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# FINANCIAL REPRESSSION IN THE EUROPEAN SOVEREIGN DEBT CRISIS

## Abstract

At the end of 2013, the share of government debt held by the domestic banking sectors of Eurozone countries was more than twice the amount held in 2007. We show that increased domestic government bond holdings generated a crowding out of corporate lending. We find that loan supply was depressed by these domestic sovereign bonds only during the crisis period (2010-11). The pattern also holds across firms with different relationship banks within a given countries. These findings suggest that sovereign bond holdings negatively impact private capital formation. We show that direct government ownership, as well as government influence through banks' boards of directors, are among the channels used to influence banks.

JEL Classification: G21, G28, G30

Keywords: Credit cycles, Sovereign debt, financial repression

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# **FINANCIAL REPRESSION IN THE EUROPEAN SOVEREIGN DEBT CRISIS**

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At the end of 2013, the share of government debt held by the domestic banking sectors of Eurozone countries was more than twice the amount held in 2007. We show that increased domestic government bond holdings generated a crowding out of corporate lending. We find that loan supply was depressed by these domestic sovereign bonds only during the crisis period (2010-11). The pattern also holds across firms with different relationship banks within a given countries. These findings suggest that sovereign bond holdings negatively impact private capital formation. We show that direct government ownership, as well as government influence through banks' boards of directors, are among the channels used to influence banks.

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When country risk and sovereign bond yields rise, governments may resort to formal and informal pressures to encourage the local financial sector to absorb new issues of government bonds at below-market interest rates; in other words, they may use a form of “financial repression.”<sup>1</sup> If the financial sector cannot raise additional funds to purchase government debt, these acquisitions can only be made at the expense of other investments, such as corporate and household lending. Financial repression may not be limited to banks, but the crowding out of bank lending can be particularly problematic since this cannot easily be replaced with other forms of financing.<sup>2</sup> In this paper we measure the impact of financial repression of the banking sector in several European countries during the recent sovereign debt crisis, documenting large falls in the availability of domestic corporate bank credit in the affected countries.

Following the start of the global financial crisis in 2008, Eurozone countries experienced a run-up in public debt issuance. This expanding sovereign debt was increasingly absorbed by the *local* (i.e., belonging to the same country) banking sector. On average, between 2010 and 2013, sovereign debt holdings of domestic banks (as opposed to foreign banks) increased by 5% of gross domestic product (GDP). Data for the early period of the crisis is scarce, but according to Eurostat, between 2007 and 2012, government debt held by the domestic financial sector increased by 13% of GDP.

Consistent with the “financial repression” argument, the shift toward reliance on the domestic banking sector for placing sovereign debt was largest in countries with the highest sovereign risk.

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<sup>1</sup> The term “financial repression” dates back to work by Shaw (1973) and McKinnon (1973) and comprises a range of policies that use the domestic financial sector to redirect savings held in the financial intermediaries to the government. This can be achieved using regulation, direct control, or “moral suasion” (that is, appeal to some greater good in order to influence somebody’s—in this case, banks’ management—behavior).

<sup>2</sup> This point is backed by a large literature, including by Diamond (1984, 1991). Gennaioli, Martin and Rossi (2014) specifically model how government defaults hurts bank balance sheets, driving down private credit.

The period over which domestic banks increased their holdings of local sovereign debt was also characterized by contraction in the issuance of new bank credit in Europe.<sup>3</sup> This, however, is not evidence of contraction in bank-credit availability, and such evidence is central to understanding real consequences of the financial repression. The expansion in government debt was at least partly a response to the global financial crisis, which created general economic stress and a consequent fall in tax revenue. In this context, banks' investment opportunities—the demand for corporate loans—might have contracted, which, in turn, might have led banks to increase their holdings of sovereign debt.

To isolate the behavior of loan supply we look at the changes in realized choice of debt type by new debt issuers. The basic idea is that, if a given firm issues debt, changes in its choice of debt are informative about the relative conditions of bank credit supply. In aggregate, the switching behavior of firms that have access to public debt market is informative about conditions of credit supply in the economy, including for bank-dependent firms. We show that, between 2007 and 2015, a period which was characterized by an expansion of European banks' holdings of domestic sovereign debt, many firms issuing debt were switching into bond financing (and away from loans). Across countries, this pattern is related to sovereign debt in bank balance sheets, especially during the peak crisis period in 2010-2011. This result is estimated with firm fixed effects, and is

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<sup>3</sup> E.g., "Italian Banks' Woes Hurt Small Firms," *The Wall Street Journal*, December 1, 2013; "The 'Silent Austerity' in Banking," *The Wall Street Journal*, January 21, 2014; "Given Them Some Credit," *The Financial Times*, February 19, 2014; "ECB: Private-Sector Lending Falls Again," *The Wall Street Journal*, February 27, 2014; "Bank's Lending to Private Sector Falls Again: ECB Data Suggests Recovery in the Euro Zone Will Remain Sluggish," *The Wall Street Journal*, March 27, 2014; "Irish Lending Hits Eight-Year Low," *The Wall Street Journal*, March 31, 2014; "For Some in Europe, High Lending Rates Hamper Recovery," *New York Times*, May 12, 2014; "Business Lending Slumps despite Pressure by Bank," *The Times*, May 29, 2014; "The ECB Will Need More Than Negative Rates To Get Lending Going," *Wall Street Journal*, June 5, 2014; "Feeble Inflation and Lending Persist in Euro Zone," *New York Times*, July 1, 2014; "Financing Europe's Small Firms: Don't Bank on the Banks," *The Economist*, August 16, 2014; "Grand Central: European Banks Pass Test, But Are They Ready to Lend?" *Wall Street Journal*, October 27, 2014; "New Entrepreneurs Find Pain in Spain," *Wall Street Journal*, November 27, 2014.

robust to time-varying firm controls, controlling for bank solvency, and with time fixed effects, i.e. eliminating Europe-wide time patterns and identifying solely off the different dynamics of sovereign debt accumulation by banks across different countries. Given that corporate bond markets are internationally fairly integrated, and especially within countries—i.e., aggregate conditions do not vary for different groups of firms within a country—our findings are unlikely to be driven by simultaneous easing of the conditions in the bond market. (See Section II below for a more complete discussion of this point.) Finally, within countries, the pattern holds across banks. This within-country result is an important additional result, in that cross-bank effects are predicted by the repression mechanism, but that general macro-economic effects are ruled out by country x time fixed effects. These results are robust to a range of bank-level controls.

*[FIGURE 1]*

Figure 1 illustrates the crowding-out effect in the aggregate data: it shows that the number of Eurozone firms issuing loans as a fraction of all firms issuing debt drops substantially during the European sovereign debt crisis. The contraction in the loan supply in the latter part of the sovereign debt crisis—the period between the second Greek bailout (2012:Q1) and 2013:Q2—is as large as the contraction in loan supply that followed the period from Lehman Brothers’ collapse through the first Greek bailout (2008:Q4-2010:Q1). This is consistent with a prolonged and aggravated economic downturn triggered by “the vicious cycle of banks hurting sovereigns and sovereigns hurting banks.”<sup>4</sup>

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<sup>4</sup> “Global Challenges in 2012,” statement by International Monetary Fund Managing Director Christine Lagarde January 23, 2012. See Bolton and Jeanne (2011) and Cooper and Nikolov (2015).

What drives the pattern in Figure 1? Accumulation of sovereign debt on European bank balance sheets was likely driven by several parallel forces. We evaluate the core contemporaneous bank trends as an explanation of our finding:

First, policy interventions during the sovereign debt crisis appear to have contributed to the accumulation of sovereign debt. Acharya and Steffen (2015), Popov and Van Horen (2015), and Drechsler et al. (2016) find that European banks were more likely to purchase risky sovereign debt using funding provided by European Central Bank (ECB). The ECB's lending facility set collateral haircuts based on the nature of the collateral (the issuing country's credit rating), and not based on the counterparty. In doing so, it allowed considerable leeway in terms of risk. However, because the ECB program treated home and foreign sovereign debt identically, it cannot explain the relative increase in the domestic share of bank-held sovereign debt; i.e., it cannot explain why Italian banks increasingly bought Italian debt while Spanish banks increasingly bought Spanish debt.

Second, the accumulation of local debt could have been driven by changes of banks' attitudes toward risk. If sovereign debt is risky, weak banks might accumulate it in order to risk-shift, especially if their capital requirements are low (Acharya and Steffen, 2015 and Buch, Koetter and Ohls, 2016). An opposite reason to accumulate sovereign debt is flight to safety. Indeed, holdings of safe debt have also increased in some banks. While we do not expect that financial repression would involve banks doing things "involuntarily", or failing to optimize, it is important for us to distinguish "financial repression" from these other explanations that do not involve government intent. Furthermore, knowing whether financial repression or shifts in risk preferences are behind increasing sovereign bond holdings results in different welfare consequences, and policy implications. (For example, more equity capital will certainly help dissuade risk shifting but probably not impact financial repression).

Our primary evidence against shift in risk preferences is that the effect on loan contraction works exclusively for domestic sovereign debt, and is absent when banks buy the riskiest or safest European sovereign debt. All of our results are robust to controls for bank capitalization, and at least risk-shifting should be associated with less capitalized banks. This also helps to address the explanation put forward by Farhi and Tirole (2012) who show that one reason to prefer risky domestic debt (over foreign debt) when risk-shifting is to facilitate coordination among local banks, thus helping to increase chances of being bailed out.<sup>5</sup> We also discuss some evidence that accumulation of domestic sovereign debt in ailing economies was also present in pension and insurance sectors. This is consistent with the centralized motive for observed phenomenon.

Finally, Stein (2013) argues that banks could voluntarily acquire local sovereign debt in a fire sale context due to a local information advantage. We provide a more direct evidence of specific mechanisms of financial repression by showing that government control through (i) ownership and (ii) board representation is positively correlated with increases in domestic sovereign bond holdings (at the bank level). While, strictly speaking, we do not rule out the “fire sale” explanation in this paper, Ongena, Popov and Van Horen (2016), De Marco and Machiavelli (2016), and Altavilla, Pagano and Simonelli (2016) find direct evidence in support of moral suasion (an appeal to morality or patriotism) in order to influence banks’ behavior.<sup>6</sup>

Ongena, Popov and Van Horen (2016), De Marco and Machiavelli (2016), and Altavilla, Pagano and Simonelli (2016) is the strand of literature that closely relates to our work. This is a set of literature that studies the accumulation of domestic sovereign debt during the European

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<sup>5</sup> This mechanism requires that future bailouts be national, or at least that national governments have considerable influence over bailout decisions.

