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Sources of the small firm financing premium:
Evidence from euro area banks

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Non-Technical Summary

The recent financial crisis highlighted the importance of bank balance sheet strength for access to credit for the real economy. This paper analyses the determinants of the cost of bank finance faced by smaller firms, as captured by the interest rate spread between small and large loans, which became particularly elevated at the height of the crisis. This spread, which we denote as the small firm financing premium (SFFP), is a particularly relevant concern for monetary policy given that smaller firms tend to rely on bank finance and have fewer external financing choices compared to larger firms. We analyse whether bank level characteristics drive the SFFP and assess whether macroeconomic factors alter the impact of relevant characteristics. We find that bank market power, sovereign bond holdings and balance sheet weaknesses can lead to disproportionate borrowing cost increases for small firms, and that these features act to exacerbate the impact of a weak macroeconomy. The results are in line with previous literature that finds that smaller, bank dependent borrowers are charged relatively higher interest rates during a period of bank funding difficulties, as they have lower bargaining power as a result of their limited alternative financing options.

Our analysis is based on monthly bank panel data from twelve euro area countries from 2007 to 2015. We focus on the difference between interest rates charged on small and large loans by the same bank, in the same country and the same month, so that we precisely identify which bank-level factors contribute to the disproportionate increases in borrowing for small firms. Moreover, the cross country and time series aspects of the data mean that we can assess how bank level factors interact with macroeconomic developments. We use panel fixed effects models to empirically assess the effects of four broad categories of variables: (i) banks' market power (ii) the stability of a bank's funding base (iii) banks' holdings of domestic sovereign bonds (iv) bank balance sheet stress. Then we examine the interactions with macroeconomic variables that capture sovereign, financial and real economy stress. A number of our key hypotheses are confirmed. We find that banks with a greater market share charge a higher SFFP, and that the effect is particularly strong in times of real economy stress. Secondly we find that banks with impaired balance sheets, as captured by non-performing loans, also have a higher SFFP and the effect increases in times of high unemployment. We also show that banks with a more stable funding base charge a lower SFFP and that it can act to mitigate the effects of macroeconomic stress. Finally, we find that in countries experiencing sovereign stress, high domestic bond holdings lead to higher SFFP, but the effect is reversed in the absence of sovereign stress. Moreover, after controlling for other indicators that capture bank balance sheet risk, the effect becomes insignificant.

The findings of this paper show that bank balance sheet strength is particularly important for access to finance for small firms. This is not only because loans constitute a relatively higher share of their external financing, but also because banks can extract greater revenue from these dependent borrowers. Our results show that banks with characteristics that capture impaired funding and capital positions indeed charge smaller firms disproportionately higher interest rates. This underscores the importance of having a strong and resilient banking sector.

Sources of the small firm financing premium: Evidence from euro area banks*

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Abstract

Conditions in the banking sector have been shown to have a meaningful impact on lending flows and real economic activity, with evidence that these effects are more pronounced for smaller and more bank-dependent borrowers. Using monthly panel data on banks across twelve euro area countries from 2007 to 2015, we investigate the role played by banks' market power, the stability of their funding base, their holdings of sovereign debt and measures of their balance sheet health on the relative interest rate they charge on small versus large large loans (the Small Firm Financing Premium, SFFP), as a proxy for the cost of credit to small versus large firms. We find strong evidence that bank market power, sovereign bond holdings and balance sheet weaknesses lead to disproportionate borrowing cost increases for small firms, and that these features act to exacerbate the impact of a weak macroeconomy. This paper provides evidence that smaller firms, who are more dependent on the banking sector, are affected more by bank balance sheet weaknesses than larger firms.

Keywords: SMEs, Cost of Credit, Bank Balance Sheets, Bank Market Power.

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1 Introduction

That conditions in the banking system matter for firms in the real economy is well established. A large literature beginning with Bernanke (1983) has shown that banks' financial health is of critical importance to the wider economy because it may influence banks' ability and appetite to lend. Prior to the recent financial crisis, studies such as Rosengren and Peek (2000) and Khwaja and Mian (2008) had confirmed the key hypothesis that credit supply shocks are important drivers of real economy credit contractions, using more detailed datasets and more rigorous empirical techniques than those available to earlier studies. The recent financial crisis has only served to intensify the research and policy interest in the area, as evidenced by the wealth of studies exploiting micro data on heterogeneous banks to identify, *inter alia*, the effect of bank losses in the sub-prime crisis on rates charged to bank-dependent borrowers (Santos, 2011), the impact of banks' exposure to the sub-prime crisis on loan rejection (Puri et al., 2011), the heterogeneous response of banks' loan granting behaviour to monetary policy (Jiménez et al., 2014) and the role of bank heterogeneity in interest rate setting (Gambacorta and Mistrulli, 2014). Similarly, another strand of literature has highlighted the damaging impact that weak banking market competition can have on firms' access to finance (Carbó-Valverde et al., 2009; Ryan et al., 2014).

Such linkages between the financial and real sectors have been a major source of concern during the recent euro area crisis. In this paper we focus specifically on one of the most salient features of the crisis, namely the increase in "the significant mark-up on loans paid by small and medium sized enterprises (SMEs) compared with larger firms".[1] This "mark-up", which we denote the Small Firm Financing Premium (SFFP) is measured as the interest rate differential between loans below and above €1 million. The aforementioned divergence in borrowing costs has been a visible and well-documented difficulty facing the European Central Bank (ECB) in channelling its accommodative monetary stance to the real economy. The importance of understanding this breakdown in monetary transmission cannot be understated, given the importance of small firms to European economies' employment and output,[2] as well as their reliance on the banking system for external financing.[3] The potential knock-on effects of a higher-than-justified increase in small firms' borrowing costs include falls in credit and investment demand, risk-taking and ultimately lower employment and output growth.

One of the most important strands of literature concerning the transmission of monetary policy known as the bank lending channel (Bernanke and Gertler, 1995) focuses on how bank characteristics affect their response to changes in policy and

[1] See: "Reviving credit growth in the euro area", Speech by Benoit Coeuré, Member of the Executive Board of the ECB, at the Paris Europlace International Financial Forum "Growth and Investment Opportunities in Europe", Paris, 11 July 2013.

[2] According to European Commission (2015a), "SMEs as a group accounted in 2014 for 67% of total employment and 58% of total value added in the EU28 non-financial business".

[3] According to European Commission (2015b), "bank loans respectively represent 14% and 3% of the total liabilities of European and US companies ... Conversely, corporate bonds are more used as a source of funding by US companies, representing 11% of their total liabilities, to compare with 4% in EU firms."

how they set interest rates (Gambacorta, 2008). It has long been recognised that the bank lending channel is more relevant for smaller firms given their dependence on the banking system for finance (Mishkin, 1996). Past research also indicates that smaller firms suffer more when bank financing conditions deteriorate, not only because bank loans constitute a larger share in their total funding mix, but also because the terms on their bank credit are disproportionately stringent relative to larger firms, given their bank dependence and lower bargaining power. For instance Santos (2011), in line with Boot et al. (1993), finds that banks with funding difficulties or a need to rebuild capital are likely to sacrifice reputational capital by reneging on their implicit commitment to not exploit their monopoly power over bank dependent borrowers. Rajan (1992) proposes that this bargaining power is greater over smaller firms with fewer outside financing options. This paper extends on this literature by exploring whether there is any relationship between bank balance sheet characteristics and the disproportionate penalty that small, bank-dependent borrowers pay. Similar to Gambacorta and Marques-Ibanez (2011), who find that the effects of bank characteristics on credit supply vary in crisis and non-crisis times, we also analyse whether these effects change with the macroeconomic environment.

Empirically, we exploit monthly bank panel data from countries across the euro area from 2007 to 2015 to investigate the forces influencing the heightened variation in the difference in borrowing costs faced by small firms relative to large firms, which we denote the SFFP. By focussing on the interest rate charged on small and large loans *by the same bank in the same country in the same month*, our approach allows us to identify the precise mechanisms through which banks' characteristics act to drive disproportionate increases in borrowing costs for small firms. Further, the cross-country nature of our panel dataset allows us to identify the bank-level factors that act to propagate or mitigate the impact of macroeconomic stress on small firm borrowing rates, providing a wealth of evidence relevant to those aiming to understand the ways in which frictions in the banking system transmit to the real economy. Our measurement of the SFFP also ensures that any effects identified go beyond a general deleterious impact of bank balance sheet weakness on real economy borrowing costs, and cleanly captures *disproportionate increases facing smaller firms*.

The detailed data available to us allow the testing of a number of hypotheses relating to the SFFP. There is ample evidence that small firms have access to fewer non-bank external sources of finance than large firms, and many past papers, such as Bernanke and Gertler (1995) and Gertler and Gilchrist (1994), take as given that larger corporates will be less affected by externalities emanating from the banking sector than smaller firms.[4] Our dataset allows us to directly test the extent to which small firms suffer more and the factors driving this phenomenon. The explanatory variables used for empirical testing, each outlined below, can be grouped into four categories: (i) banks' market power (ii) the stability of a bank's funding base (iii) banks' holdings of domestic sovereign bonds (iv) bank balance sheet stress (measured both by Non-Performing Loan ratios (NPL) and Credit Default Swap (CDS) spreads).

[4]For recent evidence of the greater non-bank external financing options available to larger euro area firms, see the ECB survey on the access to finance of enterprises (SAFE).

