The invisible hand of the government:
Moral suasion during the European sovereign debt crisis

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Abstract

Using proprietary data on banks' monthly securities holdings, we show that during the European sovereign debt crisis, domestic banks in fiscally stressed countries were considerably more likely than foreign banks to increase their holdings of domestic sovereign bonds during months when the government needed to roll over a relatively large amount of maturing debt. This result is stronger for state-owned and supported banks, and it cannot be explained by concurrent factors such as risk shifting, carry trading, or regulatory compliance. We also find evidence that domestic banks reduced the supply of household credit following months with high government refinancing need.

1.   Introduction

At the onset of the global financial crisis during the fall of 2008, domestic sovereign bonds constituted about 2 percent of euro area banks' overall assets. This picture changed radically over the course of several years, and by 2013, domestic sovereign bonds equalled more than 5 percent of the overall assets of those same banks (Figure 1). This increase was largely driven by banks in countries under fiscal stress, namely Greece, Ireland, Italy, Portugal, and Spain (hereafter "stressed countries" or "GIIPS"), whose relative holdings of domestic sovereign bonds tripled during this period (Figure 2). Crucially, while initially both domestic and foreign banks in these countries were increasing their holdings of domestic sovereign debt, after the start of the sovereign debt crisis in May 2010 domestic banks' holdings continued rising at an even faster pace—reaching 9 percent of total bank assets—while foreign banks' holdings of domestic sovereign debt (e.g., holdings of Italian sovereign bonds by affiliates of French banks in Italy) declined and returned to the same level as at the start of the global financial crisis (Figure 3).

This development has led both academics and policy makers to speculate that the rapidly increasing exposure of domestic banks in stressed countries to their sovereign was at least in part the result of "moral suasion", or governments under fiscal stress persuading their banks to purchase additional amounts of domestic sovereign bonds because market demand is weak.[1] The government's need to convince banks to purchase its debt stems from the fact that the government's inability to roll over its debt would damage its credibility and push sovereign bond yields up, raising debt refinancing costs.[2] Banks likely comply as the government's appeal might be combined with a threat of a more repressive regime if the bank does not act, such as

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[1] „Time bomb? Banks pressured to buy government debt"(Jeff Cox, *CNBC,* 31 May 2012, http://www.cnbc.com/id/47633576). „[…] sovereign credit risk may alter swiftly as it did in 2008-09 due to […] moral suasion of the financial sector (‚financial repression') to hold sovereign debt" (Viral Acharya, „Banking Union in Europe and other reforms," *VOXEU*, 16 October 2012, http://www.voxeu.org/article/banking-union-europe-and-other-reforms). „The reasons for the increased exposure of banks to their domestic sovereigns may [include] moral suasion […]" (Jens Weidmann, „Weidmann in sovereign debt warning," *Financial Times*, 30 September 2013, http://www.ft.com/intl/cms/s/0/557fe8be-29f2-11e3-9bc6-00144feab7de.html). „[…] there could be „moral suasion by regulators or politicians" in Greece to support the efforts of the authorities to effectively stay in the Eurozone" (Michaelides, 2014). Brunnermeier, James, and Landau (2016) argue that governments in countries "west and south of the Rhine" adhere to the creed that sovereign debt should never default. By morally swaying banks to absorb sovereign debt when times are dire, these governments thereby "double down on the bet that it will and cannot".

[2] For example, after the undersubscribed auction for UK government bonds (gilts) on 25 March 2009, gilt prices slumped, the UK pound weakened against the U.S. dollar and the euro, the opposition accused the government of losing control of public finances, and media commentators said the gilt failure further undermined the Prime Minister's reputation for economic competence („Alarm as government debt auction fails," *The Guardian*, 25 March 2009 https://www.theguardian.com/business/2009/mar/25/uk-economic-rescue-in-crisis).

intensified supervision, limited access to Central Bank funding, or the revoking of a bank's license (Horvitz and Ward, 1987). Furthermore, compliance might benefit the bank directly by reducing sovereign spreads and therefore bank funding costs which are linked to these spreads. In addition, banks may choose to respond to pressure from their government if they are locked in a long-term relationship with the government where it is implicitly understood that current favours are reciprocated in the future. Finally, banks may feel it is their "moral" or "patriotic" duty to buy sovereign bonds in times of fiscal stress.