<sup>6</sup> “Tactics used are closed-door meetings with bank directors, increased severity of inspections, appeals to community spirit, or vague threats.” (Investopedia, accessed on July 7, 2016). Formal channels of financial repression including majority ownership and regulation do not require appeal to banker’s personal beliefs of right and wrong to change their behavior.

sovereign debt crisis, as opposed to the other major and parallel phenomenon observed over the same period, which is the general accumulation of *risky* sovereign debt on banks' balance sheets. The three papers and our work are complementary, bringing different data and methodologies to bear on the phenomenon of domestic debt accumulation during the European Sovereign Debt Crisis. The strongest results in Ongena, Popov and Van Horen (2016), De Marco and Machiavelli (2016), and Altavilla, Pagano and Simonelli (2016) identify moral suasion as a specific mechanism of financial repression. We think carefully about the channels at play—of which there are many, and they are not mutually exclusive,—and provide cross-country evidence using ownership and board data that reinforces the Italy-specific evidence in De Marco and Machiavelli (2016). However, we should acknowledge that our evidence on the specific mechanism of financial repression while broader in nature, primarily relies on correlations. Instead, our strongest results establish the connection between accumulation of domestic sovereign debt and contraction in bank credit supply. To measure movements in bank credit supply over time, we expand the methodology developed in Becker and Ivashina (2014), and which basic intuition is illustrated in Figure I.

Our work also relates to recent papers that use credit registry data from individual countries and show that banks with higher holdings of domestic sovereign debt contract their lending the most. For example, see Crosignani, Faria-e-Castro, and Fonseca (2015) for evidence from Portugal and Bottero, Lenzu, and Mezzanotti (2015) for evidence from Italy. The richness of the credit registry data allows clean identification of cross-bank movements in credit conditions. The strength of our methodology is twofold: it allows for cross-country analysis and it provides an aggregate measure of credit conditions.

Overall, in addition to contributing to the literature that tries to understand the progression of the European sovereign debt crisis and the role played by the banking sector in this context, our

work adds to the literature studying financial repression in economic history. In particular, Reinhart and Sbrancia (2011) document the use of financial repression in advanced economies following World War II. Our results – along those in related papers – show that repression is not necessarily a thing of the past, but can reappear when the necessary conditions arise.

The rest of the paper is presented in five sections. Section 1 explains the empirical approach and discusses the data used for the construction of the core variable. Section 2 presents the main empirical findings. Section 3 evaluates alternative explanations, and Section 4 looks at a few specific channels of financial repression that might be at work. Section 5 provides a summary of the paper and discusses broader implications of the findings.

## **1. Empirical Methodology and Data**

### **1.1 Methodology**

During the European sovereign debt crisis, much of the public debt issued by governments was purchased by local banking sectors. We investigate the hypothesis that banks which took on more domestic government debt did so at the expense of corporate lending.<sup>7</sup> Thus, we need to show that the reduction in loan volumes was driven by contraction in credit supply, and not by contraction in credit demand. To measure movements in bank credit supply over time, we build on the methodology in Becker and Ivashina (2014) (which in turn builds on ideas in Kashyap, Stein and Wilcox, 1993). Intuition suggests that substitution from bank credit to public debt—i.e., the observable choice of debt type—is indicative of a relative contraction in bank credit supply.<sup>8</sup> For a given firm, the dependent variable is the quarterly indicator of the debt choice ( $L_{it}$ ) which is

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<sup>7</sup> We develop a simple, stylized model of this mechanism in the Appendix.

<sup>8</sup> This research design does not require perfect substitutability between public debt and bank loans. If substitutability is low, the tests will lack power.

equal to 1 if a firm  $i$  receives a bank loan, and 0 if a firm issues a bond in a given quarter  $t$ . The sample excludes any firm-quarter where no debt was raised. By only sampling firms that issue new debt (either bonds or loans), we ensure that all of the firms in our sample have non-zero demand for debt.

The impact of bank repression is predicted to be limited to periods and countries that experience some manner of financial stress. To capture this, we estimate the following regression:

$$L_{it} = D_i + D_t + \beta_S HG_t^i \times S_t^l + \beta_{NS} HG_t^i \times (1 - S_t^l) + B_{t-1}^i + e_{it} , \quad (1)$$

where  $D_i$  is firm fixed effects,  $D_t$  is time fixed effects,  $HG_t^i$  is domestic (home) government debt held in quarter  $t$  by firm's  $i$  potential lender,  $S_t^l \in \{0,1\}$  is an indicator taking the value one if at time  $t$  the country is undergoing a period of financial stress, and  $B_{t-1}^i$  is a set of lagged characteristics of the lender to firm  $i$ . In later specifications we will also include debt and firm time-varying characteristics. The key prediction is that  $\beta_S > 0$ , reflecting reduced lending by banks with big sovereign exposures. We expect  $\beta_{NS} = 0$ , reflecting the absence of a relationship between sovereign debt holdings and private loans in normal times.

Inclusion of firm fixed effects ( $D_i$ ) throughout the analysis ensures that the results are driven by within-firm variation. Furthermore, the coefficients of interest,  $\beta_S$  and  $\beta_{NS}$ , can be identified only if individual firms switch between loans and bonds. Firms that only issue one type of debt in our sample would push both coefficients toward zero, regardless of the type of debt that they issue. To reduce this bias, the sample is limited to firms that issued both bonds and loans at some point over the period of our sample. Although the time fixed effects ( $D_t$ ) are included throughout, they are not essential to the methodology or the results. Inclusion of time fixed effects assures that the

identification is driven by the cross-country variation in the holdings of domestic sovereign debt by European banking systems.

Our dependent variable  $L_{it}$  is a proxy: we would like to measure relative rise in the cost of bank debt, but because the loan price ( $r_l$ ) is not observable when no loan was raised, we imply movement in the relative cost of bank debt ( $r^l - r^b$ ) from firms' observable decisions about the source of new debt.  $L_{it}$  can be written as:

$$L = \begin{cases} 1 & \text{if } F(r^l - r^b) \geq \alpha \\ 0 & \text{if } F(r^l - r^b) < \alpha, \end{cases} \quad (2)$$

where  $F'(\cdot) < 0$ .

Equation (2) highlights that while the change in relative cost of loans and bonds ( $r^l - r^b$ ) is continuous, the observable outcome—debt choice—is discrete. This raises two issues. First, some firms in our sample will continue to obtain bank credit despite the fact that loans become more expensive for them. Because there is no change in the type of debt that the firms receive, we will miss changes in bank credit conditions. This makes it harder for us to find the evidence that we are looking for (than if we had access to the actual shadow cost of bond and loan finance for every firm at every point in time). Second, the “true” demand for credit is not observable. We know for certain that a firm in our sample that issues a loan or a bond has a non-zero demand for credit, but the methodology misses firms with non-zero demand for debt that cannot get a loan or a bond—i.e., firms facing the most severe supply constraint—when private credit is crowded out by

government debt.<sup>9</sup> Such observations would make our case stronger; missing these cases in our sample biases the estimate of  $\beta$  toward zero (against our findings).

Equation (2) also highlights that the methodology picks up fluctuations in the relative cost of bank debt ( $r_i^l - r_i^b$ ), but we are interested in bank credit contraction (i.e., an increase in  $r_i^l$ ). To interpret the estimates as fluctuations in bank credit supply, it has to be that bond market conditions—as measured by yield spread—are not negatively correlated with signs of financial repression (or  $dr_i^b/dS^i \geq 0$ ). Put differently, we assume that Greek firms do not face a *reduction* in the cost of issuing public debt, as compared to other European companies, just as the risk of Greek sovereign debt *increases*. Throughout the period of the sovereign debt crisis, overall conditions of bond supply in the Eurozone as a whole eased as a result of ECB cutting its benchmark rate to record low levels, but this change cannot explain the cross-country variation in propensity to switch from loans into bonds. Significant portions of the overall bond issuance were domestic and, as we will show later, traditional bond investors like pension funds and insurance companies were also subject to financial repression.<sup>10</sup> In addition, Almeida, Cunha, Ferreira and Restrepo (2016) show that bond issuers are negatively affected by sovereign downgrades. Overall, it appears that local debt markets tend to be positively correlated (a fact that makes it harder for us to find any substitution effect).

Another assumption underlying our interpretation of the empirical results is that our sample firms' preference, or demand, for a particular type of debt does not shift from loans toward bonds

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<sup>9</sup> Because of the firm fixed effect, this is only a concern for firms that a) use both types of debt over the span of our sample and b) only drop out of the sample in periods of financial repression.

<sup>10</sup> This is an example of an industry reference to at-home bias in the bond market: “(C)ompanies which have most reason to replace loans from their home countries’ weak banks with corporate bond funding are mostly headquartered in countries where economic prospects are weak. Put differently, while most European companies tapping corporate bond markets are presumably multinational, they still have a home bias and are thus heavily exposed to their respective home economy.” See “Corporate Bond Issuance in Europe,” *DB Research*, January 31, 2013.

in times of crisis. We assume that it is not the case that Greek firms favor bonds over loans—for reasons *other* than credit conditions—as the country sovereign debt crisis escalates. This is consistent with the standard prediction that in economic downturns, firms are likely to prefer bank debt because of its advantages in monitoring and renegotiation. Becker and Ivashina (2014) provide a discussion of the plausibility of a range of alternative explanations that relate to the countercyclical shift in demand for bonds.

## 1.2 Data

We use multiple data sources for this study. Our initial debt issuance sample consists of non-financial European firms (excluding SIC codes 6000 to 6999) that issued loans and bonds between 1997 and 2015. However, the best public data for bank holdings of local government debt comes from the European Banking Authority’s (EBA) “EU-wide stress testing” for 2010, 2011 and 2014, and the “EU-wide transparency exercise” in 2013. Thus, the core parts of the analysis are constrained to 2010-2015 period.

We look at substitution between term loans (installment loans as opposed to revolving credit lines) and bonds. Our firm-level data on bonds comes from Thomson Reuter’s SDC Platinum database. We exclude convertible bonds, mortgage- and asset-backed bonds, and preferred stock (which appear under bonds in SDC). Our benchmark results include only local bond issuance, excluding those labeled “Foreign Private” or “Foreign Public” as well as those issued in non-EU countries (i.e., notably, those issued in the U.S.). We also drop bond issues by foreign subsidiaries.<sup>11</sup> This way our findings cannot be explained by changes in foreign demand (supply of capital) for bonds. The median bond issue in our sample is equivalent to \$250 million, and the

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<sup>11</sup> All our results are similar if we retain all bonds.

mean is equivalent to \$541 million. The median maturity of bonds is 5.1 years and the average is 5.8 years. Less than 10% of bonds in our sample have maturities of two years or less.

