The impact of sovereign debt exposure on bank lending: Evidence from the European debt crisis

Alexander Popov
European Central Bank

Kaiserstrasse 29, D 60311 Frankfurt am Main, Germany
Telephone: +49 69 13448428, Fax: +49 69 13448552
E-mail: alexander.popov@ecb.int

Neeltje Van Horen
*De Nederlandsche Bank**

Westeinde 1, 1017 ZN Amsterdam, the Netherlands
Telephone: +31 20 5245704, Fax: +31 20 5242500
E-mail: n.van.horen@dnb.nl

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Abstract

Using loan-level data, we find that syndicated lending by European banks with sizeable balance sheet exposures to impaired sovereign debt was negatively affected after the start of the euro area sovereign debt crisis. We also observe a reallocation away from foreign (especially US) markets. The overall reduction in lending is not driven by changes in borrower demand and/or quality, or by other types of shocks to bank balance sheets. The slowdown in lending is lower for banks that reduced their debt holdings in the later stages of the crisis, pointing to potential positive effects of central bank assets purchase programs.

JEL classification: E44, F34, G21, H63.

Keywords: Sovereign debt; bank lending; international transmission.

1. Introduction

The sovereign debt crisis which erupted in the euro area in 2010 has sent ripples through the global banking system and prompted interventions by governments and central banks on a scale comparable to the programs implemented during the financial crisis of 2008-09. European authorities have pledged funds in the neighbourhood of €1 trillion for the recapitalization of troubled euro area governments. The European Central Bank (ECB) has injected unprecedented amounts of liquidity into the euro area banking system, to mitigate the consequences of the banking sector's balance sheet exposure to deteriorating sovereign debt. The consequences of the euro area sovereign debt crisis have reached far beyond Europe's borders, with the IMF calling it "the most immediate threat to global growth".[1]

The consequences of the sovereign debt crisis, however, are not yet well understood and many questions have been raised regarding the link between sovereigns and banks. One question high on the policy agenda is whether tensions in euro area government bond markets are transmitted internationally through the bank lending channel. We go to the heart of this question by examining the impact of balance sheet exposure to impaired foreign sovereign debt on lending by banks active in the syndicated loan market. For a sample of 34 banks, domiciled in 11 non-GIIPS[2] European countries, for which data on exact exposures to GIIPS sovereign debt are available, we analyse the effect of the deteriorating value of this exposure on the volume of loans extended, as well as on the composition of banks' loan portfolios. In the process, we make sure that our tests are not contaminated by changes in borrower demand and/or quality at the country, country-

[1] International Monetary Fund (2012).

[2] Throughout the paper, we use the abbreviation GIIPS to denote the five euro area countries whose access to government bond markets became most impaired during the crisis, namely, Greece, Ireland, Italy, Portugal, and Spain.

industry, and even firm level, by other types of shocks to bank balance sheets, or by unobservable time-invariant bank characteristics, such as propensity for risk taking.

European banks tend to hold a large amount of government debt securities on their balance sheet. One of the main reasons for this is that the Capital Requirements Directive (CRD), which translated the Basel Accords into European law, allows for a 0% risk weight to be assigned to government bonds issued in domestic currency. Moreover, the CRD exempts government debt issued in domestic currency from the 25% limit on large exposures that applies to all other asset holdings. Because in the case of euro area banks the special treatment of sovereign debt applies to all debt issued in euros, banks hold sizeable amounts of debt issued by foreign (mostly euro area) sovereigns. BIS data suggest that banks' exposure to the public sector of foreign countries ranges from 75% of Tier 1 capital for Italian and German banks to over 200% for Belgian banks (Bank for International Settlements, 2011). This also includes exposure to the GIIPS. The European sovereign debt crisis thus provides for an ideal experiment to examine how exposures to foreign sovereign debt impact bank lending, both domestically as well as across borders.

In theory, one can distinguish two channels through which increased riskiness of foreign sovereign debt held on banks' portfolios can lead to a reduction in the supply of bank credit. First, losses on bank capital can have a direct negative effect on the asset side of the bank's balance sheet and on the profitability of the bank, with adverse consequences for the cost and availability of funding (Gertler and Kiyotaki, 2010). In addition, expected losses on sovereign bonds can raise concerns about counterparty risk. For example in the wake of the European sovereign debt crisis market counterparties (particularly US money market mutual funds) became concerned about the risk of lending to banks with significant exposures to sovereigns facing fiscal and growth pressures. This led to a sharp retraction of money market mutual funds' exposure to European banks (International Monetary Fund, 2010). Second, sovereign debt is often used by banks as collateral to secure wholesale funding. Higher sovereign risk can therefore reduce the eligibility of collateral, and hence banks' funding capacity.

Figure 1 shows the evolution of syndicated lending between 2007 and 2011. On a quarterly basis, global syndicated lending peaked in 2007:Q2 at €636.7 billion, then collapsed during the global financial crisis to a quarter of that in 2009:Q3, and then recovered to almost its pre-crisis levels in 2011:Q4. However, the recovery in lending by European banks was much less pronounced, with quarterly lending in 2011:Q4 still 25% lower than in 2007:Q2. Figure 2 suggests that balance sheet exposure to impaired sovereign debt by a number of European banks could be one of the reasons behind this slow recovery. It plots the evolution of total syndicated lending by 34 European banks from non-GIIPS countries over the period 2009:Q3 to 2011:Q4. *Non-affected* contains the group of banks whose end-of-2010 exposure to GIIPS debt is below the median level, and *Affected* contains the group of banks whose exposure is above the median level. The figure shows that up until 2010:Q3, there were no significant differences in the rate of change of syndicated lending by both groups. After the crisis intensified with the Greek government securing a €110 billion bailout loan from the EU and the IMF in mid-2010,[3] loan growth by non-GIIPS European banks exposed to GIIPS sovereign debt has been substantially lower than lending by non-GIIPS European banks not exposed to GIIPS sovereign debt.

Our empirical analysis confirms that there is a direct link between deteriorating creditworthiness of foreign sovereign debt and lending by banks holding this debt on their balance sheet. When using our preferred econometric specification, we find that after 2010:Q3, affected banks increased lending by 23.5% less than non-affected banks, suggesting that exposure to toxic GIIPS sovereign debt mooted the post-financial crisis recovery in syndicated lending. This is true when controlling for both time-varying bank characteristics and for bank fixed effects, as well as after including borrower country-quarter fixed effects which control for unobservable borrower demand and/or quality at the country level. Our results are not driven by the measurement and timing of the

[3] This was followed by a €85 billion rescue package for Ireland in November 2010 and by a €78 billion rescue package for Portugal in May 2011.

sovereign debt exposure or by how we date the start of the crisis; and they are not driven by currency valuation effects. Importantly, our main result is robust to the concurrent operation of a number of alternative mechanisms, such as balance sheet exposure to the bank's own sovereign, pressure to deleverage in government-supported banks, systematic differences in business models across banks, and exposures to the real sector in the countries under stress. Furthermore, our results continue to hold when controlling for demand at the industry and firm level.

When assessing how banks when exposed to impaired sovereign debt rebalance their portfolio, we find evidence of a European bias whereby banks affected by the sovereign debt crisis reduce lending to all markets with the exception of non-GIIPS European ones. Furthermore, we find that affected banks adjust especially their lending to the US. Finally, our results suggest that in the initial stages of the crisis carry trade-type behaviour by a number of banks loading on high-yield debt may have arrested the slowdown in overall lending. In the later stages of the crisis the asset purchase program of the ECB may have had a similar effect by allowing banks to reduce their overall exposures once the default risk on sovereign debt previously considered to be safe (such as Spanish or Italian debt) became relatively high.

Our results are consistent with the existence of an international transmission of financial shocks through the balance sheets of multinational banks. It therefore adds to the literature that has shown that banks transmit negative shocks to their capital both domestically (Kashyap and Stein, 2000; Jimenez, Ongena, Peydro, and Saurina, 2012) as well as across borders (Peek and Rosengren, 2000; Cetorelli and Goldberg, 2011; De Haas and Van Horen, 2012; Giannetti and Laeven, 2012a; Popov and Udell, 2012; Schnabl, 2012; Ongena, Peydro, and Van Horen, 2013). We add to this literature by studying a specific channel of transmission, namely, the impact of exposure to impaired government debt on overall bank lending. Our results show a clear link between the supply of credit to (in particular foreign) corporates and foreign sovereign debt problems, suggesting that the European sovereign crisis has important cross-border implications for the real economy through the bank lending channel.

Second, our paper adds to the growing literature on the linkages between sovereigns and banks, especially with respect to the propagation of the European sovereign debt crisis. Angeloni and Wolff (2012) find that European banks' stock market performance was impacted by exposures to GIIPS sovereign debt. In addition, Arezki, Candelon, and Sy (2011) show that news on sovereign ratings affected bank stock prices in Europe during the period 2007-2010. They also find that rating downgrades near speculative grade had significant spillover effects across countries. Using a larger sample of countries and a longer time period, Correa, Lee, Sapriza, and Suarez (2012) find that sovereign rating changes impact bank stock returns, especially in the case of downgrades. Similarly, studying correlations in changes in CDS spreads of European sovereigns and banks, Acharya and Steffen (2012) uncover carry trade-type behaviour during the crisis whereby banks with access to short-term unsecured funding in wholesale markets undertake longer sovereign bond positions, hoping to pocket the spread between long-term bonds and short-term funding costs.[4] Our paper contributes to this literature by studying the link between increased riskiness of foreign sovereign debt and bank credit supply.

Our paper also contributes to the literature which studies the impact of a deterioration of sovereign creditworthiness on the availability of credit. Most studies focus on the impact of a sovereign debt crisis on sovereign borrowing (see, among others, Eichengreen and Lindert, 1989; Ozler, 1993; Gelos, Sahay, and Sandleris, 2004; Tomz and Wright, 2005). A small (emerging) literature, however, studies the effect of sovereign debt crises on bank lending to corporates. Arteta and Hale (2008), for example, find that sovereign debt crises in emerging markets lead to a decline in foreign credit to domestic private firms, both during debt renegotiations and in the period after debt restructuring

[4] Several other papers examine how a deterioration of the fiscal position of the own sovereign affects banks. Brown and Dinc (2011) provide evidence that a country's ability to support its financial sector, as reflected in its public deficit, affects its treatment of distressed banks. Demirguc-Kunt and Huizinga (2013) find that in 2008 systemically large banks saw a reduction in their market valuation in countries running a large fiscal deficit as these banks became too big to save.

agreements are reached. In the context of the euro area sovereign debt crisis, Bofondi, Carpinelli, and Sette (2013) show that following tensions in sovereign debt markets, lending by Italian banks grew by 3 percentage points less than lending by foreign banks in Italy, and that the interest rate they charge has been between 15 and 20 basis points higher. Correa, Sapriza, and Zlate (2012) find that the branches of European banks in the US experienced a run on their deposits and reduced their lending to US entities. Ivashina, Scharfstein, and Stein (2012) show that money-market funds sharply withdrew funding for euro area banks when the sovereign debt crisis started, leading to a decline in dollar lending relative to euro lending. De Marco (2013) shows that aggregate lending declined for banks with balance sheet exposure to impaired sovereign debt. Relative to these papers, we make use of both data on actual bank exposures to impaired sovereign debt and of loan-level data which allows us to better disentangle demand from supply. In addition, we study the global transmission of deteriorating sovereign creditworthiness through the lending behaviour of multinational banks.