It is however still an open question whether moral suasion indeed took place during the European sovereign debt crisis. While a number of recent papers present evidence consistent with the idea of moral suasion (e.g., Battistini, Pagano and Simonelli, 2014; Becker and Ivashina, 2014; Acharya and Steffen, 2015; Altavilla, Pagano, and Simonelli, 2015; De Marco and Macchiavelli, 2015; Horvath, Huizinga and Ioannidou, 2015), it is intrinsically difficult to tightly identify this mechanism and to separate it from other mechanisms leading domestic banks to purchase domestic sovereign bonds in times of fiscal stress, such as risk shifting, carry trading, or regulatory compliance.

In this paper, we introduce a novel identification strategy which—in combination with a novel high-frequency dataset—allows us for the first time to convincingly identify the moral suasion channel and to separate it from alternative mechanisms. In addition, it allows us to examine how moral suasion affected lending to households and firms studying both loan volumes as well as prices. Our identification strategy relies not only on exploiting differences between banks in their likelihood to be morally swayed (as the previous literature has done), but in addition on exploiting month-on-month fluctuations in the amount of sovereign debt that is maturing and therefore needs to be refinanced during times of severe fiscal stress. Adding this additional layer allows us to reliably isolate the moral suasion channel from other factors that impact a bank's decision to purchase (domestic) sovereign debt.

We find that during the acute phase of the sovereign debt crisis, domestic banks (that are arguably more likely influenced by their government) were substantially more likely to purchase domestically-issued sovereign debt than foreign banks (that are arguably less likely influenced by that same government) in those months when the government had to roll over a relatively large amount of maturing sovereign debt. This effect is not only statistically significant but also economically relevant, i.e., it amounts to about half of the within-sample standard deviation of

the monthly purchases of sovereign debt. Moreover, we find that within the group of domestic banks, the effect is particularly strong for state-owned banks and for banks that received government support.

Studying next the impact of moral suasion on bank lending to the private sector, we show that in those months directly following months with high government refinancing need, domestic banks grant less credit to households, and they do so at higher interest rates. Lending to firms, on the other hand, is not affected. Our results thus suggest that moral suasion can crowd out those types of private lending which are less costly to cut because they are more transaction based.

Our identification strategy exploits some typical features of sovereign bond markets in advanced countries. First, the main determinant of newly issued sovereign debt is the amount of maturing sovereign debt. For example, €360 billion of Italian government debt matured during 2012, and the Italian government issued €365.2 billion of new debt over the course of 2012. Second, the amount of maturing sovereign debt is strappingly pre-determined, because it is the outcome of choices typically made many years ago by previous governments. For example, the government of Mario Monti needed to roll over €45 billion of maturing Italian government debt in April 2012—2/3 of which was issued by the Berlusconi government in 2010 and 2011 and 1/3 of which was issued by the Prodi government in 2007. Third, the amount of maturing debt varies greatly on a month-to-month basis. For example, during the height of the crisis, €62.7 billion worth of Italian debt matured in September 2011 and €55.6 billion in February 2012, but only €15.7 billion in October 2011 and €16.4 billion in January 2012. Importantly, this month-on-month variation is present in all countries and characterizes sovereign debt markets before, during, and in the aftermath of the sovereign debt crisis (see Figure 4).[3]

Therefore, the first building block of our identification strategy is the conjecture that during the sovereign debt crisis in months when the amount of maturing debt is relatively high, the government has a more pressing need to sway banks to purchase domestic sovereign debt, because the risk of an undersubscribed auction—and consequently, of a resulting increase in debt servicing costs—is higher. Importantly, such month-to-month fluctuations in the government's needs to refinance maturing debt can be viewed as a source of plausibly exogenous variation in the need of the government to find investors for the debt it needs to place and hence its urgency

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[3] Data on maturing debt come from the Eurosystem Securities Database.

to exert moral suasion. As the amount of maturing debt is pre-determined, it is fully exogenous to economic and financial conditions and to banks' demand for domestic sovereign debt.

The second step in our identification strategy exploits the idea (as others in the literature have done) that some banks are more likely to be swayed by the domestic government than others. This difference is most obvious when comparing domestic and foreign-owned banks. Domestic banks are more likely to be swayed than foreign banks because they are more vulnerable to explicit and implicit threats if they decide not to cooperate (Romans, 1966; Reinhart and Sbrancia, 2015). In addition, domestic banks have more to lose in terms of funding costs if an auction should fail as their funding costs are more closely tied to that of the sovereign compared to the funding costs of foreign banks present in that same country. Finally, they are also more likely to feel a moral obligation or patriotic duty towards their government. In an extension we differentiate, within the group of domestic banks, between privately owned and state-owned banks and/or banks that received government support. The latter two groups are arguably more likely to be morally swayed by their government.