Firm-level data on term loans issuance is compiled from Thomson Reuters' DealScan database of syndicated loans. To make sure that we analyze similar forms of debt, we look at bonds and term loans rather than revolving credit lines, since a revolving line is unlikely to be a close substitute for a bond. DealScan tracks new issuance of large loans; the median loan size in our sample is \$600 million, and the mean is \$1,489 million.

Given our focus on the financial repression of banks as a specific channel that leads to the crowding out of corporate loans, we focus on loans made by local banks, where the location of the bank is determined by its headquarters as reported in DealScan. DealScan primarily covers syndicated loans, and as such involves several lenders. All loans in our sample include at least one participating local lender in the lending syndicate, and roughly 60% of all loans in our sample have a local bank as one of the lead or co-lead lenders. This observation is also consistent with Giannetti and Laeven (2012) who more broadly document a home bias in the syndicated loan market. They also show that loan home bias substantially increases in the context of banking crises.

The data used in our analysis is organized as a panel of firm-quarter observations. Multiple loan issues in the same quarter are counted as one, and we count bond issue the same way. Of observations with at least one loan (in our full sample), 39.5% have two or more loans in the same quarter. Of observations with at least one loan, 47.35% have issued two or more bonds in the same quarter. We define the dependent variable for our regressions as 1 if a firm issues one or more new

term loans but no bonds, and as 0 if it issues one or more bonds but no term loans. In quarters with issuance of both types of debt, we set the dependent variable to the share of loans, by count.<sup>12</sup>

Table I summarizes the composition of the sample by country and by year. Our starting sample has 9,359 firm-quarters. (Since firm quarters where no new debt was issued are excluded, the panel is unbalanced.) Portugal and Cyprus have the lowest incidence of bank debt issuance; 20% and 26%, respectively, of their debt issues were bank loans. As reported in Becker and Ivashina (2014), 32.3% of U.S. firms issued bank debt over the same period. Overall, 49.8% of firms issuing new debt choose bank debt in our sample. We define explanatory variables used in regressions in later sections.

*[TABLE I]*

We also examine the relation between firm's financing decisions and their relationship banks' holdings of sovereign bonds and financial characteristics. We will discuss the source of data when presenting the variables.

### **1.3 Debt Substitution as a Broader Indicator of Credit Supply**

Our empirical methodology can only be used for large firms—firms with access to the bond market—and, by design, implies that firms in our sample are able to at least partly alleviate rising costs of funding in the loan market by substituting into the public market. Yet, it is small firms—firms without access to public debt market—that are likely to be most affected by the contraction in bank credit supply. Compared to large firms, it is very likely that small firms experience similar, if not larger, contractions in credit supply. In this sense, the estimates provided in this paper

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<sup>12</sup> An alternate way of dealing with such observations is to set the dependent variable equal to the dollar share of new debt that comes from bank loans, or dropping any firm-quarter observation. Both methods reduce the sample size (8% of observations have both kinds of debt), but do not change our results in any of the regressions.

represent a lower bound on the contraction in bank lending for a typical firm. As a way of validating our measure, we look at the time-series relation between loan and bond substitution and aggregate measures of credit conditions. To do so we estimate the following equation:

$$L_{it} = D_i + \beta X_t^l + e_{it}, \quad (3)$$

where  $D_i$  is firm fixed effects and  $X_t^l$  is a quarterly country-level measure of macroeconomic conditions. The results are reported in Table II.<sup>13</sup> Similar to methodology behind our main result, and as discussed in Becker and Ivashina (2014), the inclusion of firm fixed effects eliminates selection into issuance at any given time, on observable or unobservable characteristics, as long as they are time-invariant. This helps pin down the impact of economic conditions on firm debt choices.

We are interested in aggregate loan supply conditions, so our first proxy is *Tightening in lending standards*, the most direct external measure of credit supply conditions as reported by banks. *Tightening in lending standards* is a survey-based variable collected by central banks, which is available for eleven Eurozone countries in our sample. A higher value indicates that more banks report tighter credit standards (contraction in bank credit). For six countries, the data is available from 2003 onward; for two other countries, that data is available only later.<sup>14</sup> This data limitation explains the relatively small size of the sample in column (1).

The next two variables are constructed using Bankscope and use bank balance-sheet information. The first, *Aggregate lending growth*, is measured as a four-quarter rolling-window growth in outstanding loans for all banks in a country. The *Non-performing loans* variable is based

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<sup>13</sup> All results estimated using ordinary least squares (OLS). Using logit or probit regressions does not affect our conclusions.

<sup>14</sup> More information about country-level reporting can be found at <http://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html>.

on realized losses and is defined as the ratio of non-performing loans to total loans, also for the entire banking sector. We use asset-weighted averages to consolidate the data across different banks within a country by quarter. Both measures of bank portfolio quality should be negatively associated with bank-credit conditions: a higher value is likely to be associated with a contraction in bank-credit supply.

The last two variables, *GDP growth* and *Bank stock-index*, are based on models including those of Bernanke and Gertler (1989), Holmström and Tirole (1997), Kiyotaki and Moore (1997), and Diamond and Rajan (2005). Stronger economic growth—as measured by either of the proposed proxies—is predicted to be associated with an expansion of bank credit. *GDP growth* is real change in per capita gross domestic product, at quarterly frequency (but relative to the year prior to avoid seasonality), collected from the Eurostat website. We form a stock price index of domestic banks in each country (equally weighted), and we use the log of the stock index as an independent variable.

[TABLE II]

In line with the results for the U.S. reported in Becker and Ivashina (2014), we find strong cyclicity of substitution from loans into bonds in periods that should be characterized by low credit supply. More firms switch from loans to bonds in periods when a large percentage of banks are tightening credit standards, bank credit growth is low, balances of non-performing loans and loan allowances are large, economic growth is low, and stock prices are depressed. The signs are as predicted, and all coefficients are statistically significant at the conventional levels. The coefficient estimate for GDP growth implies that a one-standard-deviation decrease in GDP growth is associated with a 4-percentage-point decrease in probability that a firm gets a loan, conditional on receiving debt financing. Bank stock prices are also positively linked with new

corporate debt being issued as bank loans rather than bonds. A 50% increase in the stock price of domestic banks is associated with a 13-percentage-point increase in the fraction of new debt issued as loans.

## **2. The Effect of Domestic Sovereign Debt Holding on Bank Lending**

This section establishes that a contraction in the corporate loan supply in the context of the European sovereign debt crisis was in large part the result of increased European bank investment in domestic sovereign bonds. The sample is constrained to 2010-2015 which is the period for which EBA collected sovereign debt holdings at the bank level. The specific variable that we look at is “Gross Direct Long Exposures” to domestic sovereign debt. To construct a country-level variable, we use a value-weighted average across all banks covered by the EBA test in a given country. This choice corresponds to the following identifying assumption: we assume that conditions in banks in a country matter more to domestic borrowers than to foreign borrowers. We consider two alternative ways to scale bank holdings of domestic sovereign debt: (i) by risk-weighted assets (*RWA*) and (ii) by common equity (*CEQ*). These variables are reported as part of the stress test, so they are comparable across banks and across countries. Regressions also control for bank capitalization, which is critical because risk-shifting should be associated with less capitalized banks. Bank capitalization comes from Bankscope and is computed at the country level.

A key aspect is the comparison of stressed and normal times: healthy banks, in countries with fiscally sound governments, can expand their balance sheets easily, so that the amount of sovereign debt they hold is unrelated to their willingness to make new loans. In other words, financial repression is unlikely to be important in the boom periods. To implement the tests based on equation (1), we use indicators of whether or not a given creditor is in a stressed environment. We

identify stressed governments in several ways. First, we use an indicator for the years 2010 and 2011, which covers the most intense period of the sovereign debt crisis. (Ongena, Popov and van Horen (2016) use the time period May 2010 to August 2012, which yields very similar results for us.) Second, we narrow the focus on those countries which were experiencing stress at this point: Greece, Ireland, Italy, Portugal and Spain in the same time period.<sup>15</sup>

To show the robustness of the results and the source of the identifications, the results reported in Table III start with a simplest specification and gradually move to incorporate the most extensive set of controls. The results in columns (1) and (2) look at the average effect of the sovereign debt holdings across all times and regions using different denominator to normalize sovereign debt holdings. The estimated relationship is negative but only marginally insignificant in one of the specifications. This is consistent with our understanding that sovereign debt is not generally associated with less lending. The next four columns correspond to equation (1). The focus is on the comparison of the relationship between sovereign debt and lending depending on whether the government experiences financial stress. In columns (3) and (4), we identify stress using a time indicator for 2010 and 2011. The coefficient on sovereign debt holdings is insignificant in non-stressed times, but negative and significant in stressed periods. The magnitude in stressed periods is large: one standard deviation increase in domestic sovereign debt-to-RWA ratio is associated with a drop of about 10% in the likelihood that new debt will be a loan. Note that the stress indicator itself is not identified due to time fixed effects. In columns (5) and (6), we repeat these regressions with a narrower stress indicator, focusing on GIIPS countries in the 2010-2011 period. The

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<sup>15</sup> In unreported tests, we have used an indicator for high sovereign CDS-spreads or large increases in sovereign CDS spreads. This is mostly consistent with these simpler stress identifiers. Our data source for CDS spreads was Bloomberg.

estimates suggest a strong negative association between sovereign debt and lending in stressed periods but not otherwise.

While we include firm fixed effects in all specification, firms' fundamentals might change over time, and this may be influencing their choice of debt. We believe that this is unlikely given that we look at a relatively short period, 2010 through 2015. However, we also expand the analysis in columns (7) to (9) to include debt and borrower time-varying controls. Specifically, in column (7), we control for debt maturity and whether the borrower has an investment-grade credit rating. In column (8), we control for firm-level accounting controls gathered from Thomson One, including firm size, return on assets, book leverage, property plant and equipment, and free cash flows, all measured as of the previous fiscal-year-end. In column (9), we control for both sets of variables. Limited availability of firm level characteristics reduces sample size. However, the estimated effect of sovereign debt on the propensity of firms to get new loans remains negative and statistically significant. Magnitudes are somewhat larger than without controls. Overall, the results in Table III suggest significant substitution from loans into bonds by firms in troubled countries where local banks increase their holding of domestic sovereign debt.

