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

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Abstract

The post-2008 period in the euro area was characterised by sharp dispersion in borrowing costs faced by firms, across both countries and firm types. This dispersion was an important manifestation of the "financial fragmentation" which hampered the smooth transmission of accommodative monetary policy. Using bank level data from 2007 to 2015, we directly measure the borrowing cost dispersion across firm types by calculating the difference in the interest rate charged by the same bank in the same month for loans to small and large firms (the "Small Firm Financing Premium", SFFP). We assess the role played by both bank and macroeconomic factors in explaining the variation in the SFFP across countries and through time. We provide evidence that bank market power, sovereign bond holdings and balance sheet weaknesses led to disproportionate borrowing cost increases for small firms, and exacerbated the impact of a weak macroeconomy during this period.
Keywords: SMEs, Cost of Credit, Bank Balance Sheets, Bank Market Power
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Non technical summary

One of the most salient features of the financial fragmentation that occurred during the recent euro area crisis was the dispersion in the spread that opened up between interest rates on small and large loans, which are proxies for loans to small and large enterprises respectively. This paper analyses the determinants of this spread, which we denote as the small firm financing premium (SFFP). The SFFP is a particularly relevant concern for monetary policy makers 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 and (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, particularly in economic downturns.

1 Introduction

The Small and Medium Enterprise (SME) credit market was one of the most adversely affected segments of the economy during the recent euro area crisis, as evidenced by the increase in the level and dispersion of interest rates on new bank loans. This dispersion, or "financial fragmentation", arose along two main dimensions: firstly, cross-country variation in firm borrowing costs grew substantially; secondly, dispersion across firm size emerged, whereby there was a marked increase in "the significant mark-up on loans paid by small and medium sized enterprises compared with larger firms".[1] Financial fragmentation, driven by tensions in the macroeconomy, the sovereign bond market and the banking sector, meant that accommodative monetary policy affected firms unevenly. Alleviating this uneven transmission was a key motivation for the implementation of a wide range of unconventional expansionary monetary tools by the European Central Bank in recent years.[2] In this paper, we are the first to investigate the role of banks' balance sheet characteristics in explaining the variation across countries, banks and time in this borrowing cost differential between small and large firms, which we denote the Small Firm Financing Premium (SFFP). Using bank level data on the interest rates charged on small and large loans by the *same* bank in the *same* country in the *same* month, we can precisely identify whether these factors have disproportionately adverse effects on smaller loans versus larger loans. Moreover, we analyse how the effects of these bank level factors vary over the economic cycle.

It is long recognised that smaller firms, via their greater reliance on banks rather than capital markets for external financing, are more exposed to the bank lending channel of monetary policy (Mishkin, 1996). Recent research on the experience during the financial crisis highlights substantial heterogeneity in the way in which adverse credit supply shocks were transmitted to firms: Gambacorta and Mistrulli (2014) show that smaller, less healthy firms with weaker banking relationships that borrow from banks with less stable balance sheets suffered greater interest rate increases during the 2008-2010 period in Italy; Santos (2011) shows that more bank-dependent borrowers paid disproportionately higher interest rates when borrowing from banks more exposed to the subprime mortgage crisis in the USA. Theoretically, such findings are motivated by frameworks such as Petersen and Rajan (1995), who show that banks with greater market power or a need to rebuild capital due to balance sheet difficulties can extract a higher rents from smaller firms with fewer outside financing options and lower bargaining power. This is why we expect bank charactersitics to have a disproportionate effect on small firms.

[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] "Fragmentation led to an impairment of the monetary policy transmission mechanism with negative repercussions on access to finance, in particular for small and medium-sized enterprises. The ECB responded forcefully to these challenges with a number of standard and non-standard monetary policy measures." Speech by Peter Praet, Member of the Executive Board of the ECB, Lisbon, 18 February 2014.