Finally, our work adds to an emerging literature that uses syndicated loan data to explore the impact of financial crises on bank behaviour. Focusing on domestic lending in the United States, Ivashina and Scharfstein (2010), Santos (2011), and Bord and Santos (2012) show that the 2007-09 global financial crisis led to a sharp drop in loan supply, an increase in spreads, and a higher cost of liquidity for corporates. De Haas and Van Horen (2012) and Giannetti and Laeven (2012a) show that funding constraints forces banks to reduce cross-border lending. Furthermore, Giannetti and Laeven (2012b) find that while international active banks sharply reduce their lending abroad during a financial crisis, they increase the proportion of new credit to borrowers at home, a flight-home effect. Complementing this finding, De Haas and Van Horen (2013) show that during the global financial crisis international banks reallocated their foreign portfolio towards markets that are geographically close, where they had more lending experience, where they operated a subsidiary, and where they were integrated in a network of domestic co-lenders. We add to this literature by using the euro area sovereign debt crisis as a trigger event to examine

how banks adjust their syndicated lending in response to tensions in government bond markets.

The rest of the paper is organized as follows. Section 2 introduces the empirical strategy. Section 3 describes the data used in the paper. Section 4 reports the main results as well as a battery of robustness tests. Section 5 provides some further insights in how banks adjust their syndicated lending when affected by increased riskiness of foreign sovereign debt on their balance sheet. Section 6 concludes with the main messages of the paper.

2. Empirical methodology

The goal of this paper is to identify the effect of tensions in government bond markets on lending by banks with balance sheet exposure to impaired foreign sovereign debt. When foreign sovereign debt is downgraded, banks' balance sheets are weakened and profitability is reduced. Furthermore, the eligibility of this debt to use as collateral to secure wholesale funding diminishes. Finally, especially when exact exposures are unknown, counterparty risk is increased. These factors affect the bank's funding capacity and therefore likely their ability and willingness to extend credit.

To examine the link between exposure to impaired foreign sovereign debt and bank lending, we model syndicated loans issued by bank *i* to borrowers in country *j* during quarter *t* as follows:

$$Log(Lending_{ijt}) = \beta_1 Post_t \times Affected_i + \beta_2 X_{it} + \beta_3 \varphi_i + \beta_4 \eta_{jt} + \varepsilon_{ijt} \quad (1)$$

Here $Affected_i$ is a dummy variable equal to 1 if bank *i* is in the top half of the sample in terms of exposure to GIIPS debt, and to 0 otherwise; $Post_t$ is a dummy variable equal to 1 on and after 2010:Q4, and to 0 otherwise; X_{it} is a vector of time-varying bank-level control variables; ϕ_i is a bank fixed effect; η_{jt} is a matrix of borrower country fixed effects and quarter fixed effects; and ε_{ijt} is an idiosyncratic error term. $Affected_i$ and

$Post_t$ are not included in the specification on their own because the effect of the former is subsumed in the bank fixed effects, and the effect of the latter is subsumed in the quarter fixed effects.

Our coefficient of interest is β_1. In a classical difference-in-differences sense, it captures the change in lending, from the pre-treatment to the post-treatment period, for the treatment group (affected banks) relative to the control group (non-affected banks). A negative coefficient β_1 would imply that all else equal, lending increased less (decreased more) for the group of affected banks. The numerical estimate of β_1 captures the difference in the change in lending between the pre- and the post- period induced by switching from the control group to the treatment group.

In our main tests, we use bank GIIPS exposures as of December 2010 to construct the two groups of banks, affected and non-affected. The reason is that the data on exposures come from stress tests conducted by the European Banking Authority (EBA). EBA has made available the data on bank exposures in March and December 2010, September and December 2011 and June 2012. Given the timing of the sovereign debt crisis, it makes sense to use one of the 2010 exposures to determine which banks are affected. We choose the December 2010 data because information on exposures is available for more of the banks in our dataset (34 vs. 27). However, in robustness tests we use March 2010 exposure levels as well.

Our sample period is 2009:Q3 – 2011:Q4. We choose 2011:Q4 as the end point of the sample period in order not to have our main results contaminated by the ECB's unprecedented long-term refinancing operation introduced in December 2011.[5] The start of the period is chosen in order to exclude the unprecedented collapse in syndicated lending during the global financial crisis (see Figure 1). In our main tests we construct

[5] See details in Section 4.3.2.

the $Post_t$ variable such that it takes on a value of 1 from 2010:Q4 onwards. While the fact that the exposures are measured in December 2010 makes it more logical to start our post- period in 2011:Q1, our choice is driven by a number of factors. First, it makes the sample period symmetric, with five pre-crisis and five post-crisis quarters. Second, we split the banks in two groups (affected and non-affected), and so all that matters is the relative ranking of banks. Given that, based on exposure data, only two banks switch groups between 2010:Q1 and 2010:Q4, it is safe to assume that the same banks that were affected based on December 2010 exposures were also affected at the beginning of the 2010:Q4 period. Nevertheless, we also formally test for the possibility that 2011:Q1 is the correct start of the post- period, and our results are qualitatively unchanged.

The vector of bank-level controls X_{it} allows us to capture the independent impact of various bank-level developments, such as sudden losses on the bank's loan portfolio or changes in bank size. In our preferred specification we also include bank fixed effects and borrower country-quarter fixed effects. By including bank fixed effects, we address the possibility that both the amount of loans extended and the bank's holdings of impaired foreign sovereign debt are driven by a time-invariant bank-specific unobservable factor, such as managerial risk appetite. By including the interaction of borrower country fixed effects and quarter fixed effects we aim at alleviating concerns that our results might be driven by time-varying differences in the demand for syndicated loans or by differences in borrower quality (at the country level) in the various borrower countries. In alternative specifications, we also employ less rich sets of fixed effects: quarter fixed effects (to control for time-specific changes in the syndicated loan market due to changing conditions in the global economy) and borrower country fixed effects (to control for time-invariant differences in the demand for syndicated loans and quality of the borrowers) without interacting them. Finally, since banks' portfolio allocation exhibits geographical specialization and is therefore correlated over time, we cluster the standard errors at the bank level.

3. Data and descriptive statistics

Our identification strategy is built on exploiting differences between banks over time with respect to their exposure to impaired foreign GIIPS debt. An analysis like this needs to be based on high-frequency bank-level data, and data on syndicated lending are particularly well-suited for this purpose for several reasons. First, syndicated loans (loans provided by a group of financial institutions - mostly banks - to a corporate borrower) are publicly registered, and so information on the universe of loans is readily available, limiting sample selection concerns. Second, syndicated lending has been an important source of external finance to corporates since the 1980s, and so information is available for an extended period of time. Third, borrowers from many countries are borrowing in the syndicated loan market from a large number of financial institutions. As such, the dataset provides us with information on lending by a large number of banks to a large number of countries. This characteristic is crucial for two reasons. First, it allows us to exploit differences between banks with respect to their exposure to impaired GIIPS debt. Second, as our goal is to identify a credit supply channel it is important to be able to control for changes in credit demand and borrower quality. Given that in the syndicated loan market multiple banks lend to the same country, we can use (time-varying) borrower-country fixed effects to control for this. This technique for isolating credit supply was first introduced by Khwaja and Mian (2008) and is now often applied in these types of studies (e.g., Cetorelli and Goldberg, 2011; De Haas and Van Horen, 2012, 2013; Schnabl, 2012).

We begin by identifying a group of banks that are both active in the market for syndicated loans and for which information is available on their exposure to GIIPS sovereign debt. To this end we first identify all European banks active in the syndicated loan market over the period July 2009 – December 2011. This list includes 119 banks. Next, we cross-check this list with the banks included in the stress test conducted by EBA. Since 2010, the EBA conducts annual stress tests on large European banking groups and publishes this information, including their exposure to GIIPS sovereign debt. This leaves us with a group of 59 European banks. In the final sample selection step, we

exclude all banks from Greece, Ireland, Italy, Portugal, and Spain. The reason is that for banks in impaired countries, it is difficult to disentangle the direct effect of balance sheet exposure to impaired debt from the indirect effect of the weakening safety net for the financial sector. This leaves us with a set of 34 banks in non-GIIPS European countries. In total these banks are responsible for about 71% of the syndicated lending issued by the 119 banks in our initial sample.

Our data source for syndicated loans is the Dealogic Loan Analytics database, which contains comprehensive information on virtually all syndicated loans since the 1980s. We download all syndicated loans extended to non-financial corporates worldwide, focusing on the period from July 2009 to December 2011. Our unit of observation is the volume of syndicated loans issued by bank *i* to borrowers in country *j* during quarter *t*. To this end, we split each loan into the portions provided by the different syndicate members. Loan Analytics provides only exact loan breakdown among the syndicate members for about 25% of all loans. Therefore, we use a procedure similar to the one applied by De Haas and Van Horen (2012, 2013) and divide the loan equally among the syndicate members. In total we split 5,862 syndicated loans in which at least one bank in our sample was active into 17,213 loan portions provided by our sample of banks.[6]

We then use these loan portions to construct our main dependent variable *Lending* . For each bank in our sample, we compute the total amount of loans that the bank issued during each quarter to a particular country. Our dependent variable is (1 plus) the log of this quarterly loan flow. As is common in this literature, we attribute to each bank (including subsidiaries) the nationality of its parent bank (see, e.g., Mian, 2006; Giannetti and Laeven, 2012b).[7] We exclude bank-country pairs between which no lending took place over the sample period.

[6] In section 4.3.2 we provide robustness tests that indicate that our results remain unchanged when we use a different assignment of the loan amount or when we study the number of loans issued by each bank.

[7] Note that only about 6% of all loan portions are provided by subsidiaries.

In total our group of 34 banks issues loans to corporates in 146 different countries (both advanced economies and emerging markets). The variation across lending banks and borrowing countries is quite large. There are 4,323 non-zero bank-borrower country-quarter observations (39.1% of the total). Average quarterly bank-country lending is 98 mln. euro with a standard deviation of 413 mln. euro. All banks in our sample lend to domestic firms, and banks lend on average to 58 foreign countries during the sample period. The majority of lending is within Western Europe (53%) and of this 11% to the GIIPS countries.