*[TABLE III]*

We next narrow down our focus to individual banks in each country. Different banks in the same country might have different exposure to financial repression, and therefore may experience different pressures on their corporate lending capacity during a crisis. We use bank-level variation in the holdings of domestic sovereign debt to examine the key prediction about the link between sovereign debt and corporate lending, using within-country variation. An important benefit of this approach is that we can control for (country x year) fixed effects, ruling out any omitted variable

that varies by country-year (including, but not limited to, macro-economic variables and political economy features that impact all firms in a country).

To use bank level data, we must link firms to individual banks; that is, in a given quarter we have to associate a firm with its most likely lender regardless of whether a firm is receiving a loan. We use past syndicated loan participation as an indication that a bank has a relationship with a firm. This assumption builds on the vast theoretical and empirical literature that discusses the benefits of long-standing banking relationships. In particular, Bharath et al. (2011) and Ivashina and Kovner (2011) examine the importance of repeated borrowing from the same lender for firms using the syndicated loan market. For any new credit—loan or bond—we assume that the firm and the bank have a relationship if, in the past five years, the bank was the lead or co-lead lender to the borrower.

In matching borrowers and banks, we lose observations if the banks in question are not included in the ECB data set of sovereign bond holdings, or if firms do not have past bank relationships. Unlike the results in Table III, where all loans issued to the borrowers in our sample were included in the analysis, only loans by the relationship banks can be analyzed now. Many firms drop out for periods of the sample (because we cannot identify a real relationship bank at some points in time). As a result, firm fixed effects cannot be easily estimated in sample. To overcome this issue, we first estimate the firm fixed effect regression for the sample period 1997-2009:<sup>16</sup>

$$L_{it} = \lambda_i + e_{it} . \tag{4}$$

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<sup>16</sup> Although we report results using an out of sample estimation, due to time-unvarying nature of the preferences, we could use the full sample to estimate equation (4) instead.

Recall that firm fixed effects are intended to capture firm (time-invariant) preference toward issuing a bank's debt or public debt, regardless of the underlying reason for such preference. This is what is being captured in equation (4). In the second stage, we use the difference between  $L_{ijt}$  (equal to 1 if a firm  $i$  receives a loan from its relationship bank  $j$  and 0 if a firm issues a bond in a given quarter  $t$ ) and  $\hat{\lambda}_i$ , the fixed effect estimate from the first stage, as a dependent variable. That is, say, that for a given firm 60% of new debt issuance historically corresponded to bank loans. If this firm issues one bond between 2010 and 2015, the dependent variable has the value  $0 - 0.6 = -0.6$ . If instead the firm receives a loan, the value is  $1 - 0.6 = 0.4$ . Second stage estimates are reported in Table IV, columns (1) and (2) correspond to:

$$L_{ijt} - \hat{\lambda}_i = D_{It} + \beta_S HG_{jt}^i \times S_t^l + \beta_{NS} H_{jt}^i \times (1 - S_t^l) + \varepsilon_{ijt}, \quad (5)$$

where  $D_{It}$  are fixed effects for country-year. The main explanatory variable is  $HG_{jt}^i$ , domestic sovereign debt holdings by the borrower  $i$  relationship bank  $j$ . Because equation (5) covers cross-bank variation and includes country-time fixed effects, the beta estimates tell us about the effect of a lender with stressed debt, holding overall conditions in a firm's home country constant. If it is easy to substitute across banks, we expect the effect to be small. If it is difficult to substitute across banks, this may be a more accurate measure of conditions facing each firm, and this would lead to larger coefficient estimates than those corresponding to equation (1).

Results are reported in Table IV. We find an economically strong, negative relationship between individual banks' holdings of domestic sovereign debt and their relationship borrowers' propensity to receive a loan when they seek debt financing, in stressed periods but not at other times. The estimated magnitudes of the effects are smaller than in Table III, suggesting that firms in our sample have some ability to substitute across domestic banks (which seems reasonable given

that these firms have access to the bond market). Taken together, the results in Table III and Table IV suggest that, during the crisis period, firms were less likely to get a loan when their relationship bank(s) had absorbed large amounts of home country sovereign debt.

*[TABLE IV]*

The banks which hold more sovereign bonds may also differ from other banks in other dimensions relevant to their corporate credit provision, leading to a potential omitted variable problem. In Table V, we therefore add a set of relationship banks' characteristics as control variables. In particular, we control for bank profitability (ROE), funding (Deposits/Assets), performance (non-performing loans/Assets), and capitalization (Tier 1 capital/Assets). All variables are lagged. In all specifications, the impact of sovereign debt holdings remains economically large and statistically significant, with the effect on lending specific to the stressed period 2010-11. The additional controls have unstable and statistically insignificant coefficients. These results confirm that it is not bank financial health generally, but specifically the holdings of domestic sovereign bonds, which drive the reduction in the corporate loan supply we observe during the crisis.

*[TABLE V]*

### **3. Financial Repression vs. Alternative Explanations**

A contraction in a firm's propensity to access new loan financing in periods when its potential lenders have high exposure to risky domestic sovereign debt is consistent with financial repression. In this section we evaluate other alternative mechanisms that could explain the connection between sovereign debt and low bank lending.

One area to consider are potential effects of ECB policies and banks regulation. Given that cross-country variation in financial repression is fundamental to the interpretation of our result,

cross-border policies (such as those affecting the whole Euro-zone) or regulatory actions cannot explain our finding. For example, Basel II and Basel III rules—which apply to most developed market banks—assign zero risk-weight in calculating capital requirements for all OECD government bonds, regardless of whether those bonds are denominated in the issuing country’s own currency. As such, Basel rules favor sovereign debt, but do not favor home-country sovereign debt above foreign sovereign debt.<sup>17</sup>

Another alternative explanation to consider is home bias as a result of distressed banks’ incentive to buy correlated risk. For example, Crosignani (2014) develops a model wherein highly levered banks risk-shift into domestic government bonds because of the high correlation with their other sources of revenue. In the case of domestic sovereign default (the bad state of the world), banks are protected by limited liability; and at the same time, home sovereign debt guarantees the highest payoff in the good state of the world. It is worth emphasizing that, historically, losses on holdings of defaulted sovereign debt were often not very large. E.g., in Rogoff and Reinhart’s (2009) sample of domestic sovereign defaults, many cases involved only a small haircut. Sturzenegger and Zettelmeyer (2008) claim that recoveries in recent sovereign defaults have been on par with senior secured corporate debt. Thus, for a healthy bank, a bank that otherwise has healthy assets, losses on holdings of defaulted sovereign bonds may be unlikely to trigger a bank failure.

In the next section we will focus on specific channels of financial repression, which will narrow the interpretation of our findings further. In what follows here, we present two placebo tests that

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<sup>17</sup> See “Squaring the Eurozone’s Vicious Circle,” by Lucrezia Reichlin and Luis Garicano, *Project Syndicate*, January 27, 2014. Another useful reference for capital treatment of sovereign debt is “Treatment of Sovereign Risk in the Basel Capital Framework,” Bank for International Settlements, December 8, 2013, available at [www.bis.org/publ/qtrpdf/r\\_qt1312v.htm](http://www.bis.org/publ/qtrpdf/r_qt1312v.htm).

help us to distinguish our findings from risk-shifting and liquidity shock as an explanation of increasing holdings of local sovereign debt. However, it is important to emphasize that financial repressions and the effects discussed below are not mutually exclusive.

(i) *Risk-shifting*

Can low lending reflect risk-shifting by banks? The risk-shifting explanation suggests that—due to the convex payoff structure of equity—banks seek to increase the holdings of risky assets during periods of stress. Risk-based capital requirements are designed to deter this behavior. However, the capital treatment of sovereign debt does not properly account for its risk, which creates an opportunity for banks to risk-shift. This type of behavior is documented by Dreschsler et al. (2013), who examine banks’ risk-shifting behavior in periods when Greek sovereign risk market assessment diverged from regulatory risk measures. But, precisely as documented in Dreschsler et al (2013), if banks like to buy risky sovereign debt in order to risk-shift—which is what ultimately leads to lower corporate lending—the level of risk carried by sovereign debt should be a stronger predictor of lending than whether the sovereign debt is domestic or foreign.

To distinguish the effects of domestic vs. generally risky sovereign debt, we reexamine the results in Table III column (3) with an extra control: the holding of risky sovereign debt. Results are reported in Table VI. As before, the analysis controls for bank capitalization. In column (1) we use Greek debt, which for most of our samples is the riskiest European sovereign debt. Greek firms are excluded from this sample in column (1). In column (2), we use the total sovereign debt holdings of three riskiest countries as measured by the last quarter sovereign CDS spread. For most of the sample, these countries are Greece, Portugal and Cyprus. Similarly, we exclude these countries from the analysis to distinguish these from the domestic sovereign debt holdings.

In both column (1) and column (2), we find that holdings of domestic debt in the crisis period are negatively associated with the propensity to issue bank debt. So does Greek debt, whereas the *top-3 CDS* (riskiest) holdings have no effect on the choice of debt.<sup>18</sup> These results show that the effect that we measure is specific to local debt, and is robust to the inclusion of the type of securities that would be most useful to a bank exhibiting the risk-shifting behavior documented by Dreschsler et al. (2013). The first column indicates that risk-shifting may also have depressed lending. The magnitude is smaller, however: based on column (1), a standard deviation increase in domestic sovereign debt holdings during the crisis is associated with a 9.4% drop in the propensity to get a bank loan, whereas a standard deviation increase in Greek debt holdings is associated with a 0.6% increase.

[TABLE VI]

(ii) *Liquidity Shock*

Can the opposite of risk-shifting, some sort of flight to quality or flight to liquidity, explain why sovereign debt is associated with less lending in the crisis? In the traditional *bank lending channel* of monetary policy, banks that need to recapitalize do so by either raising equity (injecting more capital), or by reducing RWA. One way for a bank to lower RWA is to shift its portfolio to safe (zero-weight) securities like sovereign debt.<sup>19</sup> Because of the inclusion of controls for bank capitalization, our results are not explained by weak banks, which makes a recapitalization explanation for our findings less likely.

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<sup>18</sup> We have also run this type of “horse race” regression between holdings of Greek and home country sovereign debt in the bank-specific sample like the analysis in Table IV. In this setting, banks’ holdings of home debt also have a negative effect on the propensity of borrowers to issue loans, but holdings of Greek debt do not (outside Greece).