By focussing on banking sector factors, our paper is related to the "the bank lending channel" literature which emphasises the important role played by banks in the transmission of monetary policy. We focus on factors that would enable or motivate banks to charge a premium on lending to certain borrowers, in particular during the recent crisis. Firstly, we investigate the impact of banks' market power on the SFFP, as weak competition has been shown to result in higher loan spreads (Van Leuvensteijn et al. (2008)). Secondly, we analyse the effect of banks' funding structure as a stable funding base should insulate firms from procyclical developments (Shin and Shin (2011)), which is particularly important in crisis times. Thirdly, to capture the stress in the sovereign market, we examine the effects of government bond holdings, which have been shown to affect credit provision during the crisis (Altavilla et al. (2015)). Finally, we investigate the extent to which banks' balance sheet weakness impacted the SFFP during the crisis, in line with Holton and Rodriguez d'Acri (2015) and Altavilla et al. (2016) who find that balance sheet impairments are crucial in explaining differences in interest rate pricing.

A number of key findings emerge from our empirical analysis. Firstly, 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). 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. Secondly, banks with a higher share of deposits in total funding charge a lower SFFP, and act to mitigate the disproportionate impact of macroeconomic stress, acting in a "shock absorption" capacity, though the result is not robust to the full suite of model specifications presented in the paper.

Thirdly, we show that the link between sovereign bond holdings and loan pricing varies substantially across countries; in countries not experiencing sovereign stresses (where government bonds are viewed as safe and liquid), we find that higher holdings of sovereign bonds lead to lower SFFP levels, while on the other hand, in countries acutely affected we find evidence that banks, through their holdings of government securities, transmit the sovereign crisis directly to smaller firms in the form of higher SFFP levels. However, after controlling for the aforementioned indicators that capture risk on

banks' balance sheet, the effect becomes insignificant, suggesting that the impact of stressed-economy sovereign holdings on the SFFP is inseparable from a more general impact of deteriorating bank balance sheet health.

Finally, we show that banks' asset impairment and market-perceived risk are translated into disproportionately higher funding costs for small firms. In terms of magnitude, we find that a one-point increase in the Non-Performing Loan (NPL) ratio is estimated to lead to 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). We show also that these balance sheet weaknesses act to amplify the effect of a weak macroeconomy on the SFFP. These findings provide additional insight to the literature on the bank lending channel and the impact of credit supply shocks to the real economy by showing that weaknesses on bank balance sheets are transmitted in a *disproportionate* way to smaller enterprise borrowers.

Gaining an understanding of the sources of this direct measure of financial fragmentation has a more general macroeconomic relevance, given the importance of small firms to European economies' employment and output. 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", suggesting that any knock-on effects to employment or investment emanating from the relative interest rate changes identified here may have significant consequences. Further, the relative reliance of European SMEs on the banking system for external financing further reinforces the potential aggregate importance of financial fragmentation in European bank credit markets.[3]

The paper proceeds as follows: Section 2 provides an overview of the relevant theory and outlines our key hypotheses; Section 3 describes our data and the empirical set-up we use; Section 4 reports results; Section 5 shows the results of robustness checks on the results; while Section 6 concludes.

2 Theory, Literature and Hypotheses

We avail of a rich set of bank-month varying control variables which are relevant in explaining variation in the SFFP. Here we outline in turn our key hypotheses and the theory and literature underpinning them.

- *H1: Banks with a greater market share will charge a higher SFFP*

[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."

A standard Industrial Organization view of the lending market would predict that when banks have more market power, firms will suffer adversely either via increased credit constraints (Carbó-Valverde et al., 2009; Ryan et al., 2014) or higher prices (Van Leuvensteijn et al., 2008; De Graeve et al., 2004). What has received less attention in the literature to date is the proposition that smaller firms should suffer disproportionately more than larger borrowers as a result of such market power. We argue that the narrower set of non-bank funding options available to smaller firms means that pricing externalities relating to bank competition are likely to impact them more than larger firms. In essence, a larger set of outside funding options for larger corporate borrowers implies a lower possibility for price increases in this market segment for banks with market power. Our testing of *H1* builds on the existing literature in a number of ways. 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 existing literature has generally 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 individual banks' market share within the same country-month.