Our identification strategy thus relies on assessing the differences in net purchases of domestic sovereign debt between so-called "high-need" and "low-need" months during a period of fiscal stress, for domestic banks (the treatment group) relative to foreign banks (the control group). We define a high-need month to be a month in which the total amount of maturing debt is above the country-specific median for the applicable sample period. We focus on Greece, Ireland, and Portugal during the period May 2010 to August 2012, and on Italy and Spain during the period August 2011 to August 2012 (i.e., the acute phase of the crisis for the respective country). Our hypothesis is that if a moral suasion channel is operational, domestic banks will be more likely than foreign banks to purchase domestic sovereign bonds during high-need months, while there should be no difference in behaviour between the two types of banks during low-need months.

Taking this empirical strategy to the data requires a bank-level dataset which fulfils two criteria: changes in banks' holdings of domestic sovereign bonds—as well as various shocks to banks' balance sheets—need to be observed with a *monthly frequency*, and there needs to be substantial variation in bank ownership allowing the econometrician to distinguish between domestic and foreign, as well as between privately-owned, state-owned and supported banks. We employ the Individual Balance Sheet Statistics (IBSI) of the European Central Bank (ECB),

which is the first such dataset to have been made available to researchers. This new and unique high-frequency data source allows us to use end-of-month data on assets and liabilities, starting in August 2007, for 18 state-owned, 29 private domestic, and 13 foreign-owned banks active in Greece, Ireland, Italy, Portugal, and Spain. As such, it fulfills both criteria, making it possible to bring our novel identification strategy to the data. Furthermore, the dataset includes information on the monthly loan volumes and interest rates charged on both mortgage loans and loans to firms. This makes the dataset also very useful to analyse how the additional purchase of sovereign debt due to moral suasion affected lending to the real sector.

The key advantage of our month-on-month identification strategy is that it allows us to include bank fixed effects and monthly bank balance sheet characteristics, thus controlling both for unobservable time-invariant, as well as for observable time-varying, bank-specific factors that can impact the decision of a bank to buy domestic sovereign bonds during periods of elevated fiscal stress such as risk shifting, carry-trading, regulatory compliance, and differences in investment opportunities. At the same time it also makes it possible to include country × month fixed effects which enables us to control for unobservable time-varying country-specific factors, such as economic conditions or sovereign credit-worthiness. However, we run a number of additional tests to put further rigor to the correct interpretation of the results and the robustness of our finding that moral suasion took place during the European sovereign debt crisis.

We conduct a number of falsification tests. We show that the differential behaviour between domestic and foreign banks during high-need months versus low-need month does not translate in a higher purchase of foreign sovereign bonds or an increase in direct lending to sovereigns. In addition, the divergence in behaviour for the same group of banks did not take place in stressed countries outside of the period of the sovereign debt crisis. Such divergence is also not present during the sovereign debt crisis in the case of domestic and foreign banks active in Germany (a country with ample demand for its sovereign bonds). In other words, the phenomenon that we document only occurs in periods when the sovereign is fiscally stressed and only affects domestically-issued sovereign bonds. In addition, we run a battery of additional robustness tests in which we show that our results are not driven by domestic banks acting as primary dealers, by *monthly* fluctuations in banks' incentives to shift risk or to comply with regulatory changes, or by shocks to their net worth or investment opportunities. Furthermore, we

show that our results are not limited to Greece and cannot be explained by moral suasion by foreign regulators or by the ECB's extraordinary provision of liquidity during the crisis. Finally, our results are also robust to only taking long-term maturing debt into account and to exploiting variations in auctioned instead of maturing debt.

Summarizing, our results point towards the occurrence of moral suasion during the European sovereign debt crisis. While not affecting lending to firms, it did have negative implications for lending to households, suggesting that moral suasion can crowd out those types of private lending which are less costly to cut because they are based on weaker credit relationships.

The remainder of the paper is organized as follows. Section 2 provides an overview of the literature. Section 3 describes the data and Section 4 the methodology. Section 5 provides the estimates of moral suasion and a large number of robustness tests. Section 6 discusses the implications for bank lending to the real economy. Section 7 concludes.

2. Literature review

This paper most directly relates to the literature on the sovereign-bank "doom loop" (Acharya, Drechsler, and Schnabl, 2014; Farhi and Tirole, 2014; Gennaioli, Martin, and Rossi, 2014a) and specifically the literature that tries to understand why banks tend to increase their holdings of (domestic) sovereign debt when a sovereign is in distress. Several arguments have been put forward in the literature that can explain this. Due to creditor discrimination, sovereign debt offers in turbulent times a higher expected return to domestic creditors than to foreign ones, which provides incentives for domestic purchases of debt (Broner, Erce, Martin, and Ventura, 2014). Furthermore, (undercapitalized) banks might want to purchase more domestic sovereign debt in order to shift risk (Uhlig, 2013, Drechsler, Drechsel, Marquez-Ibanez, and Schnabl, 2016) or to gamble for resurrection (Crosignani, 2015). In addition, banks may engage in carry trading by funding themselves short-term in wholesale markets to buy sovereign bonds issued by countries under fiscal stress, in order to profit from the spread (Acharya and Steffen, 2015). And finally, banks might purchase additional amounts of sovereign debt as their government under fiscal stress persuades them to do so as demand for its debt by other investors is too limited, so-called moral suasion.