<sup>19</sup> One would also need to explain what generates a home bias in this case. And if the pressure emanates from the local bailout mechanism, that is a mechanism of financial repression.

We consider the possibility that banks may have felt the need to increase their holdings of liquid assets during the crisis period due to a negative liquidity shock. For example, this could happen as a buffer against the liquidity needs of the bank's customers (Kashyap, Rajan, and Stein, 2002; Ivashina and Scharfstein, 2010). In turn, higher demand for liquidity could have led to an increase in holdings for sovereign debt (Krishnamurthy and Vissing-Jorgensen, 2012) at the expense of the willingness to hold other assets, including corporate loans. This theory would predict that banks would hold the safest sovereign debt, and not necessarily a bank's home country debt (exactly the opposite of the risk-shifting prediction).

To distinguish our result from this alternative effect, we repeat the test above, using either Germany (the lowest-risk sovereign issuer in the Euro area) or the lowest three CDS Euro area issuers (Finland, Germany and either the Netherlands or Denmark, depending on the exact time). The results are reported in Table VI, columns (3) and (4). The strong negative association with domestic debt remains, while holdings of safe debt have no association with lending.

As mentioned before, financial repression need not be limited to the banking sector. The reporting of sovereign exposures of pension plans and insurance companies varies by country and by financial institution, and only a small fraction of publically available documents has information on the decomposition of sovereign holdings in domestic and foreign debt. One exception is Portugal, for which there is a time series of domestic sovereign exposure through the country's insurance and pension regulatory agency. These data indicates that between 2007 and 2013, Portugal's pension system increased its portfolio allocation to domestic debt by 6 percentage points (from 4% to 10%). The rise of the insurance sector's exposure to domestic debt was even more dramatic. Although similar regulators exist in each country, domestic sovereign debt holdings are not collected in a centralized way (or were not until very recently).

We collect some additional evidence through annual statements of the largest European insurers and pension funds. For example, the French Public Service Additional Pension Scheme maintained the same share of domestic debt as a percentage of sovereign debt between 2007 and 2012. The picture is similar for the largest German insurer, Allianz. In sharp contrast, the Spanish Social Security Reserve Fund (a state pension fund) almost doubled its holdings of domestic debt (in relative terms; by 2012, the fund nearly tripled its holdings of Spanish sovereign debt in absolute terms), shifting almost its entire portfolio to national government debt.

These patterns are parallel to those observed for the banking sector, and suggest that the pressure to hold domestic sovereign debt was not attributable to shocks to individual financial firms, or even to a particular segment of the financial industry. This evidence further weakens the idea of liquidity shock to the banks or their recapitalization—issues that tend to be specific to the banking sector—as an explanation of our findings.

#### **4. The Mechanisms of Financial Repression**

As discussed in the introduction, there are multiple mechanisms through which governments can pressure domestic banks to buy local sovereign debt. These mechanisms are likely not mutually exclusive and some of them might be too subtle to capture with standard types of data.<sup>20</sup> With this in mind, our goal is to indicate some of the channels that were likely at play throughout the European sovereign crisis. Because our results are conditioned on controls for bank

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<sup>20</sup> Sorkin (2009) has several examples of implicit federal pressure on U.S. banks. He suggests that Treasury Secretary Hank Paulson concluded the meeting with the CEOs of the largest U.S. banks, in which the bankers were asked to acquire Lehman Brothers' assets, by saying: "*This is about our capital markets, our country. We will remember anyone who is not seen as helpful.*" This implies pressure from the government, but also long-term industry reputation risk for the banks that refuse to succumb to this pressure, since such behavior constitutes an externality on the rest of the industry.

capitalization, it is unlikely that bailouts provide the primary source of motivation for the banks in our sample to buy sovereign bonds. While we cannot measure future bailout expectations, we have compared those European banks that have received bailouts to those that have not (these tests are not reported) and found no difference in uptake of sovereign debt (similarly, the size of bailouts did not predict sovereign debt).<sup>21</sup> Next, instead we turn to more direct channels of influence over banks.

(i) *Government ownership*

Direct government ownership of banks has been shown to influence banks' investment decisions (e.g., Barth, Caprio, and Levine, 2001; La Porta, Lopez-de-Silanes, and Shleifer, 2002; and Sapienza, 2004). In Figure 2, we look at the relationship between the share of local banks with a government equity stake (horizontal axis) and the increase in the banks' holdings of local sovereign debt (vertical axis). We consider two alternative measures of government ownership of banks. The first measure is from the country-level survey conducted by the World Bank (see Barth, Caprio, and Levine, 2013, whose research team was instrumental to the design of this survey). The variable is the percentage of the banking system's assets in banks where the government owns no less than 50% equity.<sup>22</sup> The data is available for several years, and we take the average of the period from 2008–2010. The second measure is from Iannotta, Nocera, and Sironi (2013), who use Bankscope data to track government ownership of banks from 2000–2009. They focus on European commercial banks with total assets of at least 10 billion euro in at least one fiscal year-end. The measure of government ownership is a continuous variable that measures the percentage

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<sup>21</sup> We thank Sasha Steffen and Viral Acharya for generously sharing data on bailouts.

<sup>22</sup> The specific question in the 2011 survey is: “13.7.1 What percent of the banking system's assets was in banks that were government-controlled (e.g., where government owned 50% or more equity) at the end of [2008, 2009, 2010]?”.

of banking sector equity controlled by the state. Another advantage of this measure is that it predates the peak of the sovereign debt crisis.

[FIGURE 2]

The fact that the government can influence the banks does not necessarily mean that it needs to do so; only countries under fiscal pressure, with rising sovereign risk are likely to resort to financial repression. To show this, we condition the sample on countries with CDS spreads above 100 basis points as of December 2010. (As expected, without this constraint, the relationship between state ownership of banks and the increase in sovereign debt holdings is much weaker.) As Figure 2 illustrates, there is a positive relationship between the depth of government ownership of the banking sector and the likelihood that local government debt will primarily show up on the balance sheet of domestic banks. Excluding Portugal, which appears to be an outlier, the correlation between a continuous measure of government ownership and the increase in banks' local sovereign debt holdings during the crisis is 0.72—statistically significant at 10% level, despite a very small sample size.

In a parallel result, De Marco and Macchiavelli (2016) examine the share of a bank's sovereign bonds that are domestic (whereas we study the share of sovereign bonds that are held by domestic banks). They find the same connection between government control and holding a lot of domestic bonds in a similar sample. De Marco and Macchiavelli look within countries, whereas our comparison is across-country. Thus, there is multi-dimensional evidence that repression in part happens through conventional corporate control mechanisms.

(ii) *Board seats*

Equity ownership is clearly not the only instrument of control over banks available to the government. For example, although, according to the World Bank no Spanish banks are majority-

owned by the government, it is well known that the government has considerable influence over the Spanish banking sector through the banks' boards of directors, especially savings banks or "cajas" (e.g., Santos, 2013). Similarly, Italian banks show up in the World Bank data as having zero government ownership; but among the largest bank shareholders are non-profit foundations or "fondazioni" which, in turn, are controlled by political parties.<sup>23</sup> According to the IMF 2013 Country Report for Italy, foundations control or exercise significant influence over 30% of the banking system and are a major shareholder in four of the top-10 banks.

We collect background data on board members, as well as the year they joined or left the board for each bank in our sample, from BoardEx, compiled by Management Diagnostics Limited. Overall, we identify 148 individuals that by 2011 were on the boards of directors of 60 different banks covered by the ECB stress testing, and that have a current or recent (post-1998) affiliation with the government (including foundations in Italy). We distinguish between affiliation with the local and central governments as well as between members of executive and supervisory committees, but do not find these differences to be important for the interpretation of the results. We then examine the relationship between increases in sovereign debt holdings in the 2011-2013 period (as a share of risk-weighted assets) and government board representation (the time horizon is limited by data availability: at the bank level, domestic sovereign debt holdings are only known back to 2011). We define each variable by country in order to identify the slope from variation between banks in the same judicial and political system. The two variables are plotted in Figure 3.

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<sup>23</sup> "Italian Bank Foundations under Siege on Overhaul Push," *Bloomberg News*, October 30, 2013 gives the following description of these foundations: "Banking foundations are a particularly Italian institution. The 88 non-profit groups, some of which trace their origins back more than 400 years, were entrusted with the ownership of Italy's banks when they were sold by governments in the 1990s. Their mandate was to support the lenders as they consolidated and gradually opened to new investors. Banks' dividends funded foundations' charitable activities."

Regression lines are plotted separately for countries with high and low CDS spreads (we use a spread of 100 as the cutoff), and only the former relationship is significant. These data are consistent with financial repression determined in part by direct board representation.

*[FIGURE 3]*

## **5. Discussion of Broader Consequences of Financial Repression**

European markets have experienced two crisis episodes in rapid succession: first, the financial crisis that spread from the U.S.; and second, a longer and deeper crisis associated with sovereign debt problems, which is still unresolved. In the second crisis, when sovereign debt issuance has been very challenging for many countries, an increasing share of sovereign debt has been absorbed by domestic banks. This is especially true in some of the countries with the highest debt levels and the most dramatic increase in spreads, such as Greece and Italy. We show that the increase in domestic sovereign debt holdings by banks is strongly associated with a contraction in the corporate loan supply. This effect is distinct from risk-shifting or banks' responses to negative shocks to their balance sheets. Instead, consistent with financial repression, this effect is independent of bank capitalization and is more pronounced for the banks that are influenced by the government through direct ownership or board seat possession.

In this final section of the paper we look to generalize our findings beyond the European sovereign debt crisis and to reflect on welfare implications. Theory developed by Acharya and Rajan (2013) point out that myopic governments may use financial repression at the expense of growth in order to meet short-term funding needs. Empirically, we can gain some insight by examining the relationship between total domestic sovereign debt and debt choice at the firm level. The results are reported in Table VII. As before, the independent variable is the choice of debt by

individual firms. The explanatory variable of interest is the total level of local government debt as a percentage of GDP, measured at end of the preceding year. Theory does not necessarily specify a linear relationship, so we include quadratic specification as well as a step specification. With larger and riskier government debt, an increasing number of firms switch from loans to bonds, reflecting a higher relative cost of bank credit. This is consistent with repression, if bank acquisitions of sovereign debt in normal times are primarily voluntary and undertaken without government pressure, although perhaps also with other mechanisms.