A number of key findings emerge from our empirical analysis. We find strong evidence for a "bank market power effect" whereby banks with greater domestic market share charge a disproportionately higher interest rate to small firms. In magnitude terms, a 10-point increase in a bank's share of domestic total assets is estimated to lead to a 46.6 basis point increase in the SFFP in our baseline model (where the standard deviation of market share is 6 points). This finding builds on previous work which has shown that bank market power leads to SME financing constraints (Carbó-Valverde et al., 2009; Ryan et al., 2014) by measuring the market power of *individual banks* rather than the concentration or competition level across the whole system. Further, our identification that market power disproportionately impacts small firms relative to large firms is consistent with the prior that smaller firms, due to their greater reliance on banks for external financing, will be more exposed to pricing externalities arising from weak competition in the banking system. We also provide novel evidence that bank market power acts to propagate the disproportionately harmful impact of macroeconomic stress on small firm funding costs: in economies experiencing higher unemployment levels, banks with greater market power are shown to charge an even higher SFFP. We are unaware of previous research that has been able to show this interaction between banks' market power over small firms specifically and the macroeconomic environment.

Building on the understanding of the aforementioned literature on credit supply shocks, we provide evidence that bank balance sheet weaknesses are translated into disproportionately higher funding costs for small firms. In magnitude terms, the effects are much smaller than those estimated for bank market power: a one-point increase in the Non-Performing Loan (NPL) ratio is estimated to lead to a 2.4 basis point increase in the SFFP (where the standard deviation of NPL is 6.6). The analogous impact for Credit Default Swap (CDS) spreads is a 2.3 basis point increase resulting from a 100-point increase in the CDS spread (where the standard deviation is 211). This disproportionate impact is likely driven by banks' attempt to rebuild profit margins by lending to smaller borrowers with a narrower set of outside funding options, consistent with the findings of Santos (2011) who shows that more bank-dependent corporates in the US were more affected by banks' difficulties related to the sub-prime crisis, and Balduzzi et al. (2015) who show that bank funding shocks in Italy lead to a disproportionate hiring and investment response among younger and smaller firms. We also find clear evidence that these balance sheet weaknesses act to intensify the effect of macroeconomic stress on the SFFP: for banks with higher NPL ratios, the SFFP is shown to increase further in times of high unemployment.

Previous work has shown that abrupt withdrawals and pro-cyclical biases are less likely among banks with a funding model weighted more heavily towards deposits rather than market funding (Song and Thakor, 2007; Hahm et al., 2013). Consistent with these studies, we show that a more stable funding base is a favourable feature of banks from a real economy perspective: banks with an increasing stable deposit share charge lower SFFP, and act to mitigate the disproportionate impact of macroeconomic stress, acting in a "shock absorption" capacity. The magnitude is again small relative to that for market power: a ten-point increase in stable funding ratio leads to a 3.7 basis point decrease in the SFFP, where the standard deviation of the stable funding ratio is 24 points. This finding is however not robust to the

full suite of model specifications presented in the paper.

Our final set of empirical findings relate to the holding of domestic sovereign bonds. Recent literature has shown that the holdings of sovereign bonds by banks have led to spillovers and propagation of difficulties between the two sectors (Altavilla et al. (2015)). For instance, using syndicated loan data, Popov and Van Horen (2013) have shown that banks with larger sovereign exposures reduced their participation in the market and increased interest rates on loans more than less exposed banks, and Acharya et al. (2014) similarly find that losses on banks' holdings of sovereign debt were a key contributor to loan supply contractions and subsequent investment falls in Europe during the crisis. De Marco (2016) shows that banks more exposed to the sovereign shock tightened credit supply by more than banks that were less exposed, and that this operated through increases in bank funding costs. More generally, Gennaioli et al. (2013) find over a wide range of countries that during sovereign default events banks with high holdings of sovereign debt subsequently lend less than those with smaller sovereign holdings. In our case, we show that the location of the bank and sovereign matter crucially for small firms. In countries not experiencing sovereign stresses, we find that higher holdings of these liquid bonds lead to lower SFFP levels, while on the other hand, we find evidence that countries holding more sovereign bond holdings in stressed economies have higher SFFP levels, with this effect heightened where the macroeconomy is weaker. However, after controlling for other indicators that capture risk on banks' balance sheet, the effect becomes insignificant, suggesting that banks' sovereign bond holdings were merely one of a number of channels through which bank balance sheets were weakened during the crisis.

The paper proceeds as follows: Section 2 outlines our key hypotheses, related literature and empirical model; Section 3 describes our data sources; Section 4 reports empirical results; Section 5 shows the results of robustness checks on the results; while Section 6 concludes.

2 Hypotheses and Empirical Set-up

Here we outline in turn the key hypotheses to be tested.

- *H1a: Banks with a greater market share will charge a higher SFFP*

Given that smaller firms have a narrower set of non-bank funding options available, pricing externalities relating to bank competition are likely to impact them more than larger firms. Our testing of *H1a* builds on the existing literature in a number of ways. Previous work has focussed on the role of weak bank competition in higher loan spreads (Van Leuvensteijn et al., 2008; De Graeve et al., 2004) and more prevalent financing constraints for SMEs (Carbó-Valverde et al., 2009; Ryan et al., 2014). We are unaware of research that has focussed specifically on the *disproportionate* impact of banking market competition on small firms relative to larger corporates. Further, the extant literature has focussed on system-wide measures of bank competition. By measuring the market power *of individual lenders*, we tighten the empirical identification of the mechanisms at play by showing directly that SFFP increases with banks' market share within the same country-month.

- *H1b: The impact of bank market share on the SFFP is accentuated in times of macroeconomic stress*

Extending on the effect of market power on the SFFP, we also contribute to the literature concerning the relationship between loan margins and the macroeconomic cycle. Chevalier and Scharfstein (1996) find that imperfect competition leads to counter cyclicality in price mark-ups by firms, and the same behaviour has also been found in relation to loan margins set by banks. During cyclical downturns, banks with market power may smooth profits by charging relatively high prices, rather than seeking to expand market share. Moreover, if banks seek greater market share in a cyclical downturn, they would face greater adverse selection: lending to businesses with the highest cyclical probabilities of failure. For these reasons, banks opt for relatively high margins instead of greater market share during macroeconomic downturns (Dueker and Thornton, 1997). In our setting, we expect that small firms, given their higher dependency on banks and higher switching costs (Rajan, 1992) would be more susceptible to these margin increases during downturns, meaning that we expect the SFFP increases brought on by market power to be exacerbated in times of macroeconomic stress.

- *H2a: Banks with a more stable funding base will charge a lower SFFP*

Previous literature shows that a more stable funding base, weighted more heavily towards deposits than market funding, is associated with less pro-cyclical credit developments (Hahm et al., 2013) and lower likelihood of abrupt withdrawals (Song and Thakor, 2007). In line with this literature, we interpret a bank with a more stable funding base as one that has a stronger and less vulnerable balance sheet, and is therefore less likely in our setting to charge firms a higher SFFP.

- *H2b: Banks with a more stable funding base will act to mitigate the impact of macroeconomic stress on the SFFP*

Following on from *H2a*, we posit that a bank with a more stable funding base will act in a "shock-absorbing" capacity to lower the impact of a macroeconomic adverse shock on the SFFP. Shin and Shin (2011) note that an increased reliance on non-deposit funding sources is likely to introduce a pro-cyclical bias in financial intermediation. Where spreads are in general widening for smaller firms due to deteriorations in the macroeconomic environment, small firms borrowing from banks with a more stable funding base will be relatively more insulated due to the stability of the lender's funding model.

- *H3a: Banks' holdings of domestic sovereign bonds can significantly affect the SFFP, given their important role for the transmission of monetary policy*

The prediction of *H3a* derives from the fact that there are a number of channels through which sovereign bonds affect the transmission of monetary policy. There is a price channel whereby banks use these yields to explicitly or implicitly price loans; there is a liquidity channel whereby they are used as collateral in the interbank market; and there is a balance sheet channel, whereby fluctuations in the value of

bonds held by banks' affects their capital base. The effect of sovereign holdings on transmission clearly depends crucially on fluctuations in their value. When the value (and yield) of these assets is stable and they are considered a safe and liquid asset, they can strengthen banks' balance sheets and enhance their access to funding, however, when bond yields increase (and values decrease), this can hamper the transmission of monetary policy. While in general any sovereign bonds issued by countries under financial stress can upset transmission, the data available only allows us to distinguish between bonds issued by the government of the country the bank is resident in and those issued everywhere else. For this reason we use domestic bonds to be able to identify when banks have a high share of troubled sovereign bond holdings.

- *H3b: Banks with higher holdings of domestic sovereign bonds will act to propagate a macro-financial crisis directly to smaller firms*

Given that the "safe and liquid asset" status of banks' holdings domestic sovereign bonds depends crucially on market conditions. Among our sample of countries, the ten-year sovereign yield in Portugal, Italy, Spain, Ireland and Slovenia surpassed five per cent during the period under study in this paper. Such a collapse in market confidence in these countries' sovereign bonds had damaging impacts on the health of domestic bank balance sheets (Fratzscher and Rieth, 2015). Because changes in the value of sovereign bond holdings can erode banks' capital and also decrease the collateral available to them to borrow in the interbank market, *H3b* predicts that in cases where macro-financial stress has been experienced, and banks hold high levels of domestic sovereign bonds, small firms will be disproportionately impacted via an increase in the SFFP. Recent studies by Altavilla et al. (2015) and De Marco (2016) both show that bank sovereign exposures are a key factor in the transmission of stress from sovereigns to banks. Our paper is the first to test whether this propagation mechanism leads to disproportionately damaging impacts for smaller firms.

- *H4a: Banks with balance sheet weakness will charge a higher SFFP*

H4a follows directly from the long literature alluded to in the opening paragraph of Section 1 beginning with Bernanke (1983) which says that perturbations in the banking sector have real economic impacts. This literature has confirmed that funding stresses, capital levels, losses on bad loans and direct exposure to crises have economically meaningful impacts on banks' appetite for lending to the real economy (Puri et al., 2011; Jiménez et al., 2014), while variation in banks' balance sheet strength can explain variation in interest rate setting behaviour (Holton and Rodriguez d'Acri, 2015; Gambacorta and Mistrulli, 2014). In our setting, banks with higher CDS spreads or higher NPL ratios are expected to charge small firms a greater premium over large firms. The mechanisms underlying this behaviour may relate to the re-pricing of risk given these banks' recent experience with impaired lending, their need to repair profitability by charging higher spreads following recent losses, as well as to the aforementioned fact that smaller enterprises are those with the narrowest set of outside funding options, and those most likely to remain with their existing lender (Santos, 2011).