Our objective is to study the impact of exposure to foreign sovereign debt on bank lending. In order to do this we create a variable capturing the degree to which bank *i* is exposed to GIIPS sovereign debt. The variable $GIIPS \quad Exposure$ is calculated using data from the EBA on each individual bank's holdings of GIIPS debt securities as of December 2010, normalised by the bank's total assets as of December 2010. We specifically want to account for the fact that the underlying sovereign risk affects a bank's holdings of sovereign debt securities through the prices investors are willing to pay for insuring this risk. Therefore we weigh the holdings by bank *i*'s debt securities of each individual foreign GIIPS country by the average CDS spread of that country's sovereign debt over 2010:Q4. In particular,

$$GIIPS \quad Exposure_{it} = \sum_{k} \frac{Debt \quad Securities_{ikt} \times CDS_{kt}}{Total \quad Assets_{it}}, \tag{2}$$

where $t = December\ 2010$ and

$$k \in \{Greece, \ \ Ireland, \ \ Italy, \ \ Portugal, \ \ Spain\}$$

We then construct the dummy variable $Affected_i$ by splitting the sample of 34 banks in two equal groups and assigning it a value of 1 for each bank in the top half in terms of GIIPS exposure.

By construction, our measure of risk includes a quantity component (the nominal value of debt holdings) and a price component (the premium investors need to pay in order to insure against losses). Thus it is possible for two banks with very different risk profiles to end up with the same value of *GIIPS Exposure* if one holds a large quantity of relatively safe debt and the other holds a small quantity of relatively risky debt. We revisit this in Section 4.3 where we distinguish banks only based on their holding of debt issued by the government of Greece which in 2010 was already close to default.

[INSERT TABLE 1 HERE]

We also include a number of time-varying bank characteristics to capture the effect on lending of other types of shocks to bank balance sheets. To this end, we link our banks to Bureau van Dijk's BankScope database. We include as bank characteristics the total assets of the bank (*Size)* to capture changes in bank size, and three variables that capture (changes in) bank health that may be unrelated to sovereign stress: the Tier 1 capital ratio (*Tier 1)*, the share of impaired loans to total assets (*Impaired loans*), and net income of the bank normalized by total assets (*Net income*). All bank-level variables are measured at year end prior to loan signing.[8] Table 1 shows definitions and summary statistics of all variables used throughout the paper and indicates that the median bank in the sample has €676.8 billion in assets, is well-capitalized with a Tier 1 capital ratio of 10.6, has positive net income and a relatively small share of impaired loans. However, a number of banks in the sample record negative net income, as well as a very high share of impaired loans to assets (a high of 9.3%). To the degree that such balance sheet weaknesses are correlated with sovereign debt exposure, it is important to formally control for them.

Table 2 illustrates the difference between affected and non-affected banks with respect to a number of variables (all measured in 2009). Affected banks are on average

[8] In unreported regressions, we confirm that our results are not affected when we use quarterly balance sheet data. We prefer to use annual data as quarterly data are not available for all banks and if they are available they are only available from 2008 onwards.

smaller and have a marginally lower Tier 1 capital ratio. They also have negative net income while non-affected banks' net income is on average zero. Affected banks on average also lend more and are relatively more focused on domestic lending. None of these differences is significant in a statistical sense, however. The only statistically significant difference is related to the fact that lending to GIIPS countries is a considerably higher share of overall lending for affected banks, even though they are not domiciled in GIIPS countries. We formally address this in Section 4.3.

[INSERT TABLE 2 HERE]

Appendix Table 1 provides a list of all the banks in our sample. It shows each bank's country of incorporation and the total lending volume of the bank during the pre- and post- periods and the changes therein. In addition it provides each bank's *GIIPS Exposure* at 2010:Q4 and whether the bank is included in the group of affected or non-affected banks. The table demonstrates that there is substantial cross-country, but also within-country, heterogeneity in the degree of balance sheet exposure to GIIPS debt. For example, there are both affected and non-affected banks in Austria, Germany, Netherlands, and the UK, while all French banks are affected and none of the Swedish banks are. Appendix Table 2 gives a finer breakdown of nominal exposures by GIIPS country. The ratio of GIIPS debt securities to total assets ranges from 0 for DNB Bank ASA (Norway) to 7.44% for BCEE (Luxembourg).

4. Empirical evidence

4.1. Main results

The main results of the paper are reported in Table 2. We estimate a number of different variations of Model (1). In column (1), we include bank, quarter, and borrower country fixed effects, but do not control for time-varying bank characteristics. The estimate of coefficient β_1 is statistically significant (at the 1% level), and economically meaningful. Given that total syndicated lending increased between the pre- and the post-crisis period, the magnitude of the coefficient indicates that syndicated lending increased

on average by 30.9% less for the group of banks that were significantly exposed to GIIPS debt. Because the specification includes bank fixed effects, quarter fixed effects, and borrower country fixed effects, it is unlikely that our results are driven by unobservable time-invariant bank heterogeneity, by global changes in the syndicated loan market, or by time-invariant differences in borrower demand and/or quality.

[INSERT TABLE 3 HERE]

The rest of the table demonstrates that the effect is robust to using alternative econometric specifications. In particular, lending is bounded from below at 0, and 6,747 of the 11,070 bank-borrower country-quarter observations during the 2009:Q3-2011:Q4 sample period (60.9%) correspond to zero lending. Throughout the paper we estimate the regression model using OLS because of the high number of dummy variables which may create problems with maximum likelihood estimation. Nevertheless, in column (2) we use a Tobit model to take into account that the dependent variable is left-truncated. The estimates indicate that the negative effect of balance sheet exposure to impaired sovereign debt is not due to systematic differences in that dimension across banks.

A possible concern regarding our estimates so far is that we have simply captured changes in the demand for loans between the pre and post period which may have declined relatively more in countries that borrow more from our group of affected banks. We now use a within-country estimator to alleviate this concern. To that end, in column (3) we replace the quarter and borrower country fixed effects with borrower country-quarter fixed effect interactions. The idea is to compare an affected and a non-affected bank lending to the same country at the same point in time. This allows us to control for time-varying borrower demand and/or quality at the country level, and to alleviate concerns that our results so far have simply captured changes in the demand for loans. The estimates fully confirm our previous results, but the numerical estimates are somewhat lower than those in the tests with a less rich set of fixed effects.

In column (4), we report the estimates from our preferred specification. This time, we not only include bank fixed effects and borrower country-quarter fixed effects, but also bank balance sheet data. This allows us to account for time-varying shocks to the bank's financial health unrelated to its exposure to impaired GIIPS debt. In particular, we include the logarithm of bank assets, the bank's Tier 1 capital ratio, the ratio of impaired loans to total assets, and the ratio of net income to assets. In order to account for the fact that the response to accounting variables may not be immediate, we use 1-year lags in the regression.

Importantly, our estimate of β_1 continues to be negative and economically meaningful. The magnitude of the coefficient implies that during the post-crisis period, syndicated lending increased on average by 23.5% less for the group of banks that were significantly exposed to GIIPS debt than for those less exposed to GIIPS debt. Furthermore, our balance sheet variables largely have the expected sign. For example, banks with a high share of impaired loans in their portfolio lend less as they may need to rebalance their portfolio away from risky lending (Berger and Udell, 1994; Peek and Rosengren, 1997). Also, as expected, bank size (proxied by total bank assets) and lending are positively correlated, and net income and lending are negatively correlated, although in both cases the effect is not significant in the statistical sense.

4.2. Alternative explanations

We now consider a number of alternative explanations that may fully or partially account for the results reported in the previous tables. The first possibility we address is that our results are demand-driven. In particular, it is possible that within the same borrower country, low-net worth firms borrow from affected banks while high-net worth firms borrow from non-affected banks. Alternatively, the decline in credit may have come from firms switching away from banks with high GIIPS exposures, not from affected banks cutting lending. Such demand effects will not be captured by our borrower country-quarter fixed effects.

We perform two tests to address these issues. First, we re-run our main specification, this time with borrower country-industry-quarter fixed effect interactions, in addition to bank balance sheet data. The idea of this test is to control more precisely for borrower demand, by comparing lending by an affected and by a non-affected bank to the same industry (e.g., agriculture) in the same country (e.g., Turkey) at the same point in time. To that end we construct a new dependent variable, *Lending industry*, which equals the log of (1 plus) the total volume of syndicated loans issued by bank *i* to borrowers in industry *k* in country *j* at time *t*. We report the estimates from this test in column (1). Like before, we exclude bank-borrower country-industry triplets with zero lending throughout the sample period. The estimates suggest that our preferred, albeit somewhat less rich specification – the one reported in Table 3, column (4) – is a reasonable approach to accounting for demand.

Second, we isolate the sub-sample of corporates that borrowed from at least two banks in our sample during the pre- period and at least once during the post- period. There are 403 such firms for a total of 1592 bank-firm pairs. We then estimate a regression, using a linear probability OLS model, where the dependent variable, *Continued*, is a dummy variable which is equal to one if bank *i* was lending to a particular firm *q* in the pre- period and continued lending to that same firm in the post- period. Our variable of interest is $Affected_i$. Because in this set-up multiple banks – both affected and unaffected – are lending to the same firm, this specification should net our firm demand perfectly, and any difference in the estimate on $Affected_i$ should be supply-driven. We report the evidence in column (2), and it strongly suggests that our results so far are not contaminated, or even fully driven, by unobservable firm-level demand.

[INSERT TABLE 4 HERE]

Next we take into account the fact that in addition to balance sheet exposure to foreign sovereigns, banks are exposed to their own sovereign in two ways. First, they tend to hold on their balances sheet a substantial amount of sovereign debt issued by their

own government. Deteriorating creditworthiness of the bank's own sovereign will negatively affect the asset side of the bank's balance sheet, its profitability, and its ability to use this debt as a source of collateral, thereby raising funding costs. Second, owing to strong links between sovereigns and banks, sovereign downgrades often lead to downgrades of domestic banks regardless of whether their balance sheet exposure, thereby creating an additional channel through which funding costs can rise.

As a first way of addressing this concern, we excluded in all tests banks domiciled in GIIPS countries. However, the euro area sovereign debt crisis has been characterized by heterogeneity in the behavior of sovereign bond yields across non-GIIPS countries, too. For example, while in 2011 yields on German bunds went down, yields on French debt went up. If French banks are on average more exposed to GIIPS debt than German banks, we could mistakenly attribute a reduction in to balance sheet exposure to GIIPS debt while, in reality, it is due to concerns by French banks about the weakening of their domestic safety net.