- *H2: 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 less volatile balance sheet, and is therefore less likely in our setting to pass on a balance sheet vulnerability to the real economy in the form of a higher SFFP. This is likely to be an important factor during the crisis in the euro area, as differences in the stability of bank funding sources were highlighted by policy-makers as a source of heterogeneity in the cost of bank credit.[4]

- *H3: Banks' holdings of domestic sovereign bonds can significantly affect the SFFP, given their important role for the transmission of monetary policy*

The prediction of *H3* 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' affect their capital base. The effect of sovereign holdings on transmission

[4]See the article entitled "Recent developments in the composition and cost of bank funding in the euro area", ECB Economic Bulletin, Issue 1, 2016.

clearly depends 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 allow 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 stressed sovereign bond holdings. In line with the literature on monetary transmission, we hypothesize that higher holdings of sovereign bonds, in countries under stress, will lead to an greater pass-through of this balance sheet stress to small firms as measured by the SFFP. The importance of this hypothesis is underscored by recent literature showing that holdings of distressed sovereign bonds by banks have adversely influenced credit supply in the euro area during the recent crisis (Popov and Van Horen (2013) and Acharya et al. (2014)).

- *H4: Banks with balance sheet weakness will charge a higher SFFP*

H4 follows directly from the long literature 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; Jimenez 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. It is important to note that the lending rates being measured relate to *new loans*, meaning that the higher spread among high-NPL banks cannot simply be explained by the higher credit risk of the firms already borrowing from these banks. The mechanisms underlying this behaviour may relate to the re-pricing of risk given these banks' recent experience with impaired lending, or their need to repair profitability or capital by charging higher spreads following recent losses. As already mentioned, smaller enterprises with the narrowest set of outside funding options are most likely to remain with their existing lender, and so in line with Boot et al. (1993) and the findings of (Santos, 2011), banks that need to rebuild capital are likely to sacrifice reputational capital by reneging on their implicit commitment to not exploit their monopoly power over these borrowers.

- *H5: The impact of bank characteristics can vary depending on the macroeconomic environment*

There is reason to believe that the effect of the aforementioned bank characteristics would vary over the economic cycle. We extend on *H1*, looking at the effect of market power on the SFFP, by examining

the relationship between the premium 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.

Following on from *H2*, we posit that a more stable funding base will be "shock-absorbing", in line with Shin and Shin (2011) who note that an increased reliance on non-deposit funding sources is likely to introduce a pro-cyclical bias in financial intermediation. Therefore, where spreads are in general widening for smaller firms due to a deterioration 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.

Extending on *H3*, we assert that the "safe and liquid asset" status of banks' domestic sovereign bond holdings depends crucially on market conditions and can be eroded when conditions deteriorate. In line with recent studies by Altavilla et al. (2015) and De Marco (2016), we posit that bank sovereign exposures are a key factor in the transmission of stress in cases where confidence in the sovereign has diminished and banks hold high levels of these bonds. Our paper is the first to test whether this propagation mechanism leads to disproportionately damaging impacts for smaller firms.

Building on *H4*, we examine whether banks' riskiness has a particularly negative effect on their capacity to lend during periods of crisis in line with Gambacorta and Marques-Ibanez (2011). 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. In all cases, *H5* is tested empirically by interacting each of the bank-level factors covered in *H1* to *H4* with each of three macroeconomic control variables: the unemployment rate, the ten-year sovereign yield and the GDP growth rate.

3 Empirical Set-up and Data Description

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 endogeneity 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.[5] 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

[5] If certain banks specialize in new lending activity to certain segments of the enterprise lending market, for example riskier firms, it may be possible that some variation in the SFFP that emanates from the demand-side would not be captured by the country-month fixed effects. However, in order for this type of bank-borrower sorting to be problematic for the interpretation of our estimates as credit *supply* effects, it must hold that (a) banks sort more into high-risk lending among small firms than among larger firms in the same month (given that the SFFP is measured as the borrowing cost *differential* between two enterprise types) (b) this asymmetric sorting on new lending activity must also be correlated with our measures of market power, stable funding, sovereign holdings or balance sheet weakness. Other papers using these data have likewise controlled for borrower riskiness using macroeconomic variables (Altavilla et al. (2016)). The usage of a full vector of country-time dummies represents the most stringent version, in terms of the variation being saturated, of this approach.