- *H4b: Banks' balance sheet weakness will act to propagate macroeconomic shocks to smaller firms in a disproportionate way*

In line with Gambacorta and Marques-Ibanez (2011) who show that a bank's riskiness has a negative effect on their capacity to lend particularly during periods of crisis, we also examine whether the effect of bank weakness changes depending on the economic environment. As it would be difficult for banks perceived as riskier to issue funds to finance lending during periods of financial and economic stress, they may pass on these difficulties more to dependent borrowers who are more price inelastic.

To test the hypotheses outlined above, we begin by running the following model:

$$SFFP_{i,t} = \beta_1 X_{i,t-1} + \lambda_{k,t} + \alpha_i + \epsilon_{i,t} \quad (1)$$

Where the $SFFP_{i,t}$ is the difference between the interest rate on loans below and above €1 million charged by bank i at time t, $X_{i,t-1}$ are explanatory bank-level factors, lagged by one period to mitigate simultaneity concerns. $\lambda_{k,t}$ is a vector of 1,235 dummy variables for each country-month, the inclusion of which controls for all macroeconomic developments which may impact the pricing decisions of banks. On the assumption that banks in a given country-month face the same pool of potential borrowing enterprises, the inclusion of $\lambda_{k,t}$ purges estimates of the effect of $X_{i,t-1}$ from equation 1 of the influence of credit demand and borrower creditworthiness on the relative pricing decisions on small and large loans. If this assumption holds, the impact of $X_{i,t-1}$ on the $SFFP_{i,t}$ can be interpreted as a supply-side externality. It must of course be acknowledged that within a given country-month, banks with balance sheet weaknesses may lend to a particular group of SMEs that has become disproportionately more risky relative to the larger firms in the same country, in which case positive relationships between $X_{i,t-1}$ and higher $SFFP_{i,t}$ may in part capture risk-based interest rate pricing driven by changing borrower creditworthiness. The inclusion of the composite error term $\alpha_i + \epsilon_{i,t}$ indicates that all models are run as panel fixed effects models, therefore controlling for unobserved heterogeneity common to individual banks. In this instance, the α_i will capture important features such as lenders' specialization in particular types of lending technology, their preference for lending to small versus large firms, and any time-invariant structural strengths or weakness in balance sheets or funding models which may drive time-invariant differences in the relative pricing of small and large loans. Equation 1 is run in both a univariate and multivariate setting.

To extend our analysis, we investigate whether the effect of different bank characteristics $X_{i,t-1}$ on the $SFFP$ varies as a function of macroeconomic conditions. This will allow us to isolate the mechanisms through which macroeconomic shocks are propagated via the banking system to the real economy. We estimate the following equation,

$$SFFP_{it} = \beta_1 X_{i,t-1} + \beta_2 X_{i,t-1}{}^* X_{j,t-1} + \beta_3 X_{j,t-1} + \lambda_{j,y} + \alpha_i + \epsilon_{i,t} \quad (2)$$

Where as before $X_{i,t-1}$ are lagged bank characteristics, while $X_{j,t-1}$ are macroeconomic factors such as unemployment, the yield on government bonds and GDP growth, which vary over each t for each country j. The inclusion of $X_{j,t-1}$ as well

as the interaction term $X^*_{i,t-1}X_{j,t-1}$ allows the overall effect of the macroeconomic variables $X_{j,t-1}$ to be calculated after the estimation of equation 2, while a vector of country-year dummies $\lambda_{j,y}$ controls for other omitted country developments that may be correlated with changes in the macroeconomic variables and the $SFFP_{i,t}$. However, given that the inclusion of a macroeconomic variable $X_{j,t-1}$ and country-year dummies does not control as completely as a vector of country-month fixed effects, we then alter the specification of Equation 2 to the following form:

$$SFFP_{it} = \beta_1 X_{i,t-1} + \beta_2 X_{i,t-1}{}^* X_{j,t-1} + \lambda_{j,t} + \alpha_i + \epsilon_{i,t} \tag{3}$$

This final equation will allow a more statistically robust interpretation of the slope parameters β_1 and β_2, but will not allow for an interpretation of the overall impact of the macroeconomic variable $X_{j,t-1}$.

3 Data description

The dataset includes balance sheet and interest rate information on 180 euro area banks over 95 months from August 2007 to June 2015. It comprises information from the iMIR and iBSI datasets collected by the ECB and data from market sources. Once matched, the banks in our dataset account for around 55% of the total assets of the banking sector of the 12 countries included.[5] The 4 largest economies in the euro area, Germany, Italy, Spain and France account for around 65 per cent of observations, shown in Table 1. The split between stressed (defined as countries whose sovereign yield surpassed five per cent during the period under study) and non-stressed economies used in this paper is also outlined in the table. This section describes how both the bank level variables and the macro variables evolved across the euro area over different periods.

Our dependent variable of interest is the spread between loans up to and over €1 million euro, which we define as the SFFP. This measure is commonly used to analyse the cost of funds for SMEs relative to larger firms. To mitigate concerns that our results may be driven by compositional differences in the maturity of loans, we restrict our analysis to loans with a maturity of up to 1 year, for which we have most information.

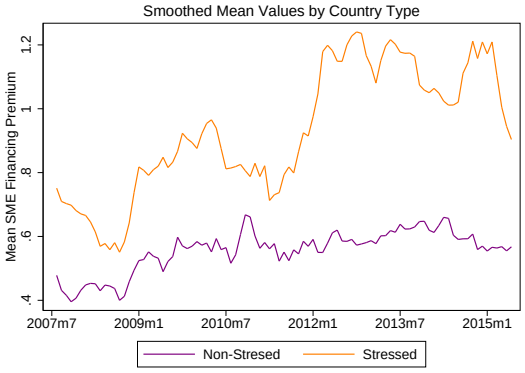
Figure 1 shows the evolution of the SFFP over the sample. As has been well documented, the mean level of the SFFP increased most notably in stressed countries compared to non-stressed countries.[6] This increase can be explained by the diverging level of difficulty faced at macroeconomic, enterprise and bank level across these country types. The use of micro data allows us to also highlight that the standard deviation within both stressed and non-stressed areas also increased during the period, suggesting that even with groups of similar countries, variation in the SFFP has heightened during this period of "financial fragmentation".

[5] Our sample which matches the iBSI and iMIR datasets accounts for around 60%.

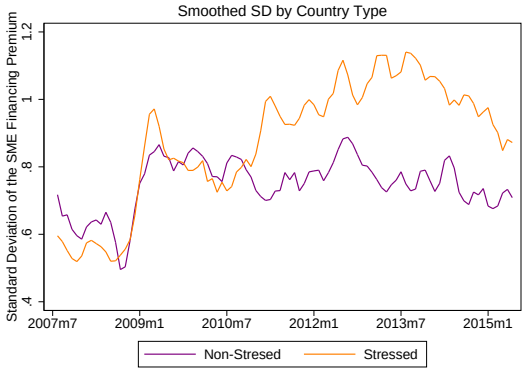
[6] See for instance, the special feature entitled "Divergence in financing conditions of small and medium-sized enterprises (SMEs) in the euro area, Financial Integration in Europe, ECB, April 2014 and the article entitled "SME access to finance in the euro area: barriers and potential policy remedies", Monthly Bulletin, ECB, July 2014.

Figure 1: Evolution of the small firm financing premium for stressed and non-stressed countries 2007-2015

(a) Mean



(b) Standard Deviation



Source: ECB IBSI data, Monthly 2007-2015; authors' calculations. Data presented as a three-month moving average

Table 2 provides the list of variables included in $X_{i,t-1}$ and $X_{j,t-1}$ along with their sources. To test the hypotheses outlined in Section 2 we use five bank level characteristics ($X_{i,t-1}$) and three macroeconomic characteristics ($X_{j,t-1}$). The individual bank characteristics are: i) market share defined as a bank's assets over total assets at a country level[7], ii) stable funding defined as non-financial private sector (NFPS) deposits over liabilities, iii) domestic government bond holdings over assets, iv) the ratio of non-performing loans over risk weighted assets and v) bank CDS spreads. To investigate the interaction between the bank level characteristics and the macroeconomic environment, we use three different country level variables: i) unemployment rates to capture deterioration in the domestic economy, ii) benchmark 10 year government bond yields to capture the financial and sovereign market stress and iii) GDP growth to capture the effects of a general decline in economic activity.

Table 3 reports the mean and standard deviation for each of the explanatory variables outlined in Table 2. We report each value across the whole sample, and then separately for both stressed and non-stressed economies. The table shows that the average bank market share in stressed and non-stressed economies is very similar. While the average stable funding and domestic sovereign bond holdings are slightly higher for stressed countries, there is no major difference with non-stressed countries.[8] The greatest differences can be seen in the measures of balance

[7] As a robustness test we also used loans to measure market share.

[8] Stressed countries began the period with a relatively higher share of NFPS deposits in main liabilities which decreased more severely during the crisis than in non-stressed countries. Both sets of countries have since seen a recovery in the share since the middle of 2012, as concerns relating in particular to sovereign markets abated. As our model controls for fixed effects, we are concerned with changes and not the structural differences across banks. For more details see the article entitled, "Recent developments in the composition and cost of bank funding in the euro area," ECB Economic Bulletin, Issue 1, 2016.

sheet stress, as NPLs and CDS spreads are both much higher for stressed than for non-stressed countries over the period in question. In terms of the macroeconomic variables, there are big differences between stressed and non-stressed countries, with the latter having much lower average unemployment rates, sovereign bond yields and higher GDP growth over the period.