To address this concern, we now explicitly control for deterioration of the creditworthiness of the bank's own sovereign. We do so by including in the model a variable capturing the bank's (time-varying) exposure to its own sovereign debt. The results of this procedure are reported in column (3) of Table 4. They strongly suggest that balance sheet exposure to the bank's own sovereign did not affect lending over that period, implying that exposure to impaired foreign sovereign debt was indeed the major reason for observed variations in lending behaviour across the banks in our dataset.

Another alternative explanation of our main result is that affected banks happen to be banks which received government support during the financial crisis. This support may have come in many different forms, ranging from the acquisition of an equity share to recapitalization to an implicit guarantee on the bank's liabilities. Consequently, the government may have exerted on these banks pressure to deleverage, potentially leading to lower lending. To account for this possibility, we collect data from a number of publicly available sources on government support programs enacted during the financial

crisis. We then create an indicator variable equal to 1 if the bank received any form of government support during the financial crisis, interact it with the dummy variable $Post_t$, and include this new interaction variable in our preferred specification. The results, reported in column (4), suggest that government support did not play a role in bank decisions to rebalance their portfolio away from syndicated lending.

Another possible concern regarding our results is that if there are different trends between affected and non-affected banks prior to the crisis (for example, because of systematic differences in risk taking between the two groups of banks), we might incorrectly interpret our results as being driven by exposure to impaired foreign sovereign debt. To test for different trends between the two types of banks we perform a placebo test in which we move our baseline sample period by three and a half years back, to 2006:Q1-2008:Q2. This results in a time period which falls fully before the beginning of the global financial crisis,[9] while at the same time we still split the banks in affected and non-affected based on 2010:Q4 exposures. If there are systematic differences in risk taking between banks based on bank characteristics unobserved by the econometrician, the estimate of β_1 in this new test should still be negative and significant. However, the estimates in column (5) imply that it is not the case. The same is true when we move the sample period such that the pre-post cut-off coincides with the beginning of the global financial crisis in 2008:Q3 (column (6)). The evidence thus strongly suggests that the effect we capture is indeed due to changes in bank behaviour specific to the sovereign debt crisis period.

The next concern we need to address is related to the fact that banks with balance sheet exposure to impaired sovereign debt may have been lending to relatively more remote or less important markets before the crisis. Then, if all banks reduced lending once the crisis started, affected banks may have reduced it more not because their

[9] The global financial crisis of 2008-09 is usually assumed to have started with the bankruptcy of Lehman Brothers in September 2008.

weakening balance sheets forced them to rebalance their portfolios, but because the relationship to their customers was weaker (De Haas and Van Horen, 2013). To address this issue, we include in column (7) only observations from bank-country pairs between which syndicated lending took place in at least 5 quarters during the 2009:Q3-2011:Q4 period. Our results continue to hold, suggesting that our main finding is not driven by the fact that affected banks systematically serve marginal foreign markets.[10]

A related concern is that affected banks were lending relatively more to borrowers in GIIPS countries before the crisis started. Recall the summary statistics in Table 2 which suggest that this is the main systematic difference between affected and non-affected banks. Consequently, affected banks may have reduced lending not because of their own balance sheet problems, but because growth opportunities in GIIPS countries collapsed as the sovereign debt crisis progressed. This effect will not be fully netted out by the borrower country-quarter fixed effects if affected banks lend mostly to GIIPS countries and non-affected banks lend mostly to non-GIIPS countries. We address this issue by excluding GIIPS borrowers from the regressions (column (8)). The estimates imply that the main result in the paper is not driven by a widening of expected returns across the two groups of banks.

It is also possible that banks are exposed to GIIPS countries not only by holding debt securities issued by the five GIIPS governments, but also by holding debt securities issued by private corporations in the five countries under stress. If the two types of exposures are correlated, then we could be overstating the effect of balance sheet exposure to impaired debt. For all the banks in our sample, the EBA also reports exposures to the real sector in the GIIPS countries in December 2010. In column (9), we explicitly control for this exposure, and it turns out to matter both economically and statistically. The effect of real GIIPS exposure, however - while statistically significant -

[10] The results are qualitatively unchanged in an alternative regression (unreported for brevity) where we only include observations from bank-country pairs between which syndicated lending took place in all ten quarters during the 2009:Q3-2011:Q4 period.

does not fully explain the lending differential between affected and non-affected banks, and the effect of balance sheet exposure to GIIPS sovereign debt on lending survives this alternative test.

One final concern is related to potential systematic differences across the two groups of banks in the currency denomination of the loans. We have converted all loans into euros before running our tests. It is possible that affected banks also happen to lend in currencies which depreciated after the sovereign debt crisis started. If so, then the reduction in lending we register may be picking a mechanical effect related to exchange rate movements. We account for this possibility by excluding from the tests all loans issued in a currency other than the euro. While the effect of balance sheet exposure to impaired sovereign debt declines relative to the benchmark (column (10)), we confirm that our main result is not driven by currency valuation effects.

4.3. Robustness tests

4.3.1. Alternative exposure measures

In the next table, we check how robust our results are to the choice of exposure data and to the criterion used to split the banks into affected and non-affected. In column (1) we utilise different data to calculate the $Affected_i$ dummy. Recall that in our baseline tests, we use the December 2010 exposure data, as reported by EBA. However, an argument can be made that the crisis started already in May 2010, when the bail-out package for Greece was agreed upon[11] and the European Financial Stability Facility was established.[12] If so, the reduction in lending would have started earlier than our baseline

[11] On May 2, 2010, the Greek government, the IMF, and euro-zone leaders agree to a €110 billion ($143 billion) bailout package that would take effect over the next three years.

[12] On 9 May 2010, the 27 EU member states agreed to create the European Financial Stability Facility, a legal instrument aiming at preserving financial stability in Europe by providing financial assistance to euro area states in difficulty. The EFSF can issue bonds or other debt instruments on the market with the support of the German Debt Management Office to raise the funds needed to provide loans to euro area countries in financial troubles, to recapitalize banks, or to buy sovereign debt. Emissions of bonds are backed by

cut-off point (2010:Q4). In addition, the December 2010 exposure data on which we base the separation of banks into affected and non-affected groups may be misleading. According to this hypothesis, depending how banks unwound their GIIPS exposures between the "true" start of the crisis and 2010:Q4, our results could be upward biased. To address this point, we recalculate the $Affected_i$ dummy based on the March 2010 exposure data reported by the EBA, and make the $Post_t$ dummy equal to 1 on and after 2010:Q2. This results in the loss of 7 banks for which there are no EBA data on exposure as of March 2010. The results are qualitatively unchanged, however, indicating that they are robust to the exposure classification criterion.[13]

[INSERT TABLE 5 HERE]

In column (2), we report estimates from a regression where the variable $Affected_i$ is calculated based on the ratio of impaired GIIPS debt to equity rather than to assets, as in the main tests. This alternative method provides a measure of risk that is more in line with regulatory requirements as it measures the bank's holding of risky assets in relationship to its capital. This test confirms that our main result does not depend on how we scale the bank's risky exposure. However, even though only two banks switch groups under this method, the numerical effect goes down with 4 percentage points, with the increase in lending by affected banks in the post-crisis period estimated to be 18.9% lower than that by non-affected banks.

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guarantees given by the euro area member states in proportion to their share in the paid-up capital of the European Central Bank. The €440 billion lending capacity of the facility is jointly and severally guaranteed by the euro area countries' governments and may be combined with loans up to €60 billion from the European Financial Stabilisation Mechanism (reliant on funds raised by the European Commission using the EU budget as collateral) and up to €250 billion from the International Monetary Fund (IMF) to obtain a financial safety net up to €750 billion.

[13] In part, this is explained by the fact that out of the remaining 27 banks, only two switch groups: ABN AMRO Bank (The Netherlands) becomes affected, and Barclays (Great Britain) becomes unaffected.

In the next column, we report estimates from a regression where our binary variable $Affected_i$ has been replaced with a continuous variable equal to the natural logarithm of exposure to GIIPS debt as defined in equation (2). One disadvantage of the variable $Affected_i$ is that it is does not allow us to calculate the effect of a marginal increase in exposure on lending. Using the continuous exposure variable, the estimate reported in column (3) implies that an increase in the riskiness of the bank's exposure to impaired debt by one standard deviation results in a 15.1% decline in lending.

Another disadvantage of the binary variable $Affected_i$ is that it is based on an arbitrary cut-off (the mid-point of the distribution of exposure). If a number of banks in the non-affected category have relatively high exposures to impaired debt, then the true effect could be attenuated. To address this issue, we now compare the two tails of the distribution of banks in terms of exposure. In column (4), we report estimates from a test where we compare banks in the top and bottom tertile of the distribution of exposures. In column (5), we compare the top and the bottom quartile. The magnitude of the estimate increases progressively, suggesting that the effect is bigger once we compare groups of banks that differ substantially in their exposure to impaired GIIPS debt.

Finally, in column (6) we address the fact that the variable $Affected_i$ is based on exposures to debt securities issued by five different countries. The main problem with this approach is that the measure of exposure to GIIPS debt calculated in (2) is based both on prices and quantities, so the same value of exposure may correspond to an exposure that is small but relatively risky (debt issued by Greece which in 2010 was already on the brink of default) and to an exposure that is large but relatively riskless (debt issued by Italy, which in 2010 was considered unlikely to default). To address this issue, we now re-classify the two groups of banks based on exposures to Greek debt only. The estimates imply that our results so far are driven mostly by the risk component rather than the quantity component of the measure in equation (2). Nevertheless, the estimate goes down numerically, implying that exposures to less risky debt, such as debt issued by Italy or Spain, plays an important role in lending decisions too.

4.3.2. Data issues, crisis cut-offs, and bank heterogeneity

A possible concern regarding our results is that they may be driven by a number of data construction choices we have made. We start by employing an alternative strategy for assigning the portions of a syndicated loan to the participating banks to the one we have used so far. Recall that whenever the exact distribution of shares in the syndicate is not recorded in the Dealogic Loan Analytics database, we divided the loan equally among the syndicate members. This procedure is similar to the one used by De Haas and Van Horen (2012, 2013). It is possible that while syndicates containing affected banks started lending less on average, the share contributed by affected banks went up. In this (unlikely) case, we would be attributing a larger-than-actual decline in lending to affected banks. To address this possibility, we employ an alternative procedure whereby we assign the full loan to the lead bank (as in Ivashina and Sharfstein, 2010; Giannetti and Laeven, 2012b). If a given loan is extended by more than one lead bank, then we assume that each lead bank extends the loan pro rata (see Giannetti and Laeven, 2012b, for details). Column (1) of Table 6 indicates that our main result is not affected by this different assignment of the loan amount. If anything, the estimate of the negative effect of GIIPS exposure on lending is economically higher than in the case where we split the loan amount equally across all banks.

