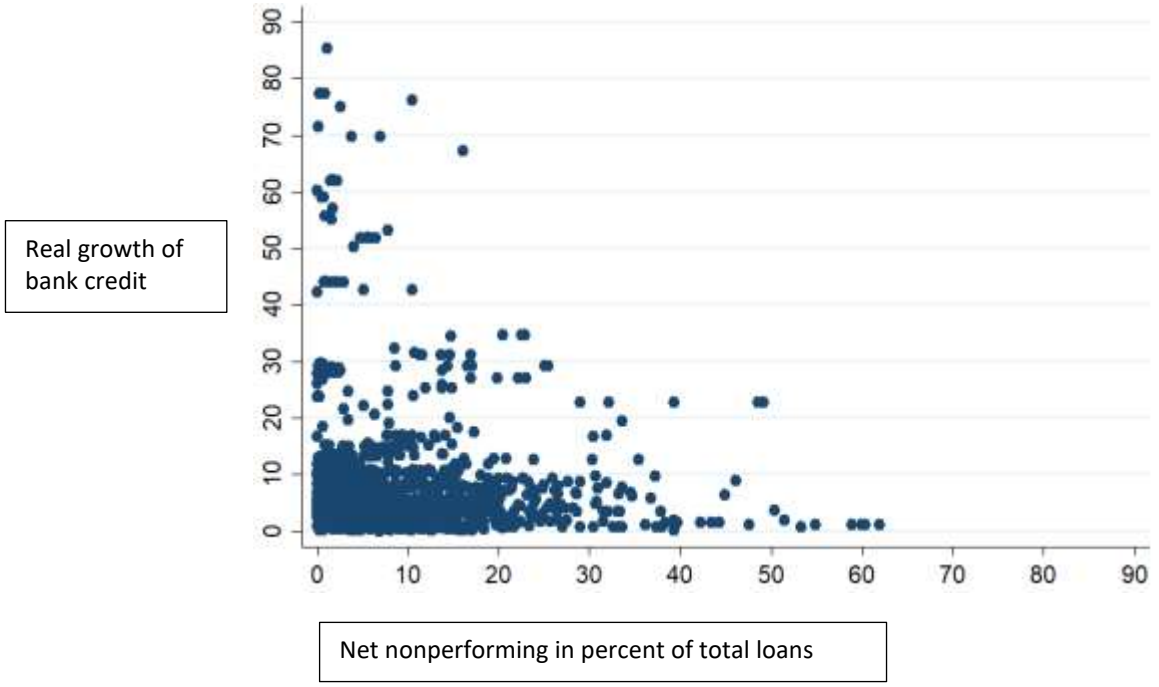
APPENDIX TABLE 3

European banks by category

	Number of banks	Percent of total
Bank category	54	6.82
Bank holding company	303	38.26
Cooperative bank	137	17.30
Investment bank	60	7.58
Private bank/asset management company	44	5.56
Real estate and mortgage bank	70	8.84
Savings bank	68	8.59
Public bank	56	7.07
Total	792	100.00