4 Results

We begin by testing the hypotheses *H1a*, *H2a*, *H3a* and *H4a*, which relate to the role of bank market power, stable funding, domestic sovereign bond holdings and direct measures of bank balance sheet weakness on the SFFP. To do this we estimate equation 1, which focuses purely on the effect of bank characteristics, for the euro area as a whole and then separately for the stressed and non-stressed countries to first ascertain whether the effects vary notably across different regions. Subsequently, we estimate equations 2 and 3 to analyse in detail the macroeconomic factors that may drive the variation and these results shown in section 4.1.

Table 4 reports results of fifteen separate estimations of equation 1: for our five key bank-level explanatory variables, across three country groups (the full sample of countries, stressed economies only and non-stressed economies only). The vector λ of 1,235 country-month fixed effects is included to capture the impact of firms' credit demand and creditworthiness as completely as possible using the data available to us. The λ allow us to proceed by interpreting the impact of each $X_{i,t-1}$ on the SFFP as the impact stemming from the *bank side*. In all cases, the standard errors are clustered at the country-month level.

In column (1) of Table 4 we test *H1a*. The results suggest that the hypothesis holds strongly across the entire sample, as well as separately in both stressed and non-stressed country groups: in all cases, as a bank's market share increases, their SFFP also increases. We remind the reader that, distinct from the previous literature, here we are measuring the market share *of an individual bank within a given country-month*, rather than the general level of competition in the economy. In terms of economic magnitude, a ten percentage point increase in a bank's market share (where the standard deviation is six points) would lead to a 46.6 basis point (bps) increase in the SFFP according to the specification across all banks. This effect is stronger in the stressed economies, where a ten point increase in market share leads to a 52 bps increase in SFFP than in the non-stressed economies (40 bps).

H2a is tested in column (2). For the euro area as a whole, higher levels of stable funding lead to a lower SFFP, as predicted. The magnitude of the impact appears small relative to that for market share: a ten-point increase in the share of stable deposits in total liabilities leads to a 3.7 bps reduction in the SFFP. This effect appears particularly small when compared to the standard deviation in the stable funding ratio, which is 24 points. We find initial evidence in the middle and bottom panels of column (2) that *H2b* holds: the impact of stable funding on the SFFP appears to be driven by developments in stressed countries, with the coefficient being not statistically different from zero in the model for non-stressed countries. A more formal test of *H2b* using interaction terms will be provided below.

H3a is tested in column 3. At the euro area level, banks' holdings of domestic sovereign bonds appear to have no significant relationship with the SFFP. The middle panel highlights that in stressed countries, banks with higher holdings of domestic sovereign bonds charge a higher SFFP and the bottom panel shows that conversely in non-stressed countries, high holdings of these assets are associated with a lower SFFP. In terms of magnitude, a ten point increase in the share of domestic sovereign bonds in a bank's total assets leads to a 14 bps increase in the SFFP in stressed economies, and a 27 point decrease in non-stressed economies. These findings show that indeed sovereign bonds do have an important impact on the SFFP. They also illustrate that, while holdings of domestic government bonds are not necessarily a problem *per se*, they can hamper or hinder the transmission of policy depending on the fluctuations in particular sovereign markets. This also provides initial evidence for *H3b*, that banks' bond holdings are a propagating mechanism between macro-financial crises and firms in the real economy.

Finally, *H4a* is tested in column (4) and (5), with two measures of bank balance sheet weakness used. At the euro area level, banks with high NPLs charge a higher SFFP, with this finding driven by banks in stressed countries. A one percentage point increase in a bank's NPL ratio is estimated to lead to a 2.4 bps increase in the SFFP, with this impact being 3.7 bps in stressed economies. In non-stressed economies, however we find no evidence of a bank balance sheet effect, and in fact find that increases in banks' NPL ratios lead to decreases in the SFFP. However, as can been seen in Table 3, the level and variation of NPLs across banks are lower in non-stressed countries compared to stressed countries, which may be driving this result.

In Column (5) higher CDS spreads are also shown to lead to higher SFFP with the result driven by banks in stressed countries. Again the magnitude estimates are relatively small, with a 100 point increase in the CDS spread leading to a 2.3 bps increase in the SFFP across all countries, and a 2.6 bps increase in stressed economies.

Table 5 investigates the robustness of the univariate findings in Table 4 to the multivariate setting. Columns (1) to (3), (4) to (6) and (7) to (9) relate to all countries, stressed economies and non-stressed economies, respectively. In columns (1), (4) and (7) we include bank market power, stable funding and domestic bond holdings, providing a multivariate test of *H1a*, *H2a* and *H3a* simultaneously. Due to the fact that data are unavailable for some banks for both measures used to test *H4a*, we then include the NPL ratio and CDS spread separately in two additional columns per country group.

In the all-country specifications, we find clear evidence that the bank market power effect, as per *H1a*, is highly robust to the inclusion of additional control variables. *H2a*, on the other hand, does not appear to be robust to controlling for other features of the banking system, with the coefficient on stable funding being always insignificant across columns (1) to (3). In column (1) we find, similarly to Table 4, that holdings of domestic government bonds do not exert an impact on the SFFP. However, columns (2) and (3) provide the intuitive insight that, once a measure of bank balance sheet weakness is directly controlled for, the "safe and liquid" hypothesis of *H3a* holds. This provides us with the stylized fact that the explanatory role

of sovereign bond holdings in propagating adverse shocks to small firms is in fact capturing the impact of bank balance sheet weaknesses. We find supportive evidence for *H4a* in the multivariate setting, with positive and statistically significant coefficients of similar magnitude to those in Table 4 being found on NPL and CDS in columns (2) and (3), respectively.

In columns (4) to (6) we find again that the bank market power effect is highly significant and is larger among stressed economies than across all countries. The role of stable funding is again called into question, with statistically insignificant coefficients across each specification. The positive coefficient on domestic bond yields is shown to hold while controlling for market power and stable funding. In columns (5) and (6) however we find that the sign turns negative (although only statistically significant in column (6)). Again, we interpret these findings as showing intuitively that the role of domestic bond holdings is merely to cause stress on bank balance sheets. Controlling directly for bank balance sheet weakness, our models suggest that higher holdings of domestic sovereign bonds lead to lower relative borrowing costs for small firms. *H4a* also receives further support in stressed economies, with both NPL and CDS coefficients being statistically identical to those for stressed economies in Table 4.

Finally columns (7) to (9) reveal that the most statistically robust hypotheses among non-stressed economies are *H1a* and *H3a*: banks with higher market share and with lower holdings of "safe and liquid" domestic government bonds are those that charge a higher SFFP. The magnitude of estimates for bank market power suggest that the mechanisms behind *H1a* are stronger in stressed economies, providing us with initial suggestive evidence in favour of *H1b* on the interaction between market power and macroeconomic conditions.

4.1 The interaction of bank-level factors with the macroeconomy

Having ascertained that there is strong empirical support for *H1a* and *H3a* across all economies and *H4a* in stressed economies only, we now move to formally test the hypotheses relating to the interlinkages between the banking system, the aggregate economy and the SFFP. Table 6 runs the specification in equation 2, in turn testing each of *H1b*, *H2b*, *H3b* and *H4b* by the inclusion of the interaction terms between each bank characteristic and each macroeconomic variable, $X_{i,t-1}{}^{*}X_{j,t-1}$. In order for the total effect of each macroeconomic variable to be calculated, the variable $X_{j,t-1}$ is included along with the interaction term.

In column (1), we find supportive evidence for *H1b*, that bank market power acts to propagate adverse economic shocks to small firms. In panel (A), we show that there is a positive and significant coefficient on the interaction between market share and the national unemployment rate. Similarly, in panel (C) we show that there is a negative interaction between market share and GDP growth, indicating that the SFFP is higher in cases where banks have high domestic market shares and the economy's growth is weaker. This provides evidence that the deleterious effects of an economic contraction on banks may lead them to renege on their implicit commitment to not exploit their monopoly power over smaller borrowers in order

to maintain their profit margins. We find no statistically significant effects in panel (B), where government bond yields are introduced as the $X_{j,t-1}$, indicating that financial market stress does not appear to affect how banks exercise their market power over smaller firms.

In column (2), panel (A) , focussing on banks' stable funding shares, we find support for *H2b*. We find a significant coefficient on the interaction between stable funding and the national unemployment rate, indicating that where banks have more stable funding models, the positive relationship between unemployment and the SFFP is mitigated, highlighting the "shock absorbing" role played by such banks during periods of macroeconomic stress. *H1b* does not however appear to be robust to other treatments of $X_{j,t-1}$, with no significant finding when government bond yields and GDP growth rate are introduced.

In column (3), we find support for *H3b* in panel (A): in instances of more severe macroeconomic stress, measured by the unemployment rate, banks' higher holdings of domestic sovereign bonds act to exacerbate the impact on the SFFP. This provides direct evidence of the propagating role played by banks in the transmission of the sovereign debt crisis to the real economy, with small firms paying the price in terms of disproportionate borrowing cost increases.

In column (4), *H4b* receives strong support: in all three panels, a higher NPL ratio acts to accentuate the link between a macroeconomic deterioration and a higher SFFP. This suggests that bank balance sheet weakness plays a fundamental role in transmitting macroeconomic weakness through to small firms in the form of higher borrowing costs, and is in line with the previous literature on the "bank lending channel" which highlights the importance of bank balance sheet health in the transmission of monetary policy.

Finally in column (5), the findings for the CDS spread do not provide any statistically robust support for *H4b*.