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 $X_{j,t-1}$.

The dataset we use to estimate these equations includes balance sheet and interest rate information on 180 euro area monetary financial institutions (MFIs) over 95 months from August 2007 to June 2015. It comprises data from market sources matched with information from two Eurosystem datasets: the individual MFI interest rate statistics (iMIR) and the individual balance sheet items (iBSI) datasets collected by the ECB.[6] Once matched, the banks in our dataset account for around 60% of the total assets of the banking sector of the 12 countries included. 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 and non-stressed economies used in this paper is also outlined in the table. We define a "stressed" economy as one which experienced a ten-year sovereign bond yield above five per cent at any point during our sample period. This section describes how both the bank level variables and the macro variables evolved across the euro area over different periods.

As already mentioned, 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.[7] 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

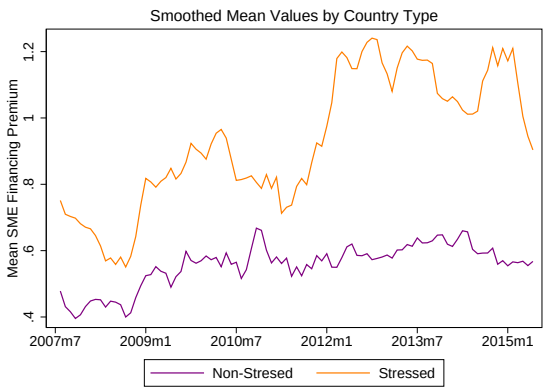
[6] For more information on these data please see Morandi and Bojaruniec (2016).

[7] 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.

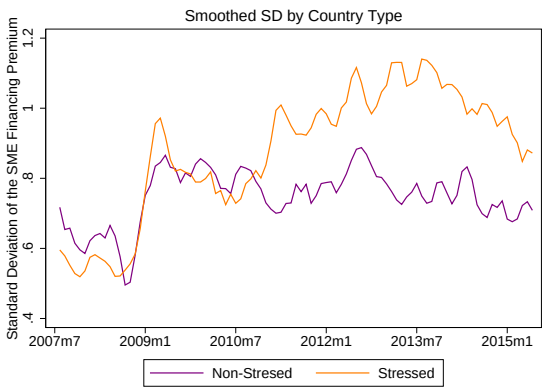
bank level data allows us to also highlight that the standard deviation within both stressed and non-stressed areas also increased during the period, suggesting that even with groups of similar countries, variation in the SFFP has heightened during this period of "financial fragmentation".

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[8], 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.[9] The

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

[9] Stressed countries began the period with a relatively higher share of NFPS deposits in main liabilities

greatest differences can be seen in the measures of balance 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 *H1*, *H2*, *H3* and *H4*, 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. 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 *H1*. 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).

H2 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

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.

of column (2) that *H5* 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 *H5* in relation to funding using interaction terms will be provided below.

H3 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 hinder the transmission of policy depending on the fluctuations in particular sovereign markets. This also provides initial evidence for *H5*, that banks' bond holdings are a propagating mechanism between macro-financial crises and firms in the real economy.

Finally, *H4* 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 5 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 *H1*, *H2* and *H3* simultaneously. Due to the fact that data are unavailable for some banks for both measures used to test *H4*, 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

H1, is highly robust to the inclusion of additional control variables. *H2*, 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 *H3* 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 *H4* 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.

With reference to stressed countries, shown 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 again becomes statistically insignificant when other variables are included. 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. *H4* 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 *H1* and *H3*: 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 *H1* are stronger in stressed economies, providing us with initial suggestive evidence in favour of *H5* 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 *H1* and *H3* across all economies and *H4* 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 reports the estimation results from the specification in equation 2, in turn testing each of *H1*, *H2*, *H3* and *H4* 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. When the interactions are significant, predicted values of the SFFP are shown in Tables 7, 8 and 9 for high, medium and low values of unemployment, government bond yields and GDP growth respectively, to illustrate the magnitude of the effects.