[INSERT TABLE 6 HERE]

It is also possible that while lending less in total, affected banks are extending loans to more borrowers. To that end, we test for a difference between the intensive and the extensive margin by looking at the number of loans extended by bank *i* to country *j* in quarter *t*, rather than at the total volume of the loans. By doing so, we capture the frequency aspect of syndicated lending.[14] The estimate of β_1 in column (2) is still

[14] An added advantage of this dependent variable is that it contains no measurement error as all lenders in a syndicate are known.

negative, implying that part of the difference in lending between affected and non-affected banks comes from a decline in the number of loans extended by affected banks.

Another possible concern with our empirical strategy is the choice of sample period. In the main tests we focus on 2009:Q3-2011:Q4. However, this choice may overstate the effect of impaired debt holdings on lending by placing the start of the sample period right at the beginning of the post-financial crisis recovery in syndicated lending (see Figure 1). Similarly, it may overstate if by placing the end of the sample period right at the ECB's long-term refinancing operation in December 2011, whose goal was to restore lending by providing unlimited liquidity to banks.[15] To account for that possibility, in column (3) we report estimates from our baseline regression where we have extended the sample period back to 2009:Q1. In column (4) we report estimates from our baseline regression where we have extended the sample period forward to 2012:Q2. Our results are clearly not affected by the choice of start- and end-point of our sample period.

A potentially even more serious problem is the choice of cut-off for the beginning of the euro area sovereign debt crisis. The sovereign debt crisis was not characterized by a Lehman Brothers-type event in the crisis, but rather a gradual deterioration in the outlook of the five GIIPS countries. For example, Greece received a bailout from the EC and the IMF in May 2010; Ireland received one in November 2010; Portugal agreed on a bailout in May 2011; and Spain and Italy never became "program countries", but rather saw gradual deterioration of their government bond yields. While the cut-off we have chosen (2010:Q4) is not unreasonable given that chain of events, any cut-off is imprecise by default. To account for the possibility that our results are determined by the choice of

[15] On December 21, the European Central Bank (ECB) extended €489 billion (nearly $640 billion) in loans to more than 500 European banks. This long-term refinancing operation (LTRO) was designed to prevent a credit freeze, and it represented the largest such deal in ECB's history. The three-year loans were offered at a fixed one percent interest rate, and their widespread adoption indicated a radical shift in the mood of the private banking sector, which had long held capital injections from central banks to be anathema.

cut-off, we re-estimate our main model after assigning the $Post_t$ dummy a value of 1 from 2011:Q1 onwards. Column (5) indicates that our results are not sensitive to how we date the crisis.[16]

The final concern we address is related to heterogeneity across the markets where the banks in our sample are domiciled. One possibility is that our findings may depend on the behavior of UK banks that constitute a relatively large part of the sample and may have reduced lending due to reasons specific to this set of banks. In particular, during the financial crisis the UK government acquired large equity stakes in two of the non-affected banks in the dataset, RBS and Lloyds. It is possible that the two banks were pressured by the government to increase, especially domestic, corporate lending. Given that UK banks account for a large share of overall syndicated lending over the sample period (about 1/3), our results may to a large degree be driven by this or other peculiarities of the UK market. However, the estimates reported in column (6), where we have excluded UK banks from the regressions, imply that this is not the case. In fact, the size of β_1 increases when these banks are excluded.

Finally, we account for the fact that there are both euro-area and non-euro area banks in our sample. The sovereign crisis increased the risk that some countries might have to leave the euro area and revert to their pre-euro currency. This break-up risk might have led many banks to lend less (especially abroad), and so the effect we observe might be driven by the special behavior of euro area banks. However, the estimates reported in column (7) provide no evidence to that theory.

5. Further evidence

5.1. Portfolio rebalancing

[16] The estimates remain qualitatively unchanged if we change the cut-off to 2010:Q3. We do not report these results for brevity.

When banks are hit by shocks to their wealth which induces them to rebalance their loan portfolio, they are more likely to abandon foreign customers with whom they have weaker lending relationships. This can happen due to biases arising from informational advantages for domestic investors (Brennan and Cao, 1997; Kang and Stulz, 1997; Ahearne, Griever, and Warnock, 2004; Portes and Rey, 2005; Van Nieuwerburgh and Veldkamp, 2009; Andrade and Chhaochharia, 2010), from familiarity considerations (Grinblatt and Keloharju, 2000; Huberman, 2001; Seasholes and Zhu, 2010), or from both. While there is strong evidence that banks transmit negative shocks to their capital domestically (Kashyap and Stein, 2000), the evidence also suggests that banks sharply reduce lending to their overseas customers as well (Peek and Rosengren, 1997; Cetorelli and Goldberg, 2011; Popov and Udell, 2012; De Haas and Van Horen, 2012), and the overall effect oftentimes is a rebalancing of the bank portfolio in favour of domestic customers. For example, Giannetti and Laeven (2012b) show that while syndicated loan origination exhibits "home bias" is a feature of good times as well, this home bias increases by around 20% during a banking crisis.

In the first six columns of Table 7, we check if similar patterns can be detected in our sample. In column (1), we look at lending to European borrowers only, and we confirm the main result of the paper, namely, that banks exposed to sovereign debt of deteriorating quality increase lending less than non-exposed or little exposed banks. However, our results also suggest that there is no difference in lending to domestic borrowers (column (2)). This result confirms the findings in Giannetti and Laeven (2012b). Interestingly, there is no difference between affected and non-affected banks in the change in lending to foreign European borrowers (column (3)). We dig deeper into this result by hypothesising that the GIIPS component of foreign lending is different from the rest. Once we exclude lending to borrowers in GIIPS countries, there is no difference between affected and non-affected banks, regardless of whether we look at both domestic and foreign European non-GIIPS lending (column (4)) or only at foreign European non-GIIPS lending (column (5)). This is possibly because in a reasonably integrated market such as the EU, information asymmetries are smaller and relationships tend to be

stronger. However, we do find systematic differences across banks when we look at lending to GIIPS countries (column (6)) in that lending to GIIPS corporate borrowers by affected banks increases less than lending by non-affected banks. Recall that according to the evidence presented in Table 4, column (8), this effect is not due to balance sheet exposure to GIIPS customers. This effect is more likely explained by affected banks' cutting lending relatively more so to countries with deteriorating growth prospects and to countries where the banks' lending relationships are weaker (De Haas and Van Horen, 2013).

[INSERT TABLE 7 HERE]

We next juxtapose the evidence for European lending with the evidence for lending to the rest of the world. In column (7) we present the estimates from a test where we have run our main specification on all non-European markets. The results strongly support the idea that while affected and non-affected banks are equally likely to keep lending to non-GIIPS European customers, banks with balance sheet problems related to holdings of impaired sovereign debt are more likely to reduce their lending to non-European customers. This result is qualitatively unchanged when we include only observations from relatively important markets, that is, bank-country pairs between which syndicated lending took place in at least 5 quarters during the 2009:Q3-2011:Q4 period (column (8)). The evidence thus suggests that our main findings are driven by affected banks retracting from all non-European markets, not just from marginal ones.

Is there evidence of flight to quality? One possibility is that when facing weakening balance sheets, banks rebalance their portfolios towards safer and more transparent assets. If this were the case, we would not observe a decline in lending to safe and transparent borrowers, such as US corporates. However, the evidence suggests that European banks hit by a negative balance sheet shock withdraw considerably less forcefully (relative to non-affected European banks) from the non-US segment of foreign markets (column (9)) than from the US market (column (10)). To the degree that lending in the US is mostly conducted in US dollars, this piece of evidence suggests a retraction by affected banks

from dollar lending. Ivashina, Scharfstein, and Stein (2012) show that in 2011, US money market funds sharply reduced the funding provided to European banks, leading to significant violations of the euro-dollar covered interest parity and to a drop in dollar lending by European banks that were more reliant on money market funds. Our evidence tentatively confirms this story, with the added twist that it was mostly European banks with actual balance sheet exposures to impaired sovereign debt that seem to be affected by this withdrawal of money market funding with negative consequences for their credit supply.

5.2 Change in GIIPS exposure and lending

It is reasonable to expect that the banks in our sample have adjusted not only lending, but also their exposure to GIIPS debt. Adjustment in their debt exposures, on the other hand, may have affected their lending behaviour.

Recognizing that debt securities issued by countries under stress may be negatively weighting on the euro area banks' asset side, in May 2010 the ECB instituted the Securities Markets Program (SMP). The program represented a series of open market operations whereby the ECB bought government debt securities in secondary markets, while simultaneously absorbing the same amount of liquidity to prevent a rise in inflation. While initially only Greek debt was eligible, already in the summer of 2010 the ECB started buying Irish and Portuguese debt, and later that year Spanish and Italian debt, too. The overall size of the program reached €218 billion in December 2012.

Our data on bank-level GIIPS exposures suggest that banks on average reduced their exposures after March 2010, although we do not know if they took advantage of the SMP, sold the debt securities to private investors, or did not roll over maturing debt. However, a number of banks actually *increased* their GIIPS exposures, during the initial stages of the sovereign debt crisis. For example, one third of the banks for which we have data on GIIPS exposures in March 2010 had higher overall exposure to the five GIIPS countries in December 2010, mainly due to increased exposure to Italian and Spanish debt. Given that the SMP gave those banks the opportunity to reduce their exposures if

they wanted to, doing the opposite may be evidence of a carry trade-type behaviour whereby banks with access to short-term unsecured funding in wholesale markets undertake longer GIIPS sovereign bond positions, hoping to pocket the spread between long-term bonds and short-term funding costs (Acharya and Steffen, 2012). This behaviour is perfectly rational if banks expect bond yields to keep rising without materialisation of default risks.

We now look at the interaction between changes in bank lending and sovereign debt exposure. We create a dummy called $Pessimist_i$ which is equal to 1 if banks reduced their holdings of government debt between March 2010 and December 2010, and interact it with the variable $Post_t$. Notice that $Pessimist_i$ can apply to both affected and non-affected banks in that banks that held no GIIPS sovereign bonds in early 2010 may have decided to load up on peripheral debt after the crisis started.

The estimates reported in Column (1) of Table 8 suggest that banks which reduced their exposure to GIIPS debt over the course of 2010 reduced their lending more than "optimist" banks which loaded on peripheral debt in the expectation of future profits. This result points to the existence of lending benefits – at least in the short-run - from such carry trade. Importantly, the statistical difference between affected and non-affected banks survives after controlling for the change in GIIPS debt exposure.