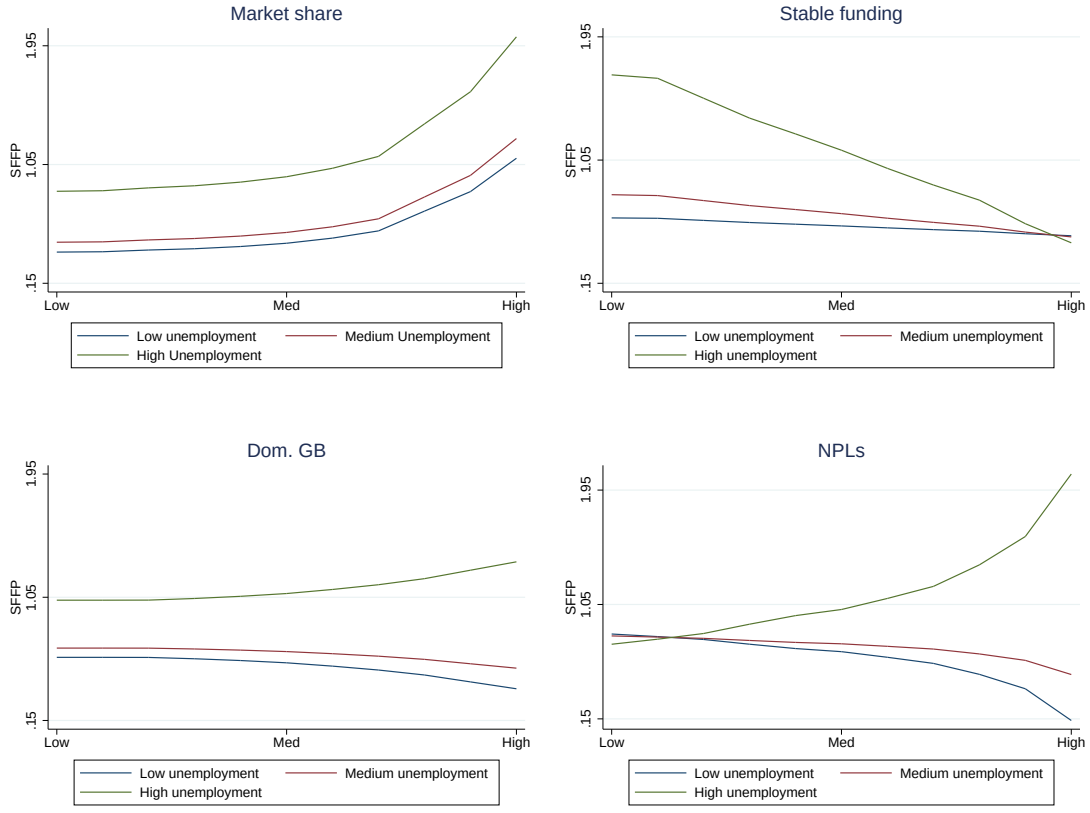
To explore the magnitude of the interaction term effects (β_2) which are statistically significant at the 10% level from Table 6, we predict the level of the SFFP for high, medium and low levels of the different bank characteristics and macroeconomic variables, as shown in Tables 7, 8 and 9 for unemployment, government bond yields and GDP growth respectively.[9] These estimated SFFPs are summarised in Figures 2, 3 and 4.

Figure 2 plots interacted relationships where $X_{j,t-1}$ is the national unemployment rate. Overall, we can see that high unemployment in general implies a higher SFFP. We can also see that changes in the level of unemployment alter the impact of a bank's market share, funding structure, domestic sovereign bond holdings and NPLs on the SFFP they set. With regard to a bank's market share, the SFFP always increases with a bank's market power and this effect intensifies when unemployment is high. Specifically, when unemployment is low an increase in market share from a medium level to a high level leads to a 65 basis points (bps) increase in the SFFP, while the increase is over 100bps when unemployment is high. For stable funding, we can see that when unemployment is low or medium, changes in the level of stable funding lead to only small decreases in the SFFP, however when unemployment is

[9]For all variables, high, medium and low levels are the observations at 5th, 50th and 95th percentiles.

high, increases in the amount of stable funds lead to much lower SFFPs. The impact of holdings of domestic sovereign bonds on the SFFP also changes depending on the state of the macroeconomic environment. When unemployment is at low or medium levels, increases in the share of domestic sovereign bond holdings lead to a lower SFFP, but when unemployment is high, increases in sovereign bond holdings lead to banks charging a higher SFFP. If there is low unemployment and a bank increases holdings from medium to high levels, then the SFFP decreases by around 20bps, while if unemployment is high, the SFFP increases by just over 20bps. Finally, for NPLs we can see that when unemployment is high, increases in NPLs lead to banks charging a higher SFFP. For medium and low levels of unemployment the opposite is the case, with slight falls in the predicted SFFP as NPLs rise. However, when unemployment and NPLs are high, the standard errors are so large that the estimate of the SFFP is not significantly different to zero.

Figure 2: Effect of unemployment interacted with bank characteristics

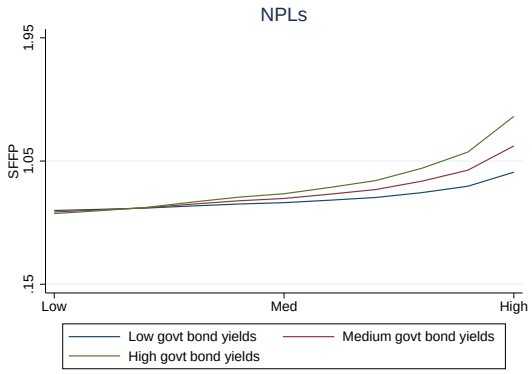


Source: Authors' calculations. Values from Table 7 for estimated levels of the SFFP at high, medium and low levels referring respectively to observations at the 5th, 50th and 95th percentiles for unemployment and for the bank characteristics (market share, stable funding, government bond holdings and NPLs).

Figure 3 repeats the exercise, with $X_{j,t-1}$ measured using government bond yields. Overall, sovereign market stress does not appear to significantly alter the effects of most bank characteristics on the SFFP, indicating that the situation in the

real economy (as measured by unemployment for instance) is more important for small firms. We can see in Figure 3 that banks with increasing NPLs charge higher SFFPs and that the effect is stronger when government bond yields increase.

Figure 3: Effect of government bond yields interacted with bank characteristics



Source: Authors' calculations. Values from Table 8 for estimated levels of the SFFP at high, medium and low levels referring respectively to observations at the 5th, 50th and 95th percentiles for government bond yields and for the bank level NPLs.

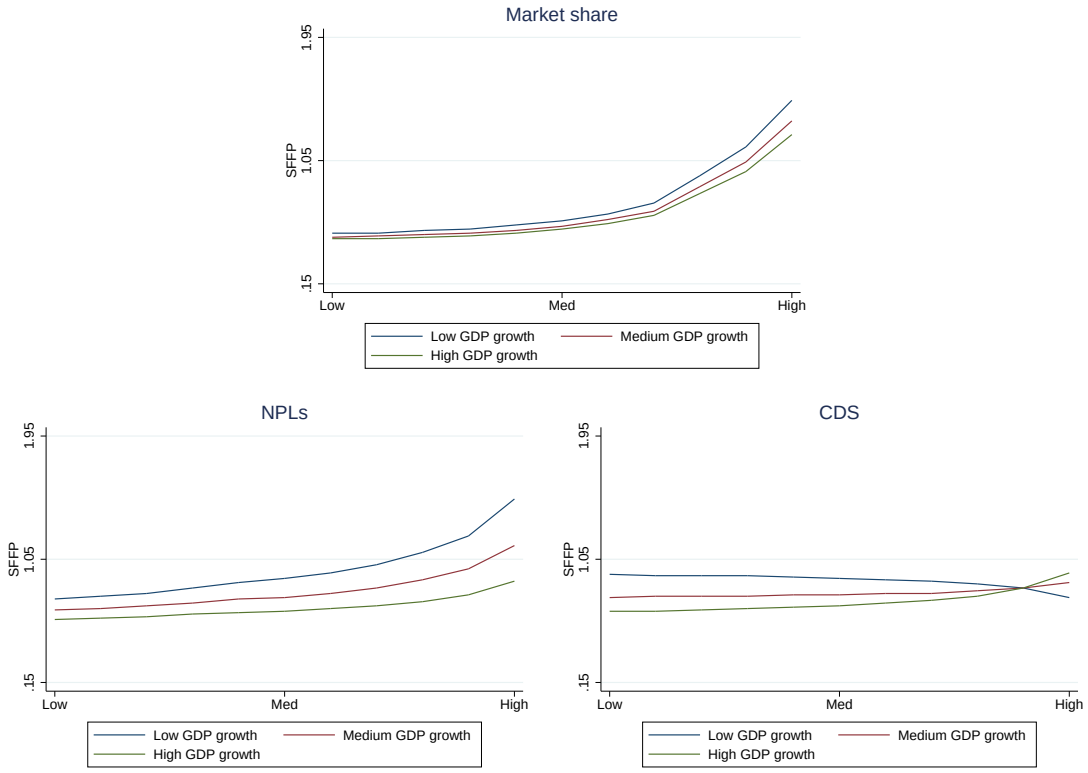
Figure 4 finally plots the interacted relationships for GDP growth. Changes in GDP growth significantly impact how banks' market share, levels of NPLs and CDS spread affect the SFFP. Overall we can see that higher GDP growth in general leads to lower SFFPs, however the effects on the SFFP overall are not as strong as for unemployment, as shown in Figure 2. Firstly, as a banks' market power increases, the SFFP increases, and this effect is more pronounced when GDP growth is low. Specifically, when GDP growth is high, the SFFP increases by 69bps when market power goes from medium to high, whereas it increases by 88bps when GDP growth is low. Increasing levels of NPLs always lead to higher SFFP at the bank level and this effect is accentuated when GDP growth is lower. Finally, higher CDS spreads capturing bank stress lead to higher SFFPs, except when GDP growth is low.