In column (1) of Table 6, we find supportive evidence for *H5* as relating to *H1*, 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. Table 7 shows that when unemployment is low, the SFFP is around 70 basis points higher for banks with higher market share, but when unemployment is high this difference increases to almost 120 basis points. Similarly, in panel (C) of Table 6 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. Estimates in Table 9 show that for banks with a high market share, the SFFP spread is 124 basis points when GDP growth is high, and this increases to 150 basis points when GDP growth is low. 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 Table 6 column (2), panel (A), focussing on banks' stable funding shares, we find support for *H5* as relating to *H2*. 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. Estimates in Table 7 show that for banks with high stable funding, the SFFP does not change a lot when unemployment increases, however changes in unemployment have a big effect on the SFFP of banks with low stable funding (increases from 63 basis points to 167 basis points when unemployment goes from low to high). The hypothesis 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 Table 6 column (3), we find support for *H5* as relating to *H3* 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. As shown in Table 7, when unemployment is high the SFFP increases when domestic sovereign bond holdings go from low to high (103 basis points to 130 basis points); conversely, when unemployment is low higher holdings of domestic sovereign bonds lead to decreases in the SFFP (from 61 basis points to 38 basis points). 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 Table 6 column (4), *H5* as relating to *H4* receives strong support: in all three panels, a higher NPL ratio acts to accentuate the link between a macroeconomic deterioration and a higher SFFP. For instance, as shown in Table 8, when sovereign bond yields are low, the SFFP is less than 30 basis points higher at banks with high NPLs as compared to banks with low NPLs, but this difference increases to around 70 basis points when sovereign bond yields are high. 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 *H5* as relating to *H4*.

To summarise the findings on bank-macroeconomy interactions, we show that the effect of market power on the SFFP is indeed accentuated in times of macreconomic stress, 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 when looking at levels of unemployment. Higher holdings of domestic sovereign bonds only lead to higher SFFP when macroeconomic stress increases, 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, 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.

5 Robustness Checks - Lagged Dependent Variable

To investigate whether the dynamic properties of the SFFP have an impact on our results, 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 from Table A1 that our main findings hold. Firstly, we can see that: i) banks with greater market power charge a higher SFFP (*H1*) ii) that stable funding leads to lower SFFP, particularly in stressed economies (*H2*) 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 (*H3*) and finally iv) that balance sheet weakness captured by NPLs leads to higher SFFP (*H4*). 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 ii) higher stable funding leads to lower spreads as macroeconomic conditions deteriorate, as shown for unemployment iii) increasing government bond holdings lead to a higher SFFP as the economy deteriorates, as reflected in the changes for unemployment and finally iv) the effect of balance sheet weakness is exacerbated when the economy declines, as reflected in the findings for NPLs.

6 Conclusion

The recent crisis period in the euro area was characterised by an increased dispersion in enterprise borrowing costs both across firm types and across countries. This heightened "financial fragmentation" within the currency area was at the forefront of policy thinking regarding the need for additional monetary stimulus in recent years. 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 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 *premium* 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 findings suggest an important role for bank heterogeneity in explaining the increased financial fragmentation across countries and firm types experienced in the euro area in the post-2008 period.

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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)
$MarketShare_{t-1}$	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)
$StableFunds_{t-1}$	-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)
$DomGovBonds_{t-1}$	-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)
$NPLRatio_{t-1}$		0.0252***			0.0353***			-0.00379	
		(0.00595)			(0.00697)			(0.00974)	
CDS_{t-1}			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: Predicted values of the SFFP based on unemployment interactions from Table 6

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: Predicted values of the SFFP based on government bond yield interactions from Table 6

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: Predicted values of the SFFP based on GDP growth interactions from Table 6

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.

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