Source: BankScope

a) Below average capitalized banks



(b) Above average capitalized banks

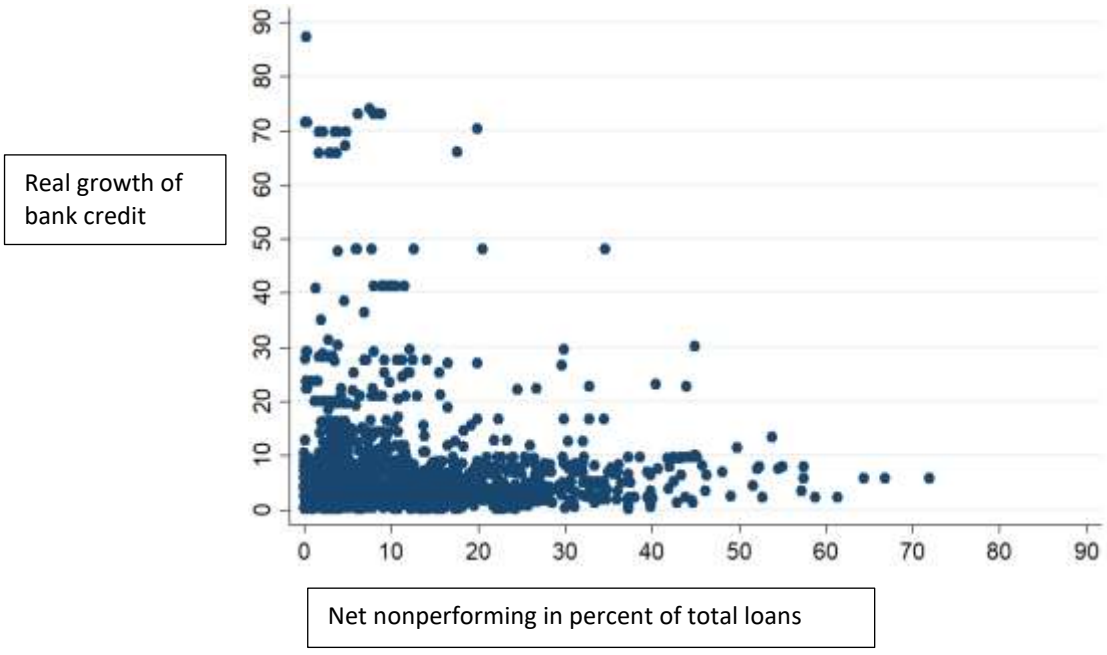
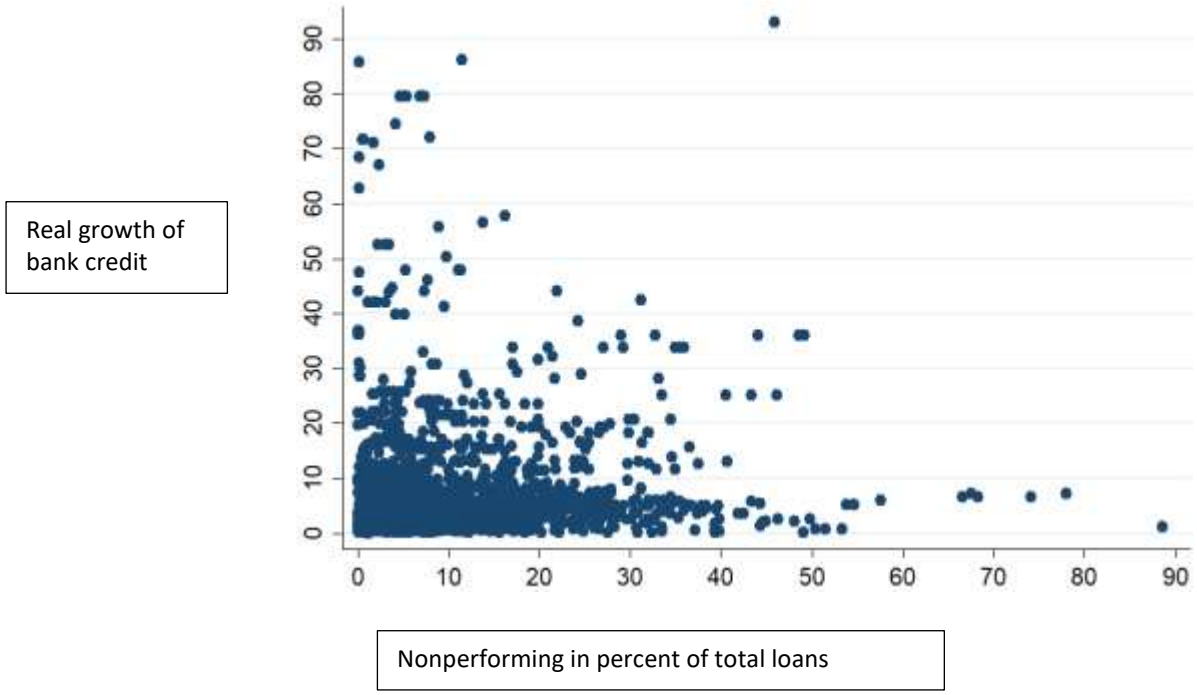


FIGURE 1 Nonperforming loans (NPLS) and the real growth of bank credit in above- and below-average capitalized banks

(a) Below average profit banks



(b) Above average profit banks

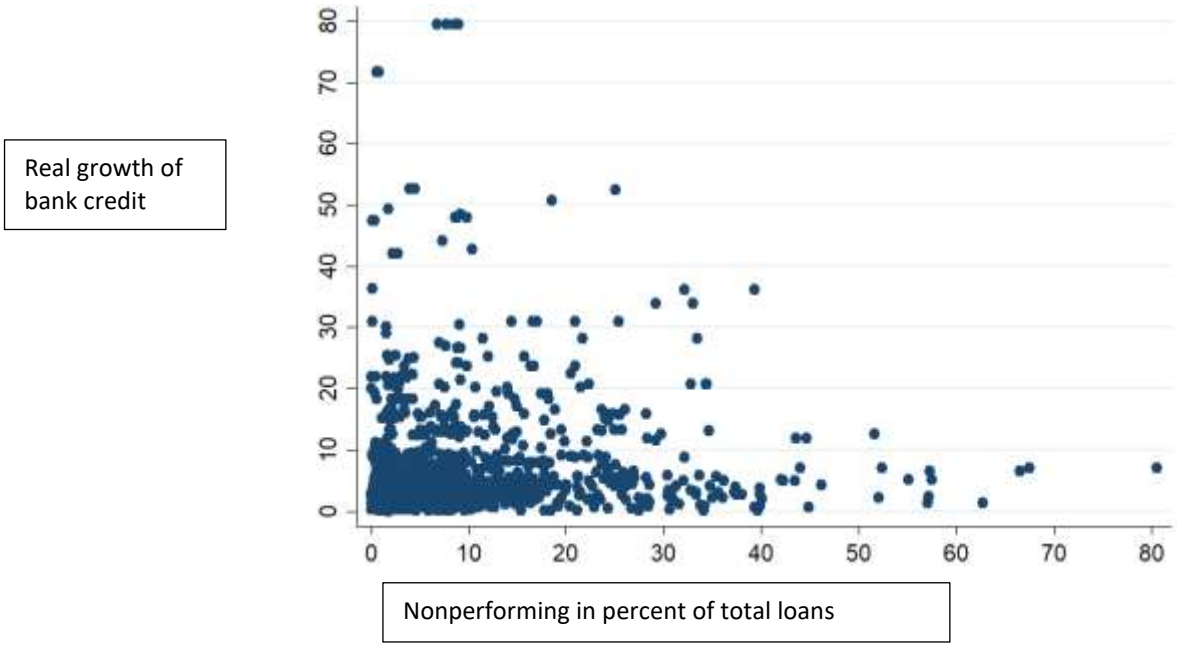


FIGURE 2 Nonperforming loans and the real growth rate of bank credit in above- and below-average profit banks