*[TABLE VII]*

The estimated magnitude implies that a ten-percentage-point increase in the ratio of public debt to GDP predicts a 1-percentage-point lower likelihood of new debt being bank loans, but this effect is highly non-linear. Column (4) suggests that most of the effect may occur when transitioning from high to very high debt levels, with an estimated 8 percentage point drop in the loan share of new debt. This finding is consistent with the use of financial repression as an indirect form of gradual, government debt restructuring. It is also helpful for aggregate welfare assessments of our finding, given the result from a number of approaches summarized in Reinhart, Reinhart, and Rogoff (2012), which show that very high levels of public debt may have a negative effect on economic growth.

Finally, to provide a sense of the magnitude of the drop in bank credit supply to firms, we run a horse race between GDP growth and sovereign debt holdings. Comparing the two bad periods 2008:Q4-2010:Q1 and 2011:Q4-2013:Q2 to all other quarters, the loan share was below average by around 12% (cf. Figure 1). We decompose this by running a regression as in Tables III and IV, with GDP growth capturing the regular effect of a recession, and sovereign debt holdings capturing the effect of repression. Changes in the composition of issuing firms explain less than 1% point of

the 12% drop, the business cycle explains 7%, and the impact of sovereign debt on bank balance sheets also explains 7%. The remainder is not explained by our regressions. Financial repression appears to have reduced the loan share substantially, and by much more than in a typical recession.

## **6. Conclusions**

In this paper, we document the connection between sovereign bond holdings on bank balance sheets during the European crisis, and the low level of corporate lending. We make the case that low loan supply—and not low loan demand from corporations—is behind the low loan flow, by observing substitution into bond issuance by individual borrowers, following Becker and Ivashina (2014). Across countries, we find a large and robust negative connection between domestic sovereign bonds held on bank balance sheets and the availability of bank loans for corporations. This also holds true across different banks within countries (we connect borrowers to banks using past lending relationships). This does not reflect risk shifting, since the result holds regardless of bank capitalization and it is domestic sovereign bonds, and not high risk sovereign bonds more generally, which are connected to low lending. Nor are holdings of safe sovereign bonds associated with depressed loan supply. A likely interpretation of these facts is that banks are coerced to hold domestic bonds at the expense of foregoing lending opportunities. We show that, in the cross-country setting, the propensity to hold domestic debt and the resulting contraction in credit supply is correlated with the intensity of government influence over domestic banks (as measured by direct government ownership and board seats). Overall, our paper is most consistent with financial repression reducing private credit formation in the recent period of sovereign debt pressure.

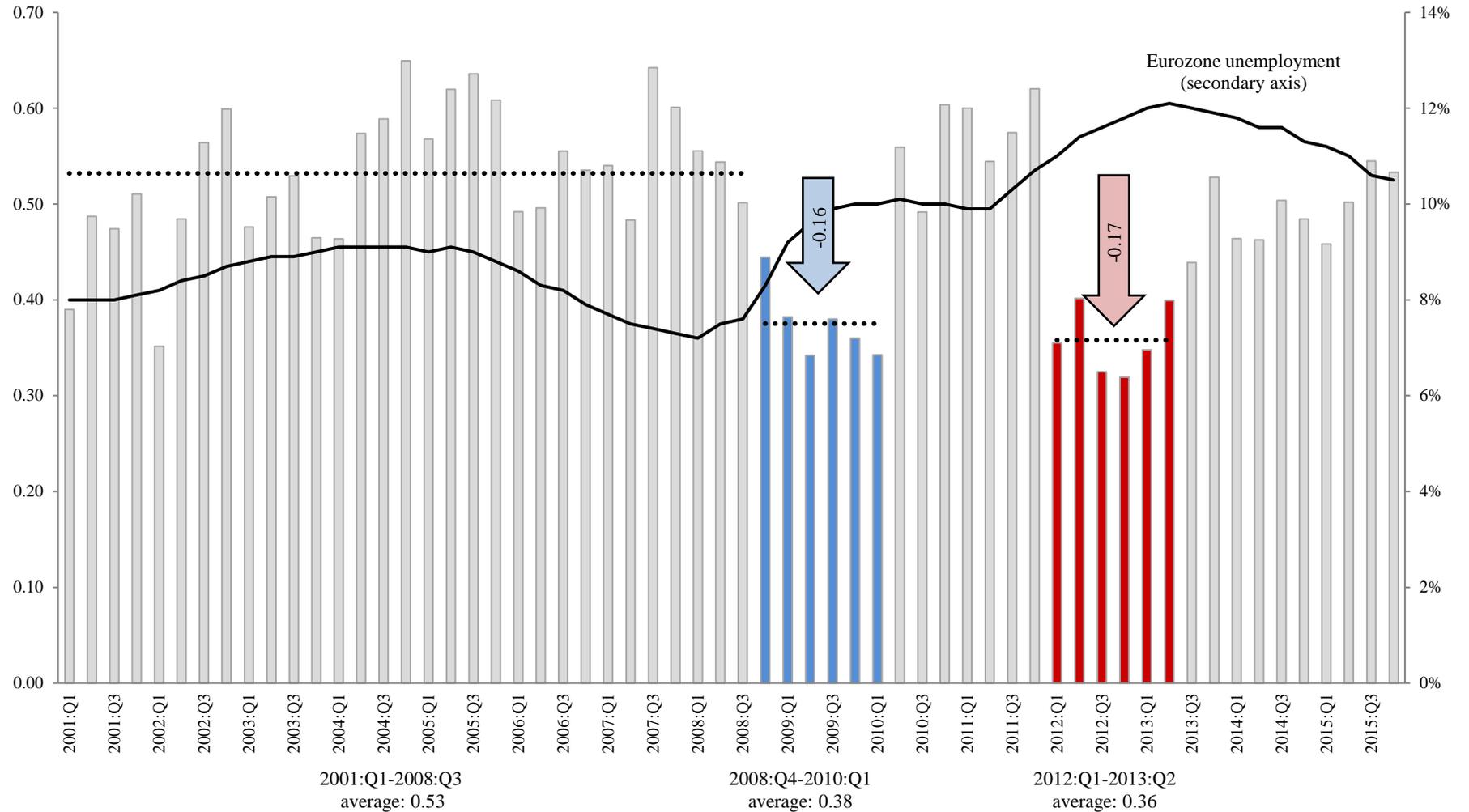
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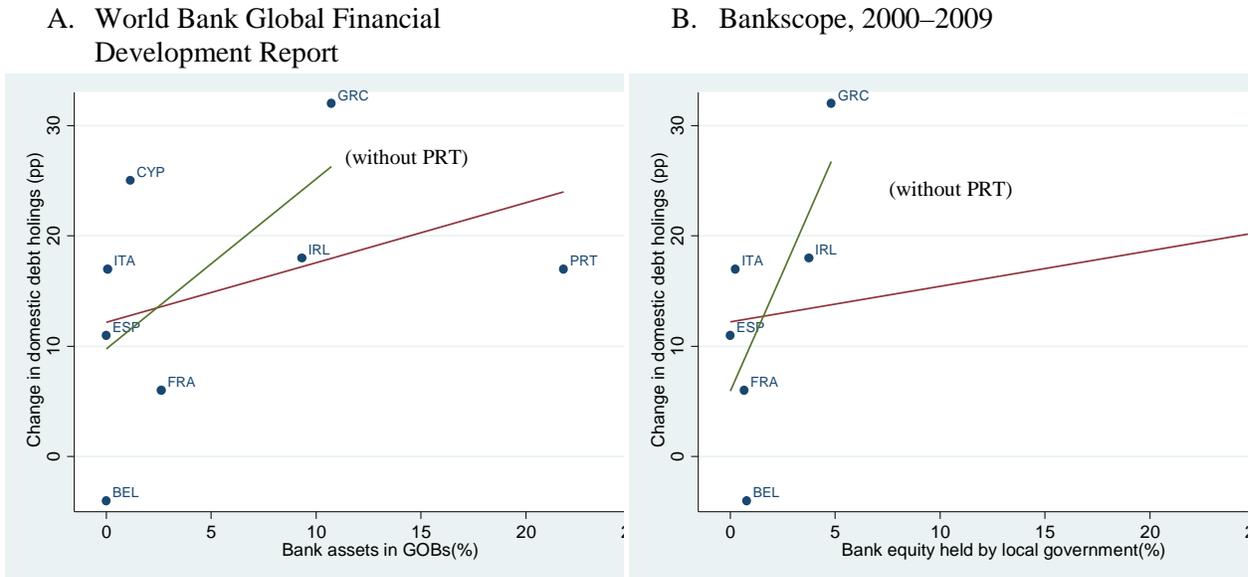
**Figure 1. Corporate credit supply in Europe**

The figure shows the number of European firms issuing new bank loans as a fraction of all firms issuing new debt in a given quarter (Bank debt/Total debt). Data on Eurozone unemployment rate is from Eurostat.



**Figure 2.** The role of government-owned banks

The figure plots change in domestic banks' share of bank-held sovereign bonds from 2010 to 2013 (vertical axis) against: (A) percentage of the banking system's assets that is in government-controlled banks, i.e., where the government owned 50% or more equity; and (B) percentage of the large banks equity held by the local government. The first measure of government ownership of banks is compiled from the World Bank Global Financial Development Report 2013. It is based on the survey data, and corresponds to the average for the period from 2008–2010. The second measure is from Iannotta, Nocera, and Sironi (2013), who collected bank ownership information from 2000–2009 from Bankscope. The sample is constrained to European countries with CDS spread above 100 basis point as of December 2010.





**Table I.** Sample distribution of loan vs. bond choice

These tables present the distribution of our core dependent variable  $L_{it} = [0,1]$ , the share of new debt that are loans in a quarter  $t$ . If a firm is not included in the sample in any quarter when it did not have a new loan or bond issue.