[INSERT TABLE 8 HERE]

We cannot repeat this exercise for the change in exposures between December 2010 and December 2011 because all but two banks reduced their exposures during 2011. Instead, we create a variable $Big\ sale_i$ equal to 1 if the bank is in the top half of the distribution of percentage reduction in GIIPS exposure between December 2010 and December 2011, and interact it with $Post_t$. The evidence reported in column (2) suggests that the size of the reduction did not matter for lending. However, its effect on lending becomes significant in column (3) where we also control for whether the bank is a

"pessimist". All else equal, the evidence in column (3) suggests that banks increased lending less from the pre-crisis to the post-crisis period if they reduced their exposures during 2010 when the crisis was still confined to Greece, Ireland, and Portugal; if they still had large GIIPS exposures in December 2010; and if they did not manage to reduce their GIIPS exposures in 2011 when the crisis spilled over to Spain and Italy too. Columns (4)-(6) confirm that these results are not driven by non-euro area banks, such as Barclays which increased its debt holdings (in nominal terms) by a whopping 68% between March 2010 and December 2010.

We conclude that in the initial stages of the crisis carry trade-type behaviour by a number of banks may have arrested the slowdown in overall lending, while in the later stages of the crisis the SMP program may have had a similar effect by allowing banks to reduce their overall GIIPS exposures once the default risk on debt previously considered relatively safe (such as Spanish or Italian debt) became relatively high.

6. Conclusion

The sovereign debt crisis which erupted in the euro area in the first half of 2010 has sent ripples through the global banking system and prompted interventions by governments and central banks on a scale comparable to the programs implemented during the financial crisis of 2008-09. We examine the impact of exposure to impaired foreign sovereign debt on lending by banks active in the syndicated loan market. For a sample of 34 banks, domiciled in 11 European non-GIIPS countries, for which data on exact exposures to GIIPS sovereign debt are available from EBA, we analyse the effect of the deteriorating value of this exposure on the amount of loans extended, as well as on the geographic composition of their loan portfolio.

Our results suggest that foreign sovereign stress can have a sizeable impact on bank lending through the channel of bank funding. We find that syndicated lending recovered on average in the aftermath of the financial crisis (after 2009:Q3). However, it increased on average by 23.5% less for the group of banks that were significantly exposed to GIIPS

debt than for those less exposed to GIIPS debt. We record this result when controlling for both time-varying bank characteristics and for bank fixed effects, as well as after including borrower country-quarter fixed effects which control for unobservable changes in borrower demand and/or quality at the country, country/industry, and even firm level. The effect is robust to the choice of underlying exposure data, to crisis dating, and to controlling for bank balance sheet exposure to its own sovereign.

Importantly, we account for a number of alternative explanations for our results, such as the impact of the domestic safety net for the financial industry, pressure on government-supported banks to deleverage, systematic differences in business models or risk taking across banks, exposure to the GIIPS real sector, and exchange rate valuation effects. Our main result survives all these robustness tests. We also find evidence for a European bias in response to deteriorating finances of the country where the bank is domiciled whereby banks reduced especially non-European (but also GIIPS) lending in response to their own sovereign's problems.

What policy measures are most efficient in reversing the slowdown in bank lending in response to balance sheet weakening induced by deteriorating sovereign debt? Two types of measures have been implemented since the start of the crisis: a consolidation of public finances in countries under stress in combination with loans by the EU and the IMF, and various assets and liquidity operations by the ECB. While the effectiveness of the former in reducing tensions in government bond markets is hotly debated, central bank policy in the later stages of the crisis has been perceived as relatively effective, even by some of its harshest critics during the early stages of the crisis.[17] Our results suggest that while in the initial stages of the crisis, some banks may have engaged in a carry

[17] "Nobel Prize-winning economist Paul Krugman said that European Central Bank President Mario Draghi has made him more upbeat about a solution to the euro area's debt crisis […]. 'I'm more hopeful now,' Krugman said at a conference today in Rovinj, Croatia. 'I'm impressed by Draghi […]'" ("Krugman Says Impressed by Draghi, Depressed by Germany", Bloomberg.com, Oct. 5, 2012).

trade-type behaviour, attracted by high yields on (initially relatively safe) Italian and Spanish debt, in the later stages of the crisis, when this debt also became risky, assets purchases by the ECB may have arrested a slowdown in lending by allowing banks to reduce their overall exposures to impaired debt. While our paper provides evidence that exposure to impaired sovereign debt negatively affected the supply of bank credit, the verdict on the overall effect of the euro area crisis, as well as on policy makers' success in resolving it, is still out.

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Figure 1
Syndicated lending, 2007-2011

This figure shows the evolution of the total amount of syndicated loans issued worldwide in billion euros by all lenders in the market and by our sample of 34 European banks over the period 2007:Q1 to 2011:Q4. Only loans to non-financial corporates are included.

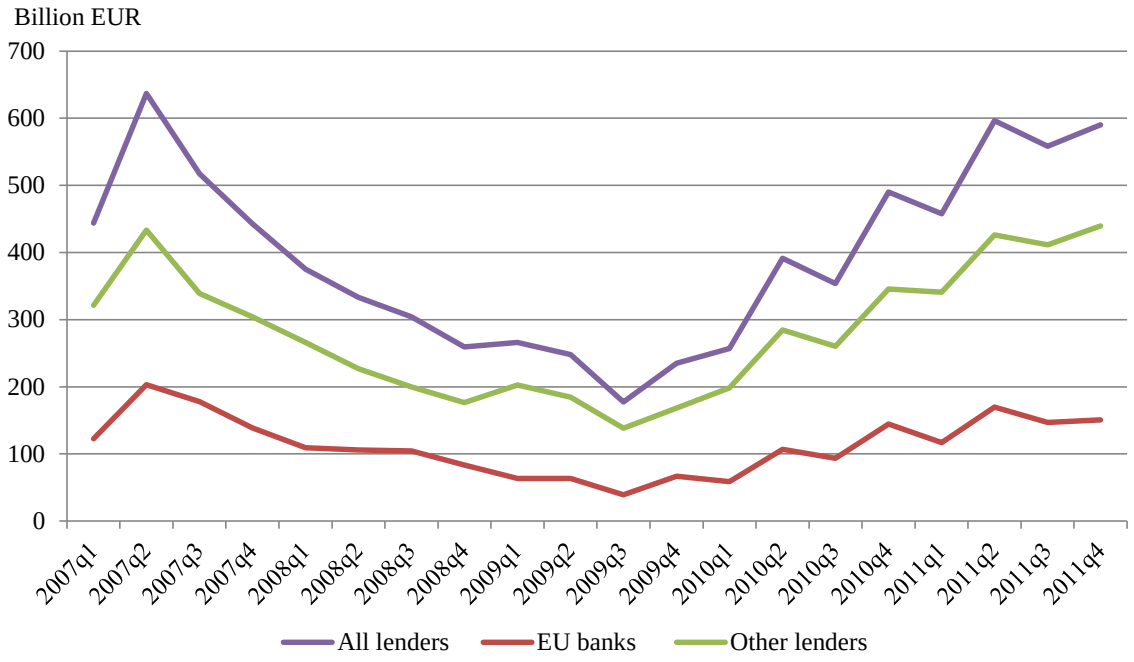

Figure 2
Impact of GIIPS sovereign debt exposure on bank lending

This figure shows the evolution of total syndicated lending by our sample 34 European banks over the period 2009:Q3 to 2011:Q4. It depicts total volume (in euros) of syndicated loans issued in each quarter for the two groups of banks indexed to be 100 at 2010:Q3. Only loans to non-financial corporates are included. *Non-affected* contains the group of banks whose exposure to GIIPS debt was below the median level and *Affected* contains the group of banks whose exposure was above the median level.

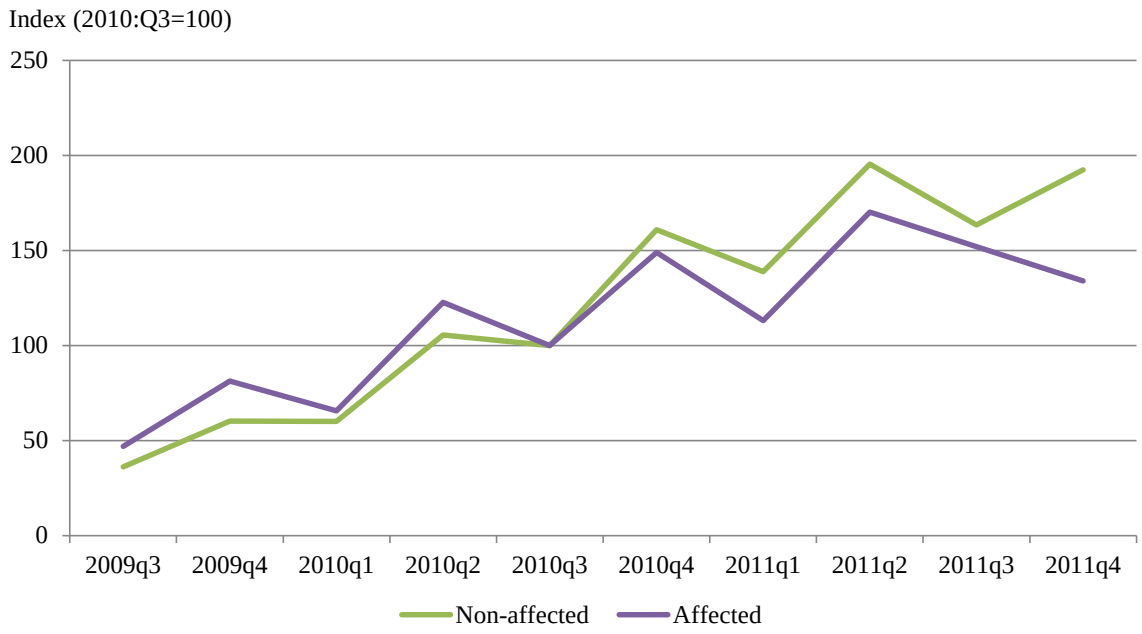

Table 1
Descriptive statistics

This table presents definitions and summary statistics of all variables used in the paper. Syndicated loan variables are computed by the authors using data from Dealogic's Loan Analytics database. Exposure to GIIPS sovereign debt is computed using information provided by the European Banking Authority on sovereign debt holdings by European banking groups and CDS spreads come from Datastream. Real sector exposure is computed using information provided by the European Banking Authority. Information on government support measures is collected by the authors from a large number of publicly available sources. Bank-specific variables are from BankScope.