Overall to summarise the findings in terms of our hypotheses, we can see that the effect of market power on the SFFP is indeed accentuated in times of macreconomic stress (*H1b*), as evidenced by the differential effects of market power on the SFFP when unemployment and GDP growth vary. We can also see that stable funding mitigates the effects of economic stress (*H2b*) when looking at levels of unemployment. Higher holdings of domestic sovereign bonds only lead to higher SFFP when macroeconomic stress increases (*H3b*), as can be seen from different levels of unemployment. And finally, balance sheet weakness propagates shocks to smaller firms disproportionately when the macro environment deteriorates and sovereign stress increases (*H4b*), as can be seen for NPLs.

Finally, to check the robustness of our results, we estimate the equation 3 using country-month dummies $\lambda_{j,t}$ in place of the macroeconomic variables $X_{j,t-1}$, in order to ensure that we have fully controlled for all macroeconomic variation when estimating β_2, the impact of $X_{i,t-1} \times X_{j,t-1}$ on the SFFP. The results are shown in Table

10 and we can see that they are mostly unchanged, in particular for unemployment.

Figure 4: Effect of GDP growth interacted with bank characteristics



Source: Authors' calculations. Values from Table 9 for estimated levels of the SFFP at high, medium and low levels referring respectively to observations at the 5th, 50th and 95th percentiles for GDP growth and for the bank characteristics (market share, stable funding, government bond holdings, NPLs and CDS).

5 Robustness checks - lagged dependent variable

To investigate whether dynamics have an impact on our results for the SFFP, we re-estimate our equations while also including a lagged dependent variable, to fully control for these effects. Bias that can be present when including a lagged dependent variable in an OLS framework is mitigated by the fact that we have 95 monthly observations (Judson and Owen (1997)). The results are shown in Tables A1 to A4.

Overall we can see that in all cases the coefficient on the lagged dependent variable is positive and significant, reflecting the persistence in the SFFP. Importantly for our hypotheses however, we can see that from Table A1 that our main findings hold. Firstly, we can see that: i) banks with greater market power charge a higher SFFP (*H1a*) ii) that stable funding leads to lower SFFPs, particularly in stressed economies (*H2a*) iii) that higher holdings of domestic sovereign bonds lead to lower SFFP in non-stressed countries, while the opposite is the case for stressed countries (*H3a*) and finally iv) that balance sheet weakness captured by NPLs leads to higher SFFP (*H4a*). Table A2 shows the multivariate results and the main findings from

Table 5 also remain unchanged. Table A3 shows the effects for the interactions and again, all the main findings hold: i) the effect of market power increases as the macroeconomic conditions deteriorate, as shown for GDP growth (*H1b*) ii) higher stable funding leads to lower spreads as macroeconomic conditions deteriorate, as shown for unemployment (*H2b*) iii) increasing government bond holdings lead to a higher SFFP as the economy deteriorates, as reflected in the changes for unemployment (*H3b*) and finally iv) the effect of balance sheet weakness is exacerbated when the economy declines, as reflected in the findings for NPLs (*H4b*).

6 Conclusion

Previous research has provided evidence that banks' balance sheet weaknesses act to impair the flow of credit to the real economy, and that smaller firms appear to suffer disproportionately as a result of bank sector weakness, due to their higher reliance on banks for external financing. This paper explicitly models the differential cost of borrowing for small versus large borrowers in the euro area between 2007 and 2015, and illustrates that a range of bank-level factors have contributed to increasing "financing premiums" for small firms (SFFP), particularly in stressed euro area economies.

Banks' market share and weaknesses in their balance sheets measured by NPL ratios and CDS spreads, are all shown to lead to a higher financing premium for small firms. A more stable funding base is also shown to reduce the SFFP. Holdings of domestic government bonds, in countries not experiencing sovereign stress in yields during the recent crisis, lead to lower premiums for small firms. These findings provide strong evidence that bank heterogeneity can lead to varying funding conditions for small firms, even within countries and time periods. In magnitude terms, the impact of a bank's market share is shown to have the strongest impact on the SFFP, indicating that competitive externalities from the banking sector are a key source of difficulty for small firms' cost of credit.

We extend the analysis by showing that the above bank characteristics have important interactions with macroeconomic developments. The impact of bank market power and bank balance sheet weakness on higher small firm premiums is shown to be exacerbated during periods of high unemployment and weak GDP growth. This provides direct evidence of the way in which banking market structure and balance sheet weakness can act to propagate negative shocks to the real economy. Similarly, holdings of domestic sovereign bonds, which in normal times are viewed as safe and liquid assets, act to increase the SFFP when the real economy is weak and provide a direct propagation mechanism via the banking sector from the sovereign debt crisis to the borrowing costs of small firms. Stable funding on the other hand,is shown to mitigate the impact of a weaker aggregate economy by reducing the SFFP during periods of macroeconomic stress.

The evidence provided in this study is unique in focussing directly on the *premiun* paid by small relative to large firms when borrowing from the same bank in the same month. In so doing, we rule out the influence of the above-mentioned factors on financing conditions generally, and are able to narrowly focus in on ways in which banking sector and macroeconomic conditions act to disproportionately

impact smaller borrowers, who are more susceptible to be impacted by pricing externalities given their reliance on banks for external financing. The evidence suggests that the bank lending channel in particular influences the cost of finance for smaller firms. Our results show, in line with previous literature, that there is a range of ways in which difficulties in the banking sector act to spill over into the real sector, and that the recent financial fragmentation seen across the euro area can in part be explained by such spillovers.

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Tables

Table 1: Breakdown of bank-level data by country

Country	Freq.	Stressed	Percent
Austria	774	N	6
Belgium	354	N	3
Germany	3,843	N	31.77
Spain	1,391	Y	12
Finland	511	N	4.22
France	1,193	N	10
Ireland	435	Y	3.6
Italy	1,662	Y	13.74
Luxembourg	682	N	5.64
Netherlands	395	N	3.27
Portugal	430	Y	3.55
Slovenia	426	Y	4
Total	12,096		100

Table 2: Explanatory variables description

Variable	Description	Source
	A. Bank Level variables, $X_{i,t-1}$	
Market Share	Main assets over total main assets at a country level	iBSI and BSI
Stable Funding	Deposit of non-financial corporations and households over main liabilities excluding capital	iBSI
Dom GB	Holdings of domestic sovereign bonds over main assets	iBSI
NPL	Non-performing loans over risk weighted assets	SNL
CDS	CDS spreads	Datastream
	B. Macroeconomic variables, $X_{i,t-1}$	
Unemployment	Total Standardised unemployment rate	Eurostat
GB yields	Ten year benchmark government bond yields	OECD
GDP growth	Annual growth of gross domestic product at market prices	Eurostat

Table 3: Summary of variables

	Mean (all)	SD (all)	Mean (stress)	SD (stress)	Mean (non-stress)	SD (non-stress)
Bank level variables						
SFFP	0.70	0.85	0.95	0.93	0.56	0.76
Market share	0.04	0.06	0.05	0.06	0.04	0.06
Stab fund	0.37	0.24	0.39	0.17	0.35	0.28
Dom GB	0.04	0.04	0.05	0.05	0.03	0.03
NPLs	7.78	6.64	9.28	7.60	5.98	4.66
CDS	197.11	210.50	278.34	291.15	141.09	93.45
Macroeconomic variables						
Unemp	9.05	5.11	13.43	6.12	6.60	1.71
GBY	3.30	1.67	4.56	1.68	2.59	1.19
GDP gr.	0.32	2.99	-0.51	2.86	0.79	2.96

Table 4: Impact of individual bank characteristics on the SFFP

Dependent variable: SFFP					
Indep. vars	(1)	(2)	(3)	(4)	(5)
Bankchars:	Market share	Stable funding	Dom GB	NPL	CDS
All banks					
$Bankchar_{t-1}$	4.662***	-0.365***	-0.0471	0.0241***	0.000227**
	(0.704)	(0.137)	(0.367)	(0.00583)	(0.000108)
N	12096	12074	12096	3877	6225
R^2	0.130	0.129	0.127	0.291	0.226
R^2 w/o $Bankchar_{t-1}$	0.127	0.128	0.127	0.285	0.225
Stressed					
$Bankchar_{t-1}$	5.238***	-0.550**	1.402***	0.0373***	0.000257**
	(0.928)	(0.216)	(0.432)	(0.00663)	(0.000117)
N	4344	4323	4344	2169	2543
R^2	0.210	0.209	0.208	0.322	0.296
R^2 w/o $Bankchar_{t-1}$	0.206	0.207	0.206	0.304	0.294
Non-stressed					
$Bankchar_{t-1}$	4.028***	-0.212	-2.704***	-0.0164*	0.0000126
	(1.064)	(0.172)	(0.565)	(0.00972)	(0.000287)
N	7752	7751	7752	1708	3682
R^2	0.0735	0.0720	0.0753	0.253	0.150
R^2 w/o $Bankchar_{t-1}$	0.0718	0.0718	0.0718	0.251	0.150

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors, clustered at country-month level, in parentheses. Fifteen coefficients: five univariate models across three country group. Full set of country-month dummy variables $\lambda_{j,t}$ included in all models.