Country	Part of EBA stress testing	Loan officers survey data start	Bank share (mean)	Obs.	
European Union (Eurozone):				4,465	
Austria	AUT	Yes	2003:Q1	0.396	53
Belgium	BEL	Yes	2003:Q1	0.462	170
Cyprus	CYP	Yes	2009:Q2	0.200	15
Finland	FIN	Yes	--	0.659	191
France	FRA	Yes	2011:Q2	0.442	1,126
Germany	DEU	Yes	2003:Q1	0.496	838
Greece	GRC	Yes	2003:Q1	0.583	96
Ireland	IRL	Yes	2003:Q1	0.340	190
Italy	ITA	Yes	2003:Q1	0.420	400
Luxembourg	LUX	Yes	2003:Q1	0.716	63
Netherlands	NLD	Yes	2003:Q1	0.547	580
Portugal	PRT	Yes	2003:Q1	0.265	128
Spain	ESP	Yes	2003:Q1	0.516	615
European Union (other):				3,948	
Denmark	DNK	Yes	--	0.284	97
Sweden	SWE	Yes	--	0.466	643
U.K.	GBR	Yes	--	0.514	3,208
Europe (other):				946	
Iceland	ISL	No	--	0.258	89
Norway	NOR	Yes	--	0.524	295
Switzerland	CHE	--	--	0.642	562
Total			0.498	9,359	

Year	Bank share (mean)	Obs.
1997	0.494	331
1998	0.505	370
1999	0.460	430
2000	0.441	449
2001	0.472	454
2002	0.502	473
2003	0.499	495
2004	0.583	547
2005	0.612	598
2006	0.517	534
2007	0.558	483
2008	0.518	390
2009	0.366	420
2010	0.507	472
2011	0.586	564
2012	0.354	532
2013	0.434	582
2014	0.483	631
2015	0.508	595
Total		9,359

**Table II.** Within-firm evidence on loan vs. bond choice

The dependent variable is  $L_{it} = [0,1]$  is the share of new debt that are loans in a quarter  $t$ . If a firm is not included in the sample in any quarter when it did not have a new loan or bond issue. Data on tightening in lending standards comes from ECB and corresponds to the net percentage of banks tightening credit standard for new loans or credit lines to enterprises. Country-level measures of *Aggregate lending growth*, and *Non-performing* are compiled from Bankscope. Lending growth is measured as a four-quarter rolling-window growth in aggregate loans outstanding. Non-performing loans and loan allowances are scaled by total loans, and correspond to the assets-weighted average for the banks within a given country. *GDP growth* is real change in per capita GDP, determined quarterly (measured with respect to the same quarter the year prior to avoid seasonality); the data is collected from the Eurostat website. *Bank stock-index* is the logarithm of an equally weighted stock index. Errors are heteroskedasticity-robust and clustered by country $\times$ year. \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Tightening in lending standards	-0.011*** (0.003)	--	--	--	--
Aggregate lending growth	--	0.219** (0.088)	--	--	--
Non-performing loans	--	--	-6.106*** (1.051)	--	--
GDP growth	--	--	--	0.020*** (0.003)	--
Bank stock-index	--	--	--	--	0.033*** (0.012)
Fixed effects					
Firm ( $D_i$ )	Yes	Yes	Yes	Yes	Yes
Observations	2,719	8,686	9,359	9,211	8,264
$R$ -squared	0.43	0.41	0.41	0.42	0.42

**Table III. Banks' balance sheets and bank credit supply**

The dependent variable  $L_{it} \in [0,1]$  is the share of new debt that are loans received by firm  $i$  in a quarter  $t$ . If a firm is did not have a new loan or bond issue in a given quarter, it is not included in the sample for that quarter. The sample is constrained to 2010-2015 which is the period over which EBA collected sovereign debt holdings at the bank level. *Domestic sovereign debt* is the amount held by all domestic banks, normalized by risk-weighted assets (*RWA*) or common equity (*CEQ*). Other explanatory variables are described in the Appendix. Standard errors are heteroskedasticity-robust and clustered by country  $\times$  year. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Sovereign debt holdings normalized by:	RWA (1)	CEQ (2)	RWA (3)	CEQ (4)	RWA (5)	CEQ (6)	RWA (7)	RWA (8)	RWA (9)
Domestic sovereign debt held by local banks	-0.523 (0.348)	-0.063* (0.037)	--	--	--	--	--	--	--
Domestic sovereign debt x $I_{2010-2011}$	--	--	-1.267** (0.500)	-0.072* (0.043)	--	--	--	--	--
Domestic sovereign debt x $(1-I_{2010-2011})$	--	--	-0.550 (0.352)	-0.026 (0.043)	--	--	--	--	--
Domestic sovereign debt x $I_{2010-2011}^{GIIPS}$	--	--	--	--	-4.715*** (1.019)	-0.389*** (0.103)	-4.397*** (0.289)	-8.368*** (1.007)	-7.911*** (1.780)
Domestic sovereign debt x $(1-I_{2010-2011}^{GIIPS})$	--	--	--	--	-0.450 (0.308)	-0.047 (0.035)	-0.519* (0.289)	2.190* (1.153)	1.992 (1.202)
$I_{2010-2011}^{GIIPS}$	--	--	--	--	0.400*** (0.117)	0.434*** (0.147)	0.340*** (0.098)	1.047* (0.223)	1.036*** (0.242)
Tier 1 capital ratio	4.134 (2.890)	4.134 (2.890)	0.829 (5.133)	1.847 (3.26)	6.131* (2.816)	3.030 (3.201)	7.030*** (2.217)	17.12** (7.445)	10.63 (6.790)
Borrower characteristics:									
Debt maturity (years)	--	--	--	--	--	--	-0.015*** (0.003)	--	-0.014*** (0.005)
Investment grade rating	--	--	--	--	--	--	0.562*** (0.048)	--	0.395*** (0.069)
Log (Assets)	--	--	--	--	--	--	--	-0.231*** (0.097)	-0.123 (0.113)
ROA (Net income/Assets)	--	--	--	--	--	--	--	-1.365** (0.532)	-1.255* (0.722)
Leverage (% of assets)	--	--	--	--	--	--	--	-1.615*** (0.506)	-1.612*** (0.484)
PP&E (% of assets)	--	--	--	--	--	--	--	0.528 (0.344)	0.497 (0.339)
Free cash flow (% assets)	--	--	--	--	--	--	--	1.116* (0.530)	0.950* (0.544)
Fixed effects: Firm ( $D_i$ ), Year-quarter ( $D_t$ )	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/No	Yes/No
Observations	2,405	2,402	2,405	2,402	2,405	2,402	2,345	679	662
R-squared	0.54	0.54	0.54	0.54	0.54	0.54	0.60	0.51	0.55

**Table IV.** Relationship banks' balance sheets and bank credit supply

The analysis in this table focuses on matching between firms and their relationship banks. At a given point in time, a relationship between a firm and a bank is taken to exist if a bank was a lead or co-lead in a syndicated loan taken out in the last five years. That is, for loans issued in 2010:Q1, we identify banking relationship using DealScan data from 2005-2009. The dependent variable is the residual from a regression of a bank loan/bond indicator on firm fixed effects. *Domestic sovereign debt* is the amount held by all domestic banks, normalized by risk-weighted assets (*RWA*) or common equity (*CEQ*).  $I_{2010-2011}$  is equal to 1 during the years 2010 and 2011, and 0 otherwise.  $I_{2010-2011}^{GIIPS}$  is equal to 1 during the years 2010 and 2011 for firms located Greece, Italy, Ireland, Spain or Portugal, and 0 otherwise. Standard errors are heteroskedasticity-robust and clustered by country  $\times$  year. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Sovereign debt holdings normalized by:	RWA	CEQ	RWA	CEQ	RWA	CEQ
	(1)	(2)	(3)	(4)	(5)	(6)
Domestic sovereign debt holdings	-0.874*** (0.281)	-0.037*** (0.013)	--	--	--	--
Domestic sovereign debt holdings $\times I_{2010-2011}$	--	--	-0.993*** (0.171)	-0.043*** (0.008)	--	--
Domestic sovereign debt holdings $\times (1-I_{2010-2011})$	--	--	-0.419 (1.204)	-0.029 (0.03)	--	--
Domestic sovereign debt holdings $\times I_{2010-2011}^{GIIPS}$	--	--	--	--	-0.868*** (0.289)	-0.037*** (0.014)
Domestic sovereign debt holdings $\times (1-I_{2010-2011}^{GIIPS})$	--	--	--	--	-1.005 (1.207)	-0.036 (0.043)
Fixed effects: Firm ( $D_i$ )	(1 <sup>st</sup> stage)					
Fixed effects: Year $\times$ Country ( $D_{it}$ )	Yes	Yes	Yes	Yes	Yes	Yes
Observations	614	614	614	614	614	614
R-squared	0.10	0.08	0.08	0.08	0.08	0.08

**Table V. Relationship banks' balance sheets and bank credit supply: additional controls**

This table expand the results in Table IV by adding controls for relationship banks' characteristics. At given point in time, a relationship between a firm and a bank is taken to exist if a bank was a lead or co-lead in a syndicated loan taken out in the last five years. If a firm has relationship with multiple lenders, banks characteristics correspond to the average across firm's relationship banks. For a given loan, relationship banks' characteristics are measured as of the previous year end. For compactness we only report results for domestic sovereign debt holdings normalized by risk-weighted assets (*RWA*). Standard errors are heteroskedasticity-robust and clustered by country  $\times$  year. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Domestic sovereign debt holdings	-0.967*** (0.317)	-0.943*** (0.293)	-0.989*** (0.308)	-0.923*** (0.298)	-1.107*** (0.369)	--	--	--	--	--
Bank return on equity (ROE)	0.006* (0.003)	--	--	--	-0.000 (0.008)	--	--	--	--	--
Deposits/Assets	--	-0.220 (0.447)	--	--	-0.373 (0.656)	--	--	--	--	--
Non-performing loans (NPL)/Assets	--	--	-16.14* (9.10)	--	-20.45 (21.11)	--	--	--	--	--
Tier 1 capital/Assets	--	--	--	1.372 (3.338)	4.829 (3.642)	--	--	--	--	--
Domestic sovereign debt holdings x $I_{2010-2011}$	--	--	--	--	--	-1.111*** (0.200)	-0.991*** (0.184)	-1.139*** (0.214)	-0.985*** (0.188)	-1.050*** (0.179)
Domestic sovereign debt holdings x $(1 - I_{2010-2011})$	--	--	--	--	--	-0.352 (1.319)	-0.637 (1.278)	-0.448 (1.226)	-0.327 (1.202)	-0.303 (1.281)
Bank ROE x $I_{2010-2011}$	--	--	--	--	--	0.005*** (0.002)	--	--	--	-0.006 (0.007)
Bank ROE x $(1 - I_{2010-2011})$	--	--	--	--	--	0.007 (0.007)	--	--	--	0.002 (0.011)
Deposits/Assets x $I_{2010-2011}$	--	--	--	--	--	--	0.332 (0.505)	--	--	0.864** (0.365)
Deposits/Assets x $(1 - I_{2010-2011})$	--	--	--	--	--	--	-0.445 (0.585)	--	--	-0.812 (0.814)
Non-performing Loans/Assets x $I_{2010-2011}$	--	--	--	--	--	--	--	-17.24*** (5.776)	--	-32.48* (18.77)
Non-performing Loans / Assets x $(1 - I_{2010-2011})$	--	--	--	--	--	--	--	-15.76 (15.15)	--	-15.87 (27.04)
Tier 1 capital x $I_{2010-2011}$	--	--	--	--	--	--	--	--	-1.520 (4.119)	-0.311 (3.289)
Tier 1 capital x $(1 - I_{2010-2011})$	--	--	--	--	--	--	--	--	2.438 (3.922)	6.579* (3.755)
Fixed effects: Firm ( $D_i$ )	(1 <sup>st</sup> stage)									
Fixed effects: Year x Country ( $D_{it}$ )	Yes									
Observations	593	593	593	589	589	593	593	593	589	589
R-squared	0.08	0.08	0.08	0.08	0.10	0.098	0.08	0.08	0.08	0.09