Variable name	Unit	Definition	N	Mean	Median	St. dev	Min	Max
Lending	Log	Log of total loans extended by bank *i* to borrowers in country *j* in quarter *t*	11,070	1.78	0	2.37	0	9.17
Lending industry	Log	Log of total loans extended by bank *i* to borrowers in industry *k* of country *j* in quarter *t*	31,690	1.16	0	1.95	0	8.69
Continued	0/1	Dummy=1 if bank *i* stopped lending to firm k in the post period	1,737	0.73	1	0.44	0	1.00
GIIPS exposure	Log	The log of the sum of bank *i*'s holdings of GIIPS sovereign debt divided by the bank's assets weighted by the CDS spread of that country's sovereign debt (all measured in 2010:Q4)	11,070	1.34	1.39	0.76	0	2.93
Affected	0/1	Dummy=1 if *GIIPS exposure* of bank *i* is above the median level	11,070	0.53	1	0.50	0	1
Affected (2010:Q1)	0/1	Same as *Affected*, except exposure and CDS are measured in 2010:Q1	9,430	0.54	1	0.50	0	1
Affected (equity)	0/1	Same as *Affected*, except exposure is divided by bank *i*'s equity	11,070	0.56	1	0.50	0	1
Affected own sovereign	0/1	Same as *Affected*, except based on exposure to own sovereign	11,070	0.44	0	0.50	0	1
Affected real sector	0/1	Same as *Affected*, except based on exposure to GIIPS real sector	11,070	0.50	1	0.50	0	1
Pessimist	0/1	Dummy=1 if bank *i* reduced its exposure to GIIPS sovereign debt between March and December 2010	11,070	0.68	1	0.47	0	1.00
Big sale	0/1	Dummy=1 if bank *i* is in the upper half of the distribution of reduction in GIIPS exposure between December 2010 and December 2011	11,070	0.50	0	0.50	0	1.00
Size	Log	Log of total assets of the bank (one year lagged)	11,070	20.19	20.32	1.05	17.09	21.65
Tier 1	%	The ratio of Tier 1 capital to risk-weighted assets (one year lagged)	10,620	10.78	10.56	2.12	6.89	19.89
Impaired loans	%	Impaired loans divided by total assets (one year lagged)	10,186	1.75	1.41	1.43	0.09	9.28
Net income	%	Net income divided by total assets (one year lagged)	11,070	0.14	0.25	0.46	-2.33	0.86
Support	0/1	Dummy=1 if bank *i* received goverenment support during the global financial crisis	11,070	0.61	1	0.49	0	1

Table 2
Comparison affected and non-affected banks

This table shows the means of the respective variables for the group of affected and the group of non-affected banks and t-tests that test whether the mean is the same for the two groups of banks. All variables are based on 2009 information.

	Non-affected	Affected	T-test of equal means (p-value)
Balance sheet			
Assets (billion USD)	644.36	581.48	0.77
Tier 1 ratio	11.62	10.54	0.21
Impaired loans to assets	2.19	2.11	0.89
Net income	0.00	-0.14	0.53
Syndicated lending			
Total lending (billion EUR)	6.62	8.27	0.58
Share domestic lending	0.29	0.34	0.57
Share GIIPS lending	0.03	0.11	0.01
Share European lending (incl domestic)	0.67	0.61	0.45

Table 3
Transmission of GIIPS sovereign debt exposure

This table shows the impact of GIIPS sovereign debt exposure on bank lending. The dependent variable is *Lending* which measures the lending of bank *i* to borrowers in country *j* during quarter *t*. The sample period is 2009Q3-2011Q4 and the *Post* period is 2010Q4-2011Q4. All regressions include bank fixed effects. In addition, column [1] and [2] include borrower country and quarter fixed effects, and column [3] and [4] borrower country X quarter fixed effects. All regressions are estimated using OLS except the one in column [2] which is estimated using Tobit. All regressions include a constant and standard errors are clustered by bank. Robust standard errors appear in parentheses and ***, **, * correspond to the one, five and ten per cent level of significance, respectively. See Table 1 for variable definitions and sources.

	[1]	[2]	[3]	[4]
Affected * Post	-0.309***	-0.688**	-0.223**	-0.235***
	(0.106)	(0.297)	(0.100)	(0.086)
Size				0.100
				(0.096)
Tier 1				-0.012
				(0.017)
Impaired loans				-0.147***
				(0.047)
Net income				-0.150**
				(0.058)
Bank fe	yes	yes	yes	yes
Quarter fe	yes	yes	no	no
Borrower country fe	yes	yes	no	no
Borrower country X quarter fe	no	no	yes	yes
Estimation method	OLS	Tobit	OLS	OLS
No. of observations	11,070	11,070	11,070	10,162
R2	0.368		0.501	0.507

Table 4
Robustness: Alternative explanations

This table shows a number of robustness tests on the impact of GIIPS sovereign debt exposure on bank lending. The dependent variable is *Lending*, unless otherwise specified. In column [1] the dependent variable is *Lending industry* which measures the lending of bank *i* to borrowers in industry *k* of country *j* during quarter *t*. In column [2] the dependent variable is *Continued*, which captures the probability that bank *i*, a creditor of firm *q* in the pre- period, continued lending to the same firm in the post- period. In column [3] we control for the exposure of the bank to its own sovereign. In column [4] we control for government support received by the bank. In column [5] we conduct a placebo test using a sample period before the collapse of Lehman Brothers (2006:Q1-2008:Q2) where we let *Post* start in 2007:Q2. In column [6] we conduct a placebo test over the sample period 2007:Q3-2009:Q4 where *Post* starts just after the collapse of Lehman Brothers (2008:Q4). In column [7] we only include bank-country pairs between which syndicated lending took place in at least five quarters during the sample period. In column [8] we exclude GIIPS borrowers. In column [9] we control for the exposure of the bank to the real sector of the GIIPS countries. In column [10] we only include loans denominated in Euros. The sample period equals 2009:Q3-2011:Q4 and *Post* equals 2010:Q4-2011:Q4, unless otherwise specified. All regressions include bank level controls as in Table 3, bank fixed effects and a constant. In addition, column [1] included borrower country X industry X quarter fixed effects, column [2] firm fixed effects columns [3]-[10] borrower country X quarter fixed effects All regressions are estimated using OLS and standard errors are clustered by bank. Robust standard errors appear in parentheses and ***, **, * correspond to the one, five and ten per cent level of significance, respectively. See Table 1 for variable definitions and sources.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Control for demand: Lending industry	Control for demand: Continued	Control for own sovereign exposure	Control for govern-ment support	Placebo: 2006:Q1-2008:Q2	Placebo: 2007:Q3-2009:Q4	Important markets only	Excluding GIIPS countries	Control for real sector exposure	Euro loans only
Affected * Post	-0.174***		-0.229***	-0.197**	-0.056	0.012	-0.325***	-0.218**	-0.180**	-0.174**
	(0.067)		(0.081)	(0.088)	(0.095)	(0.130)	(0.120)	(0.086)	(0.073)	(0.084)
Affected		-6.686***								
		(2.037)								
Affected own sovereign * Post			-0.121							
			(0.089)							
Support * Post				-0.094						
				(0.097)						
Affected real sector * Post									-0.136*	
									(0.075)	
Bank level controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bank fe	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Borrower country X quarter fe	no	no	yes	yes	yes	yes	yes	yes	yes	yes
Borrower industry X country X quarter fe	yes	no	no	no	no	no	no	no	no	no
Firm fe	no	yes	no	no	no	no	no	no	no	no
No. of observations	29,308	1,592	10,162	10,162	10,174	11,506	3,588	9,394	10,162	5,100
R2	0.475	0.535	0.507	0.507	0.485	0.464	0.492	0.511	0.507	0.499

Table 5
Robustness: Exposure measure

This table shows a number of robustness tests on the impact of GIIPS sovereign debt exposure on bank lending. The dependent variable is *Lending*. In column [1] we recalculate our *Affected* dummy based on March 2010 exposures, and the Post period is 2010:Q2-2011:Q4. In column [2] we divide exposure by equity instead of total assets. In column [3] we use the continuous exposure variable calculated as in (2) instead of the dummy *Affected*. In column [4] we only include banks that are in the top or bottom quartile of the distribution of our GIIPS exposure measure. In column [5] we only include banks that are in the top or bottom tertile of the distribution of our GIIPS exposure measure. In column [6] we recalculate our *Affected* dummy based on exposures to Greece and let *Post* start 2010:Q2. The sample period equals 2009:Q3-2011:Q4 and *Post* equals 2010:Q4-2011:Q4, unless otherwise specified. All regressions include bank level controls as in Table 3, bank fixed effects, borrower country X quarter fixed effects and a constant. All regressions are estimated using OLS and standard errors are clustered by bank. Robust standard errors appear in parentheses and ***, **, * correspond to the one, five and ten per cent level of significance, respectively. See Table 1 for variable definitions and sources.

	[1] Affected based on March 2010 exposures	[2] Exposure as share of equity	[3] Continuous exposure variable	[4] Top/bottom quartile	[5] Top/bottom tertile	[6] Exposure Greece only (post starts 2010:Q2)
Affected * Post	-0.313***	-0.189**		-0.467***	-0.330***	-0.233***
	(0.098)	(0.091)		(0.139)	(0.116)	(0.087)
GIIPS exposure * Post			-0.199***			
			(0.066)			
Bank level controls	yes	yes	yes	yes	yes	yes
Bank fe	yes	yes	yes	yes	yes	yes
Borrower country X quarter fe	yes	yes	yes	yes	yes	yes
No. of observations	8,580	10,162	10,162	4,630	6,030	10,162
R2	0.518	0.507	0.507	0.520	0.516	0.507

Table 6
Robustness: Dependent variable, sample period and host markets

This table shows a number of robustness tests on the impact of GIIPS sovereign debt exposure on bank lending. The dependent variable is *Lending*. In column [1] we assign the loan to the lead arranger(s) only, instead of assigning it to all syndicate members. In column [2] we use the number of loans extended by bank *i* to country *j* in quarter *t* instead of the total volume of loans. In column [3] we extend the sample period back to 2009:Q1. In column [4] we extend the sample period forth to 2012:Q2. In column [5] we assign a value of 1 to the *Post* dummy in 2011:Q1 and onwards instead of 2010:Q4 and onwards. In column [6] and [7] we exclude UK banks and non-euro area banks from our sample, respectively. The sample period equals 2009:Q3-2011:Q4 and *Post* equals 2010:Q4-2011:Q4, unless otherwise specified. All regressions include bank level controls as in Table 3, bank fixed effects, borrower country X quarter fixed effects and a constant. All regressions are estimated using OLS and standard errors are clustered by bank. Robust standard errors appear in parentheses and ***, **, * correspond to the one, five and ten per cent level of significance, respectively. See Table 1 for variable definitions and sources.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]
	Lead bank only	Number loans	Period 2009:Q1-2011:Q4	Period 2009:Q3-2012:Q2	Post starts 2011:Q1	Excluding UK banks	Excluding non-Euro area banks
Affected * Post	-0.307***	-0.068***	-0.257**	-0.235**	-0.232***	-0.338***	-0.233***
	(0.097)	(0.025)	(0.106)	(0.094)	(0.074)	(0.091)	(0.087)
Bank level controls	yes	yes	yes	yes	yes	yes	yes
Bank fe	yes	yes	yes	yes	yes	yes	yes
Borrower country X quarter fe	yes	yes	yes	yes	yes	yes	yes
No. of observations	8,680	10,162	13,726	13,776	10,162	8,122	7,218
R2	0.468	0.510	0.513	0.510	0.507	0.505	0.546