Table 5: Effects of bank balance sheet characteristics on the SFFP (multivariate regressions)

Dependent variable: SFFP									
	All banks			Stressed			Non-stressed		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market share	4.604***	7.322***	3.910***	5.778***	8.144***	5.519**	3.951***	6.554	2.988**
	(0.860)	(1.702)	(1.325)	(1.363)	(1.954)	(2.367)	(1.154)	(4.030)	(1.509)
Stable funds	-0.0320	-0.398	-0.198	0.220	0.105	-0.646	-0.0250	-1.207*	0.119
	(0.169)	(0.363)	(0.250)	(0.316)	(0.426)	(0.414)	(0.190)	(0.682)	(0.299)
Dom gov bonds	-0.0763	-1.485*	-2.189***	1.514***	-0.427	-1.801**	-2.682***	-8.263***	-3.258***
	(0.387)	(0.825)	(0.583)	(0.501)	(0.876)	(0.833)	(0.568)	(2.076)	(0.871)
NPL ratio		0.0252***			0.0353***			-0.00379	
		(0.00595)			(0.00697)			(0.00974)	
CDS			0.000251**			0.000210*			0.000109
			(0.000112)			(0.000123)			(0.000287)
N	12074	3863	6203	4323	2156	2522	7751	1707	3681
R^2	0.131	0.302	0.232	0.214	0.333	0.305	0.0770	0.273	0.157
R^2 w/o *Bankchars*	0.128	0.284	0.227	0.207	0.303	0.297	0.0718	0.251	0.151

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors, clustered at country-month level, in parentheses. Full set of country-month dummy variables $\lambda_{j,t}$ included in all models.

Table 6: SFFP and the interaction between bank characteristics and macroeconomic conditions

Dependent variable: SFFP					
Indep. vars	(1)	(2)	(3)	(4)	(5)
Bankchars:	Market share	Stable funding	Dom GB	NPL	CDS
A. Unemployment					
$Bankchar_{t-1}$	3.282***	0.196	-3.149***	-0.0547***	-0.0000634
	(0.872)	(0.216)	(0.627)	(0.00870)	(0.000227)
$Unemp_{t-1}$	0.0254	0.0585***	0.0232	-0.0110	0.00392
	(0.0156)	(0.0176)	(0.0145)	(0.0260)	(0.0206)
$Unemp_{t-1} * Bankchar_{t-1}$	0.141**	-0.0775***	0.247***	0.00477***	0.0000177
	(0.0563)	(0.0208)	(0.0450)	(0.000497)	(0.0000153)
N	12096	12074	12096	3877	6225
R^2	0.0739	0.0738	0.0734	0.154	0.116
B. Government bond yields					
$Bankchar_{t-1}$	4.784***	-0.387**	-0.582	0.00916	0.000213
	(0.781)	(0.156)	(0.701)	(0.00708)	(0.000157)
GBY_{t-1}	-0.00788	-0.00932	-0.0155	-0.00926	-0.0101
	(0.0153)	(0.0170)	(0.0147)	(0.0236)	(0.0208)
$GBY_{t-1} * Bankchar_{t-1}$	-0.00561	-0.00406	0.193	0.00361**	-0.00000171
	(0.0951)	(0.0257)	(0.171)	(0.00170)	(0.0000256)
N	12096	12074	12096	3877	6225
R^2	0.0731	0.0714	0.0703	0.136	0.116
C. GDP growth					
$Bankchar_{t-1}$	4.740***	-0.380***	0.0238	0.0222***	0.000172**
	(0.668)	(0.128)	(0.343)	(0.00493)	(0.0000854)
$GDPgrowth_{t-1}$	-0.00389	-0.00510	-0.00906*	-0.0115	-0.0309***
	(0.00486)	(0.00527)	(0.00512)	(0.0101)	(0.00738)
$GDPgrowth_{t-1} * Bankchar_{t-1}$	-0.115***	-0.0121	0.000846	-0.00208**	0.0000918***
	(0.0351)	(0.00788)	(0.0841)	(0.00100)	(0.0000203)
N	12096	12074	12096	3877	6225
R^2	0.0740	0.0718	0.0704	0.138	0.119

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors, clustered at country-month level, in parentheses. Full set of country-year dummy variables $\lambda_{j,y}$ included in all models.

Table 7: Effects of bank balance sheet characteristics and unemployment on the SFFP

Market share									
	Low			Medium			High		
	Margin	95% confidence Int.		Margin	95% confidence Int.		Margin	95% confidence Int.	
Low unemp	0.39***	0.24	0.53	0.45***	0.32	0.59	1.1***	0.87	1.32
Medium unemp	0.46***	0.39	0.53	0.54***	0.48	0.59	1.25***	1.06	1.43
High unemp	0.85***	0.43	1.27	0.96***	0.55	1.37	2.02***	1.59	2.45
Stable funding									
	Low			Medium			High		
	Margin	95% confidence Int.		Margin	95% confidence Int.		Margin	95% confidence Int.	
Low unemp	0.63***	0.46	0.79	0.57***	0.44	0.7	0.5***	0.32	0.67
Medium unemp	0.8***	0.7	0.89	0.66***	0.62	0.7	0.49***	0.38	0.6
High unemp	1.67***	1.19	2.16	1.12***	0.72	1.52	0.45*	-0.01	0.9
Domestic government bond holdings									
	Low			Medium			High		
	Margin	95% confidence Int.		Margin	95% confidence Int.		Margin	95% confidence Int.	
Low unemp	0.61***	0.48	0.74	0.57***	0.45	0.7	0.38***	0.23	0.53
Medium unemp	0.68***	0.63	0.73	0.65***	0.61	0.7	0.53***	0.46	0.61
High unemp	1.03***	0.64	1.42	1.08***	0.69	1.47	1.31***	0.91	1.71
NPLs									
	Low			Medium			High		
	Margin	95% confidence Int.		Margin	95% confidence Int.		Margin	95% confidence Int.	
Low unemp	0.82***	0.53	1.11	0.68***	0.39	0.96	0.14	-0.22	0.5
Medium unemp	0.8***	0.69	0.92	0.74***	0.64	0.84	0.5***	0.3	0.7
High unemp	0.74**	0.03	1.45	1.01***	0.31	1.71	2.08***	1.36	2.79

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors for the confidence interval are calculated using the Delta method. Estimated using the coefficient estimates from Table 6, when the interactions are significant at the 10% level. High, medium and low are levels of the bank characteristics and macroeconomic variables at the 5th, 50th and 95th percentiles respectively.

Table 8: Effects of bank balance sheet characteristics and government bond yields on the SFFP

NPLs									
	Low			Medium			High		
	Margin	95% confidence int.		Margin	95% confidence int.		Margin	95% confidence int.	
Low GBY	0.69***	0.56	0.82	0.75***	0.64	0.85	0.97***	0.77	1.17
Medium GBY	0.68***	0.62	0.74	0.78***	0.75	0.8	1.16***	1.01	1.31
High GBY	0.67***	0.52	0.81	0.81***	0.7	0.93	1.38***	1.12	1.63

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors for the confidence interval are calculated using the Delta method. Estimated using the coefficient estimates from Table 6, when the interactions are significant at the 10% level. High, medium and low are levels of the bank characteristics and macroeconomic variables at the 5th, 50th and 95th percentiles respectively.

Table 9: Effects of bank balance sheet characteristics and GDP growth on the SFFP

Market share									
	Low			Medium			High		
	Margin	95% confidence Int.		Margin	95% confidence Int.		Margin	95% confidence Int.	
Low GDP gr	0.52***	0.44	0.6	0.61***	0.54	0.68	1.49***	1.3	1.69
Medium GDP gr	0.49***	0.44	0.55	0.57***	0.54	0.61	1.34***	1.15	1.52
High GDP gr	0.48***	0.41	0.55	0.55***	0.5	0.6	1.24***	1.05	1.42
NPLs									
	Low			Medium			High		
	Margin	95% confidence Int.		Margin	95% confidence Int.		Margin	95% confidence Int.	
Low GDP gr	0.76***	0.64	0.87	0.91***	0.82	0.99	1.49***	1.22	1.76
Medium GDP gr	0.68***	0.61	0.74	0.77***	0.75	0.8	1.15***	1	1.3
High GDP gr	0.61***	0.51	0.72	0.67***	0.59	0.75	0.89***	0.69	1.09
CDS									
	Low			Medium			High		
	Margin	95% confidence Int.		Margin	95% confidence Int.		Margin	95% confidence Int.	
Low GDP gr	0.94***	0.85	1.02	0.91***	0.83	0.99	0.77***	0.66	0.89
Medium GDP gr	0.77***	0.75	0.8	0.79***	0.77	0.81	0.88***	0.82	0.94
High GDP gr	0.67***	0.6	0.73	0.71***	0.65	0.77	0.95***	0.85	1.05

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors for the confidence interval are calculated using the Delta method. Estimated using the coefficient estimates from Table 6, when the interactions are significant at the 10% level. High, medium and low are levels of the bank characteristics and macroeconomic variables at the 5th, 50th and 95th percentiles respectively.

Table 10: SFFP and the interaction between bank characteristics and macroeconomic conditions (including country-month dummies)

Dependent variable: SFFP					
Indep. vars	(1)	(2)	(3)	(4)	(5)
Bankchars:	Market share	Stable funding	Dom GB	NPL	CDS
A. Unemployment					
$Bankchar_{t-1}$	3.098***	0.230	-3.224***	-0.0551***	0.000151
	(0.916)	(0.228)	(0.665)	(0.0108)	(0.000298)
$Unemp * Bankchar_{t-1}$	0.150**	-0.0789***	0.249***	0.00502***	0.00000519
	(0.0586)	(0.0217)	(0.0477)	(0.000575)	(0.0000200)
N	12096	12074	12096	3877	6225
R^2	0.131	0.131	0.130	0.311	0.226
B. Government bond yields					
$Bankchar_{t-1}$	4.585***	-0.348**	-0.548	0.0152*	0.000216
	(0.831)	(0.165)	(0.754)	(0.00853)	(0.000190)
$GB10y * Bankchar_{t-1}$	0.0208	-0.00639	0.164	0.00311	0.00000188
	(0.106)	(0.0270)	(0.185)	(0.00210)	(0.0000321)
N	12096	12074	12096	3877	6225
R^2	0.130	0.129	0.128	0.292	0.226
C. GDP growth					
$Bankchar_{t-1}$	4.629***	-0.358***	-0.0737	0.0259***	0.000178*
	(0.695)	(0.136)	(0.360)	(0.00586)	(0.000107)
$GDP * Bankchar_{t-1}$	-0.136***	-0.00973	0.0603	-0.00183	0.000160***
	(0.0412)	(0.00834)	(0.0948)	(0.00133)	(0.0000305)
N	12096	12074	12096	3877	6225
R^2	0.131	0.129	0.128	0.292	0.232

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors, clustered at country-month level, in parentheses. Full set of country-month dummy variables $\lambda_{j,t}$ included in all models.