**Table VI. Financial repression vs. risk-shifting and liquidity shocks**

This table is based on Table III, column (3) but, in addition, includes domestic banks' "placebo" sovereign debt holdings of: Greece (column (1)), countries with three highest CDS spreads (column (2)), Germany (column (3)), and countries with three lowest CDS spreads (column (4)). All sovereign holdings are normalized by risk-weighted assets (*RWA*). As in Table III, the dependent variable  $L_{it} \in [0,1]$  is the share of new debt that are loans received by firm  $i$  in a quarter  $t$ . If a firm is did not have a new loan or bond issue in a given quarter, it is not included in the sample for that quarter. The sample is constrained to 2010-2015 which is the period over which EBA collected sovereign debt holdings at the bank level.  $I_{2010-2011}$  is equal to 1 during the years 2010 and 2011, and 0 otherwise. Standard errors are heteroskedasticity-robust and clustered by country  $\times$  year. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

"Placebo" sovereign debt corresponds to:	Greece (1)	Top-3 CDS (2)	Germany (3)	Bottom-3 CDS (4)
Domestic sovereign debt $\times I_{2010-2011}$	-1.011** (0.455)	-1.367*** (0.495)	-2.055*** (0.635)	-0.129** (0.050)
Domestic sovereign debt $\times (1-I_{2010-2011})$	-0.438 (0.336)	-0.692* (0.346)	-0.719** (0.336)	-0.062* (0.035)
"Placebo" sovereign debt $\times I_{2010-2011}$	-2.438*** (0.797)	-0.629 (0.735)	0.260 (0.778)	0.640 (0.665)
"Placebo" sovereign debt $\times (1-I_{2010-2011})$	873.8 (565.8)	0.780*** (0.233)	0.875 (1.166)	-0.297 (0.550)
Tier 1 capital ratio	2.868 (2.852)	2.311 (3.065)	2.377 (3.010)	2.235 (2.961)
Fixed effects: Firm ( $D_i$ )	Yes	Yes	Yes	Yes
Fixed effects: Year-quarter ( $D_t$ )	Yes	Yes	Yes	Yes
Observations	2,389	2,405	2,164	2,405
<i>R</i> -squared	0.54	0.54	0.54	0.54

**Table VII.** Domestic sovereign debt and bank credit supply

The dependent variable  $L_{it} \in [0,1]$  is the share of new debt that are loans received by firm  $i$  in a quarter  $t$ . If a firm did not have a new loan or bond issue in a given quarter, it is not included in the sample for that quarter. The focus is on domestic sovereign debt outstanding, as a fraction of GDP. Domestic sovereign debt indicators in columns (3) and (4) are equal to one if sovereign debt is more than or equal to 60%, but less than 90%, of GDP; between 90% and 120% of GDP; and above 120% of GDP. The omitted category is observations where government debt is below 60% of GDP. Standard errors are heteroskedasticity-robust and clustered by country  $\times$  year. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Sample:	1997-2015	1997-2015	1997-2015	1997-2015
	(1)	(2)	(3)	(4)
Domestic sovereign debt / GDP	-0.096** (0.052)	0.378* (0.219)	-0.078 (0.084)	--
Domestic sovereign debt / GDP, Squared	--	-0.342** (0.153)	--	--
Sovereign CDS, previous quarter	--	--	-0.185* (0.094)	--
Domestic sovereign debt > 60% GDP	--	--	--	-0.004 (0.021)
Domestic sovereign debt > 90% GDP	--	--	--	-0.080** (0.036)
Domestic sovereign debt > 120% GDP	--	--	--	-0.039 (0.068)
Fixed effects: Firm ( $D_i$ )	Yes	Yes	Yes	Yes
Observations	8,378	8,378	4,804	8,378
$R$ -squared	0.40	0.10	0.46	0.40

## A1. The Model

To formalize our hypothesis, we assume a country has fixed total private savings  $S$ . These savings can be invested in government bonds or in loans to companies.<sup>24</sup> We assume that government debt cannot be funded abroad. Finally, we assume that both loans to firms ( $K$ ) and bonds issued by the government ( $B$ ) are intermediated by domestic banks. Bonds are repaid with a (net) interest rate  $r$ , while bank loans produce a gross return  $f(K)$ .  $f' > 0$  and  $f'' < 0$ ; this assumption is meant to capture declining marginal returns to private investment. The budget constraint is:

$$S = K + B . \tag{A1}$$

We assume that the banking sector (“the banks”) maximizes the return  $f(K) + (1 + r)B$  subject to the budget constraint. Assuming that banking balance sheets are fixed in size corresponds to severe financial frictions. This stark assumption may be most relevant when banks find it difficult to access financial markets; for example, during a financial crisis.

The first-order condition for the banks is:

$$f'(K) = 1 + r . \tag{A2}$$

The optimal allocation of household funds to the banking system is  $K^* = h(1 + r)$  and the allocation to government bonds is  $B^* = S - h(1 + r)$ , where  $h = f'^{-1}$  is the inverse function. Since  $h' < 0$ , more bonds can be issued when the government offers a higher interest rate. This

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<sup>24</sup> By assuming that savings are fixed, we are assuming that the Ricardian equivalence fails to hold. This may reflect households who make investment decisions with short horizons (Barro, 1974). It also implicitly depends on the limited ability of banks to raise funding abroad.

crowds out private lending by banks (either fewer borrowers receive loans, or individual loans become smaller, or both).

In the context of financial repression, the government rewards banks, or their managers, for holding more government debt, or, equivalently, penalizes them for holding private assets. For example, the government may make future bailouts conditional on such bank behavior, or may put pressure on decision-makers in other formal or informal ways (we discuss these mechanisms further in the final section of the paper). We capture this financial repression as a proportional tax  $t \in (0,1)$  on the return to private loans. As a result, households' first-order condition becomes:

$$(1 - t)f'(K) = 1 + r . \tag{A3}$$

The optimal allocation to banks becomes  $K^* = h[(1 + r)/(1 - t)]$ , which is lower than what this allocation would be without repression. Essentially, repression distorts the allocation of aggregate household savings from private lending to government bonds. Consequently, repression is visible both in lower lending volumes and in expansion of sovereign debt purchases. These observations lie at the core of our empirical tests.

Another way to understand how repression works is to consider the interest rate that the government must offer to place sovereign bonds. Without financial repression, from (A2),  $r = f'(K) - 1$ . With repression, we can similarly back out  $r$  from (A3):

$$r = (1 - t)f'(K) - 1 . \tag{A3'}$$

This means that more repression (higher  $t$ ) reduces the interest rate that the government has to offer. Government deficits can be funded more easily, at the expense of lower private capital formation.

## A2. Variable Definitions

For a given quarter:	
<i>Domestic sovereign debt held by local banks</i>	Total holdings of domestic sovereign debt in previous year, reported in EBA stress tests, normalized by either <i>RWA</i> or <i>CEQ</i> .
<i>Relationship bank</i>	At a given point in time, a relationship between a firm and a bank is taken to exist if a bank was a lead or co-lead in a syndicated loan taken out in the last five years. That is, for loans issued in 2010:Q1, we identify banking relationship using DealScan data from 2005-2009. For firms with multiple relationship banks we take an average.
<i>Domestic sovereign holdings (relationship banks)</i>	Average relationship bank total holdings of domestic sovereign debt in previous year, reported by ECB, normalized by either <i>RWA</i> or <i>CEQ</i> .
<i>I</i> <sub>2010-11</sub>	Indicator variable equal to 1 during the years 2010 and 2011, and 0 otherwise.
<i>I</i> <sub>2010-2011</sub> <sup>GIIPS</sup>	Indicator variable equal to 1 during the years 2010 and 2011 for firms located Greece, Italy, Ireland, Spain or Portugal, and 0 otherwise.
<i>Tier 1 capital ratio</i>	Total tier 1 capital relative to risk-weighted assets of domestic banks covered by ECB data, measures as of the end of the previous year
<i>RWA</i>	Bank's risk-weighted assets (end of previous year) reported by EBA.
<i>CEQ</i>	Banks' common equity (end of previous year) reported by EBA.
<i>Tier 1 capital/Assets</i>	Average relationship banks' ratio of Tier 1 capital to consolidated assets, compiled from Capital IQ and measured as of the previous fiscal year.
<i>ROE</i>	Average relationship banks' return on equity compiled from Capital IQ measured as of the previous fiscal year.
<i>Deposits/Assets</i>	Average relationship banks' ratio of deposits to consolidated assets, compiled from Capital IQ and measured as of the previous fiscal year.
<i>Non-performing loans/Assets</i>	Average relationship banks' ratio of non-performing loans (NPL) to consolidated assets, compiled from Capital IQ and measured as of the previous fiscal year.
<b><u>Borrower characteristics:</u></b>	
<i>Debt maturity (years)</i>	Value-weighted average time to maturity at issue for all new bonds and loans issued by a firm in a quarter.
<i>Investment grade rating</i>	An indicator based on firms' S&P credit rating, end of previous quarter.

<i>Log (Assets)</i>	Natural logarithm of book value of assets, previous quarter.
<i>ROA (Net income/Assets)</i>	Net income over assets, previous quarter.
<i>Leverage (% of assets)</i>	Total book value of debt divided by book value of all assets, previous quarter.
<i>PP&amp;E (% of assets)</i>	Property, plant and equipment divided by assets, previous quarter.
<i>Free cash flow (% assets)</i>	Free cash flow divided by assets, previous quarter.