Table 7
Adjustment in domestic and foreign lending

This table shows the impact of exposure to GIIPS sovereign debt on domestic and foreign lending. The dependent variable is *Lending*. In column [1] only European borrowers and in column [2] only domestic (European) borrowersare included. In column [3] only foreign (European) borrowers are included. In columns [4] and [5] only European borrowers (all and foreign only, respectively) excluding GIIPS borrowers are included. Column [6] includes only GIIPS borrowers and column [7] only non-European borrowers. In column [8] only non-European borrowers are included and from this set of markets only those bank-borrower country pairs in which non-zero lending took place in at least five quarters during the sample period. In column [9] only non-European borrowers excluding the US are included. In column [10] only US borrowers are included. The sample period equals 2009:Q3-2011:Q4 and *Post* equals 2010:Q4-2011:Q4. All regressions include bank level controls as in Table 3, bank fixed effects, borrower country X quarter fixed effects and a constant. All regressions are estimated using OLS and standard errors are clustered by bank. Robust standard errors appear in parentheses and ***, **, * correspond to the one, five and ten per cent level of significance, respectively. See Table 1 for variable definitions and sources.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Europe (all)	Europe (domestic only)	Europe (foreign only)	Europe ex GIIPS (all)	Europe ex GIIPS (foreign only)	GIIPS	ROW	ROW (important markets only)	ROW ex US	US
Affected * Post	-0.194*	-0.100	-0.202	-0.124	-0.125	-0.445*	-0.256**	-0.524**	-0.226*	-0.958**
	(0.112)	(0.257)	(0.124)	(0.137)	(0.159)	(0.266)	(0.125)	(0.225)	(0.124)	(0.465)
Bank level controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bank fe	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Borrower country X quarter fe	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
No. of observations	3,502	298	3,204	2,734	2,436	768	6,660	1,670	6,390	270
R2	0.426	0.898	0.458	0.400	0.445	0.569	0.534	0.570	0.474	0.788

Table 8
Change in debt exposure and lending

This table shows the impact of a change in GIIPS sovereign debt exposure in the initial stages of the euro area sovereign debt crisis on subsequent bank lending. The dependent variable is *Lending*. In columns [1] and [3] we control for banks that reduced their exposures to GIIPS debt between March 2010 and December 2010. In columns [2] and [4] we control for the size of the reduction in exposures to GIIPS debt that took place between December 2010 and December 2011. In columns [3] and [6] we control for both. The sample period equals 2009:Q3-2011:Q4 and *Post* equals 2010:Q4-2011:Q4. All regressions include bank level controls as in Table 3, bank fixed effects, borrower country X quarter fixed effects and a constant. All regressions are estimated using OLS and standard errors are clustered by bank. Robust standard errors appear in parentheses and ***, **, * correspond to the one, five and ten per cent level of significance, respectively. See Table 1 for variable definitions and sources.

	[1]	[2]	[3]	[4]	[5]	[6]
	All banks			Euro area banks		
Affected * Post	-0.233**	-0.223***	-0.311***	-0.292**	-0.239***	-0.330***
	(0.101)	(0.079)	(0.085)	(0.120)	(0.076)	(0.094)
Pessimist * Post	-0.177*		-0.225***	-0.200**		-0.315***
	(0.095)		(0.082)	(0.091)		(0.094)
Big sale * Post		0.110	0.226**		0.078	0.272***
		(0.089)	(0.091)		(0.103)	(0.090)
Bank level controls	yes	yes	yes	yes	yes	yes
Bank fe	yes	yes	yes	yes	yes	yes
Borrower country X quarter	yes	yes	yes	yes	yes	yes
No. of observations	8,270	9,552	8,270	5,410	6,482	5,410
R2	0.537	0.522	0.538	0.580	0.565	0.580

Appendix Table 1
List of banks

This table shows all banks in our sample, their nationality, our measure of GIIPS sovereign debt exposure, whether the bank is included in the group of affected or non-affected banks and the total volume of loans the bank issued in the pre and post periods (in million EUR).

Bank name	Nationality	Exposure GIIPS sovereign debt	Affected	Total lending pre (2009Q3-2010Q3)	Total lending post (2010Q4-2011Q4)	% change
Erste Group	AUT	2.54	1	1,417	2,289	0.62
Oesterreichische Volksbanken	AUT	3.57	1	260	561	1.16
Raiffeisen Bank	AUT	0.67	0	3,404	6,408	0.88
Dexia	BEL	12.98	1	4,258	4,112	-0.03
KBC	BEL	6.49	1	4,892	6,493	0.33
BayernLB	DEU	1.32	0	6,220	11,043	0.78
Commerzbank Group	DEU	10.44	1	12,647	28,568	1.26
Deutsche Bank	DEU	2.17	0	33,708	69,309	1.06
DZ Bank	DEU	7.25	1	4,381	7,693	0.76
HSH Nordbank	DEU	1.94	0	1,579	2,396	0.52
Landesbank Berlin	DEU	4.26	1	757	778	0.03
LBBW	DEU	3.04	1	4,255	6,620	0.56
NordLB	DEU	3.36	1	1,561	3,037	0.95
WestLB	DEU	16.81	1	8,924	12,754	0.43
WGZ	DEU	12.59	1	506	723	0.43
Danske Bank	DNK	0.96	0	2,142	9,593	3.48
Nykredit Bank	DNK	1.30	0	302	726	1.40
OP-Pohjola Group	FIN	0.28	0	443	1,613	2.64
BNP Paribas	FRA	6.38	1	48,082	81,019	0.69
Credit Agricole	FRA	6.07	1	32,757	46,971	0.43
Societe Generale	FRA	5.65	1	27,074	43,613	0.61
Barclays	GBR	3.03	1	27,726	65,465	1.36
HSBC	GBR	2.31	0	32,595	77,881	1.39
Lloyds Banking Group	GBR	0.02	0	11,483	24,394	1.12
RBS	GBR	1.87	0	31,586	73,638	1.33
BCEE	LUX	17.64	1	149	0	-1.00
ABN AMRO Bank	NLD	1.77	0	3,291	7,733	1.35
ING	NLD	3.29	1	26,221	44,390	0.69
Rabobank	NLD	0.80	0	9,751	20,437	1.10
DNB Bank ASA	NOR	0.00	0	6,431	21,759	2.38
Nordea Markets	SWE	0.06	0	8,564	19,717	1.30
SEB	SWE	1.00	0	3,696	14,099	2.81
Svenska Handelsbanken	SWE	0.00	0	2,664	8,066	2.03
Swedbank First Securities	SWE	0.00	0	1,009	4,780	3.74

Appendix Table 2
Sovereign debt exposures

This table shows the GIIPS sovereign debt exposures of the banks in our sample as of December 2010 provided by the the European Banking Authority. Exposures are divided by assets of the bank in 2010 (from Bankscope) . Numbers are percentages.

Bank name	Nationality	Exposure Greece	Exposure Ireland	Exposure Italy	Exposure Portugal	Exposure Spain	Exposure GIIPS
ABN AMRO Bank	NLD	0.00	0.06	0.65	0.00	0.05	0.77
Barclays	GBR	0.01	0.03	0.54	0.08	0.50	1.16
BayernLB	DEU	0.05	0.01	0.16	0.00	0.21	0.42
BCEE	LUX	0.22	0.00	6.30	0.47	0.45	7.44
BNP Paribas	FRA	0.26	0.03	1.40	0.12	0.25	2.06
Commerzbank Group	DEU	0.49	0.01	1.87	0.16	0.65	3.18
Credit Agricole	FRA	0.09	0.02	1.50	0.17	0.54	2.32
Danske Bank	DNK	0.00	0.10	0.14	0.03	0.03	0.29
Deutsche Bank	DEU	0.09	0.03	0.40	0.01	0.14	0.67
Dexia	BEL	0.61	0.00	2.79	0.34	0.26	4.00
DNB Bank ASA	NOR	0.00	0.00	0.00	0.00	0.00	0.00
DZ Bank	DEU	0.19	0.01	0.72	0.26	1.09	2.28
Erste Group	AUT	0.17	0.02	0.29	0.05	0.07	0.60
HSBC	GBR	0.07	0.02	0.54	0.05	0.11	0.79
HSH Nordbank	DEU	0.07	0.00	0.44	0.04	0.12	0.66
ING	NLD	0.08	0.01	0.82	0.08	0.21	1.20
KBC	BEL	0.14	0.08	1.74	0.05	0.44	2.45
Landesbank Berlin	DEU	0.34	0.00	0.25	0.00	0.29	0.88
LBBW	DEU	0.21	0.00	0.38	0.03	0.14	0.75
Lloyds Banking Group	GBR	0.00	0.00	0.00	0.00	0.01	0.01
Nordea Markets	SWE	0.00	0.00	0.02	0.00	0.01	0.03
NordLB	DEU	0.07	0.02	0.82	0.11	0.22	1.23
Nykredit Bank	DNK	0.08	0.00	0.31	0.00	0.00	0.39
Oesterreichische Volksbanken	AUT	0.24	0.03	0.33	0.06	0.14	0.80
OP-Pohjola Group	FIN	0.00	0.05	0.00	0.00	0.00	0.05
Rabobank	NLD	0.06	0.01	0.07	0.01	0.03	0.17
Raiffeisen Bank	AUT	0.00	0.00	0.33	0.00	0.00	0.33
RBS	GBR	0.07	0.03	0.41	0.02	0.09	0.61
SEB	SWE	0.05	0.00	0.12	0.05	0.04	0.26
Societe Generale	FRA	0.25	0.09	0.78	0.08	0.42	1.62
Svenska Handelsbanken	SWE	0.00	0.00	0.00	0.00	0.00	0.00
Swedbank First Securities	SWE	0.00	0.00	0.00	0.00	0.00	0.00
WestLB	DEU	0.78	0.08	2.52	0.00	1.70	5.08
WGZ	DEU	0.34	0.24	1.49	0.49	1.24	3.79