Table A1: Inclusion of lagged dependent variable: Impact of individual bank characteristics on the SFFP

Dependent variable: SFFP					
Indep. vars	(1)	(2)	(3)	(4)	(5)
Bankchars:	Market share	Stable funding	Dom GB	NPL	CDS
All banks					
$SFFP_{t-1}$	0.364***	0.366***	0.366***	0.408***	0.413***
	(0.0179)	(0.0179)	(0.0178)	(0.0317)	(0.0235)
$Bankchar_{t-1}$	2.990***	-0.240*	-0.0814	0.0134***	0.000141
	(0.645)	(0.123)	(0.361)	(0.00493)	(0.000101)
N	11751	11731	11751	3817	6113
R^2	0.251	0.250	0.250	0.410	0.362
Stressed					
$SFFP_{t-1}$	0.435***	0.438***	0.436***	0.419***	0.469***
	(0.0246)	(0.0249)	(0.0246)	(0.0401)	(0.0325)
$Bankchar_{t-1}$	2.926***	-0.408**	0.801*	0.0211***	0.000147
	(0.801)	(0.175)	(0.431)	(0.00584)	(0.000108)
N	4305	4285	4305	2158	2518
R^2	0.360	0.361	0.359	0.441	0.451
Non-stressed					
$SFFP_{t-1}$	0.314***	0.316***	0.312***	0.373***	0.360***
	(0.0241)	(0.0241)	(0.0240)	(0.0527)	(0.0329)
$Bankchar_{t-1}$	2.834***	-0.0855	-2.142***	-0.0118	0.00000612
	(1.012)	(0.164)	(0.602)	(0.00886)	(0.000285)
N	7446	7446	7446	1659	3595
R^2	0.170	0.169	0.171	0.360	0.265

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors, clustered at country-month level, in parentheses. Full set of country-month dummy variables $\lambda_{j,t}$ included in all models.

Table A2: Inclusion of lagged dependent variable: Effects of bank balance sheet characteristics on the SFFP (multivariate regressions)

Dependent variable: SFFP									
	All banks			Stressed			Non-stressed		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$SFFP_{t-1}$	0.364***	0.399***	0.410***	0.434***	0.408***	0.466***	0.311***	0.359***	0.355***
	(0.0179)	(0.0321)	(0.0238)	(0.0247)	(0.0405)	(0.0332)	(0.0241)	(0.0536)	(0.0332)
$Marketshare_{t-1}$	2.926***	4.209***	2.233*	2.885**	4.583***	1.904	2.909***	3.534	2.395*
	(0.766)	(1.565)	(1.174)	(1.143)	(1.719)	(2.113)	(1.068)	(4.290)	(1.350)
$Stablefunds_{t-1}$	-0.0316	-0.317	-0.110	-0.0209	-0.0607	-0.513	0.0496	-0.719	0.194
	(0.149)	(0.342)	(0.231)	(0.254)	(0.394)	(0.406)	(0.176)	(0.662)	(0.271)
$Domgovbonds_{t-1}$	-0.114	-0.956	-1.206**	0.759	-0.290	-1.065	-2.118***	-5.809***	-1.836**
	(0.378)	(0.781)	(0.533)	(0.475)	(0.830)	(0.762)	(0.608)	(2.041)	(0.810)
$NPLratio_{t-1}$		0.0144***			0.0202***			-0.00380	
		(0.00517)			(0.00624)			(0.00914)	
CDS_{t-1}			0.000146			0.000116			0.0000546
			(0.000103)			(0.000112)			(0.000285)
N	11731	3804	6093	4285	2145	2498	7446	1659	3595
R^2	0.251	0.414	0.365	0.362	0.444	0.457	0.172	0.369	0.268

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors, clustered at country-month level, in parentheses. Full set of country-month dummy variables $\lambda_{j,t}$ included in all models.

Table A3: Inclusion of lagged dependent variable: SFFP and the interaction between bank characteristics and macroeconomic conditions

Dependent variable: SFFP					
Indep. vars	(1)	(2)	(3)	(4)	(5)
Bankchars:	Market share	Stable funding	Dom GB	NPL	CDS
Unemployment					
$SFFP_{t-1}$	0.348***	0.349***	0.349***	0.343***	0.379***
	(0.0166)	(0.0166)	(0.0166)	(0.0260)	(0.0204)
$Bankchar_{t-1}$	2.388***	0.211	-2.321***	-0.0391***	-0.0000543
	(0.814)	(0.190)	(0.659)	(0.00815)	(0.000218)
$Unemp_{t-1}$	0.0173	0.0417**	0.0142	-0.00577	-0.000485
	(0.0150)	(0.0164)	(0.0143)	(0.0252)	(0.0196)
$Unemp * Bankchar_{t-1}$	0.0703	-0.0608***	0.177***	0.00325***	0.0000123
	(0.0513)	(0.0191)	(0.0481)	(0.000467)	(0.0000145)
N	11751	11731	11751	3817	6113
R^2	0.189	0.190	0.189	0.258	0.245
Government bond yields					
$SFFP_{t-1}$	0.349***	0.351***	0.351***	0.358***	0.379***
	(0.0166)	(0.0166)	(0.0166)	(0.0258)	(0.0204)
$Bankchar_{t-1}$	3.018***	-0.253*	-0.338	0.00472	0.0000972
	(0.736)	(0.144)	(0.675)	(0.00594)	(0.000143)
GBY_{t-1}	-0.0112	-0.0103	-0.0128	-0.00566	-0.00947
	(0.0155)	(0.0169)	(0.0146)	(0.0237)	(0.0204)
$GBY * Bankchar_{t-1}$	0.0283	-0.000955	0.0981	0.00230	0.00000539
	(0.0911)	(0.0236)	(0.163)	(0.00150)	(0.0000213)
N	11751	11731	11751	3817	6113
R^2	0.188	0.188	0.187	0.250	0.245
GDP growth					
$SFFP_{t-1}$	0.348***	0.351***	0.351***	0.359***	0.377***
	(0.0166)	(0.0166)	(0.0166)	(0.0258)	(0.0204)
$Bankchar_{t-1}$	3.112***	-0.240**	-0.0335	0.0133***	0.000103
	(0.617)	(0.116)	(0.332)	(0.00424)	(0.0000811)
GDP_{t-1}	-0.00529	-0.00509	-0.00956*	-0.00820	-0.0258***
	(0.00468)	(0.00469)	(0.00499)	(0.0103)	(0.00696)
$GDP * Bankchar_{t-1}$	-0.0772**	-0.0112	0.0336	-0.00167*	0.0000617***
	(0.0313)	(0.00769)	(0.0799)	(0.000926)	(0.0000179)
N	11751	11731	11751	3817	6113
R^2	0.189	0.189	0.187	0.251	0.247

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors, clustered at country-month level, in parentheses. Full set of country-month dummy variables $\lambda_{j,t}$ included in all models.

Table A4: Inclusion of lagged dependent variable: SFFP and the interaction between bank characteristics and macroeconomic conditions

Dependent variable: SFFP					
Indep. vars	(1)	(2)	(3)	(4)	(5)
Bankchars:	Market share	Stable funding	Dom GB	NPL	CDS
			Unemployment		
$SFFP_{t-1}$	0.363***	0.364***	0.364***	0.390***	0.413***
	(0.0178)	(0.0178)	(0.0179)	(0.0325)	(0.0235)
$Bankchar_{t-1}$	2.210***	0.213	-2.314***	-0.0354***	0.0000679
	(0.853)	(0.199)	(0.710)	(0.00999)	(0.000286)
$Unemp * Bankchar_{t-1}$	0.0753	-0.0599***	0.174***	0.00311***	0.00000495
	(0.0534)	(0.0199)	(0.0521)	(0.000542)	(0.0000190)
N	11751	11731	11751	3817	6113
R^2	0.251	0.252	0.251	0.418	0.362
			Government bond yields		
$SFFP_{t-1}$	0.364***	0.366***	0.366***	0.408***	0.413***
	(0.0179)	(0.0179)	(0.0178)	(0.0318)	(0.0235)
$Bankchar_{t-1}$	2.896***	-0.233	-0.375	0.00794	0.000110
	(0.785)	(0.150)	(0.726)	(0.00700)	(0.000172)
$GBY * Bankchar_{t-1}$	0.0249	-0.00232	0.0957	0.00193	0.00000513
	(0.103)	(0.0247)	(0.176)	(0.00182)	(0.0000268)
N	11751	11731	11751	3817	6113
R^2	0.251	0.250	0.250	0.411	0.362
			GDP growth		
$SFFP_{t-1}$	0.363***	0.366***	0.366***	0.408***	0.408***
	(0.0179)	(0.0179)	(0.0178)	(0.0318)	(0.0235)
$Bankchar_{t-1}$	2.968***	-0.234*	-0.109	0.0148***	0.000111
	(0.640)	(0.123)	(0.352)	(0.00499)	(0.0000997)
$GDP * Bankchar_{t-1}$	-0.0921**	-0.0102	0.0682	-0.00145	0.000101***
	(0.0364)	(0.00819)	(0.0879)	(0.00126)	(0.0000255)
N	11751	11731	11751	3817	6113
R^2	0.251	0.251	0.250	0.411	0.365

* $p < .1$, ** $p < .05$, *** $p < .01$. Standard errors, clustered at country-month level, in parentheses. Full set of country-month dummy variables $\lambda_{j,t}$ included in all models.