Our paper adds to this literature, by providing evidence of the existence of the last channel by isolating it from the effects of the other channels. A number of recent papers provide evidence that suggests that moral suasion was one of the driving forces behind banks' increase in holdings of domestic sovereign debt (e.g., Battistini, Pagano and Simonelli, 2014; Becker and Ivashina, 2014; Altavilla, Pagano, and Simonelli, 2015; De Marco and Macchiavelli, 2015; Horvath, Huizinga and Ioannidou, 2015). These papers tend to identify moral suasion by differentiating between banks with respect to their level of government control (e.g. government ownership) and examine how this influences their behaviour. While this provides evidence consistent with moral suasion, it remains difficult to convincingly isolate the moral suasion channel from the other channels. Our paper builds on this literature by adding an additional layer of identification. We do not only differentiate between differences in the likelihood of banks to be morally swayed, but also between periods (during the height of the sovereign debt crisis) in which moral suasion more likely took place. This novel month-to-month identification strategy allows us to reliably isolate the adjustments in banks' holdings of domestic sovereign debt as a result of moral suasion from adjustments driven by other incentives such as risk-shifting, carry-trading, or regulatory compliance.

By studying one of the channels that affects banks' holdings of domestic sovereign debt, our paper also contributes to a large literature which has documented the existence of "home bias" in investors' behaviour. Home bias normally arises because investors and banks exhibit a preference for geographically proximate (domestic) assets because of lower information asymmetries (Coval and Moskowitz, 1999, 2001; Grinblatt and Keloharju, 2001; Chan, Covrig, and Ng, 2005; Butler, 2008). During crises, home bias tends to increase as information asymmetries become more penalizing. For example, banks reduce under these circumstances their lending to foreign corporates in favour of lending to domestic ones (Gianetti and Laeven, 2012). Banks also tend to increase their home bias with respect to sovereign debt holdings during a sovereign debt crisis (Battistini, Pagano, and Simonelli, 2014; Gennaioli, Martin, and Rossi, 2014b; Horvath, Huizinga and Ioannidou, 2015). We show that one of the reasons they do so is because they are persuaded by their government to purchase more domestic sovereign debt.

Furthermore, our paper adds to the growing empirical literature that studies the link between sovereign debt on a bank's balance sheet and its lending to the real sector. One strand of the literature shows that exposure to impaired sovereign debt can have direct negative

consequences for lending to the real sector (De Marco, 2014; Popov and Van Horen, 2015; Altavilla, Pagano and Simonelli, 2015) with a negative impact on the performance of firms (Acharya, Eisert, Eufinger, and Hirsch, 2014). A second strand focuses on the crowding out effects. It shows that, due to frictions in private borrowing, increases in banks' holdings of sovereign debt have a negative impact on private lending (Broner, Erce, Martin, and Ventura, 2014; Gennaioli, Martin, and Rossi, 2014b, Becker and Ivashina 2014). We add to this second strand and document a crowding out effect directly related to moral suasion. We show that in the months following months in which governments had to roll over a relatively large amount of maturing debt, domestic banks did curtail credit to the private sector, but this only affected loans to households and not to firms.

Finally, our paper adds to the empirical literature on the impact of political factors on banks' performance and business decisions. A vast literature building on the seminal work of La Porta, Lopez-de-Silanez, and Shleifer (2002) shows that government ownership reduces banks' profitability and gives rise to politically influenced' lending decisions.[4] In addition, papers have shown that political interests have affected the timing of the removal of barriers to entry in the U.S. banking industry (Kroszner and Strahan, 1999), delayed foreclosures on mortgages (Agarwal, Amromin, Ben-David, and Dinc, 2012) and lead to a delay of release of bad news about problems in the banking sector (Brown and Dinc, 2005; Imai, 2009; Liu and Ngo, 2014). Our paper adds to this literature by demonstrating that government refinancing needs in times of fiscal stress affects domestic banks' choices to purchase domestic sovereign debt and that this crowds out lending to households.

3.   Data and descriptive statistics

The main data source we employ is the ECB's Individual Balance Sheet Statistics (IBSI) Dataset. This new and unique high-frequency data source contains end-of-month data on assets and liabilities, starting in August 2007, for 247 individual financial institutions in Europe, comprising about 70 percent of the domestic banking sector. Banks are observed at the unconsolidated level.

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[4] See, among others, Sapienza (2004), Dinc (2005), Khwaja and Mian (2005), Micco, Panizza, and Yanez (2007), Claessens, Feijen, and Laeven (2008), and Shen and Lin (2012).

This dataset has a number of important advantages compared to other datasets used in the literature that make it particularly useful to implement our novel identification strategy. First, its monthly frequency allows us to study changes in banks' demand for sovereign bonds at a much higher frequency than studies that use sovereign bond data from the European Banking Authority (EBA) that are biannual (e.g., De Marco, 2014; Popov and Van Horen, 2015; Horvath, Huizinga and Ioannidou, 2015) or Bankscope that only provides information at an annual frequency (e.g., Gennaioli, Martin and Rossi, 2014b). Second, the data include information on both flows and stocks, while EBA and Bankscope data only include stocks. This enables us to accurately gauge the adjustment in each bank's stock of domestic sovereign bonds that is due to the purchase of new such bonds. Third, the data are observed at an unconsolidated level, and it therefore includes changes in sovereign debt holdings of both domestic banks as well as of affiliates of foreign banks active in a country. EBA data, on the other hand, are measured at the consolidated level. Fourth, the data are available since June 2007 and as such cover the period of the global financial crisis as well as the period of the sovereign debt crisis (and its aftermath). This enables us to assess whether the differential behaviour of domestic banks in high-need months that we document is specific to periods when the sovereign is stressed. Finally, the dataset differentiates between lending to households and to firms, and includes information on credit volumes and interest rates for both sectors. This is major advantage over datasets such as Bankscope or SNL which typically do not provide this degree of segmentation.

For the purpose of our analysis, we start with the 77 banks active in Greece, Ireland, Italy, Portugal, or Spain. We next use a number of data availability criteria which further concentrate the list of banks in the sample. First, we set aside 5 banks for which we could not determine their ownership status. Next, we do the same for 12 banks with no information on domestic sovereign bond holdings during the sample period (May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain). The resulting sample used in the analysis contains 60 banks for which we have all the information needed.

We use the bank ownership database of Claessens and Van Horen (2015) to determine whether a bank is domestic or foreign-owned. Those banks that are not covered by the database (mainly foreign branches) we check manually. A bank is considered foreign-owned if at least 50 percent of its shares are owned by foreigners (a definition commonly used in the literature). Of

our sample of banks 47 are domestic and 13 are foreign-owned. Importantly, there is at least one domestic and at least one foreign bank active in each of our sample countries.[5]

Our main variable of interest is *Flow_t/Stock_t-1 domestic sovereign securities*, defined as the ratio of the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by the domestic sovereign at time t-1. By using the flow and normalizing by the stock, we proxy for the change in total holdings that is due to the purchase of new domestic sovereign debt, and at the same time make sure that we do not overweigh banks with large holdings of domestic sovereign bonds.

In robustness tests, we also look at the ratio of the loans issued by the bank to the domestic sovereign at time t to the stock of the bank's total loans to the domestic sovereign at time t-1 (*Flow_t/Stock_t-1 loans to domestic sovereign*). This variable allows us to distinguish between different mechanisms whereby banks can support the domestic government in times of need. We also look at the ratio of the bank's net flow of securities issued by foreign sovereigns at time t to the bank's total holdings of securities issued by foreign sovereigns at time t-1 (*Flow_t/Stock_t-1 foreign sovereign securities*). This variable allows us to test whether changes in the propensity to hold domestic sovereign bonds are not part of a broader move towards sovereign debt in general. We trim all these variables at a 100 percent in either direction to mitigate the impact of potential outliers.

In terms of bank-specific control variables, we include the total assets of the bank (*Assets)* to capture changes in bank size, and three variables that capture (changes in) bank health or bank business model that may impact a bank's decision to increase its holdings of domestic sovereign debt: the ratio of deposits to assets (*Deposits/Assets)*, the ratio of loans to deposits (*Loans/Deposits*), and the ratio of bank equity to total assets (*Capital*). All bank-level variables are observed with monthly frequency. All control variables are measured with a 12-month lag.

Data on maturing sovereign debt come from the ECB's Centralized Securities Database (CSDB). This database covers since January 2009 all active and matured securities relevant to the European System of Central Banks. It includes each sovereign bond that has been issued and, crucial for our purpose, provides information about its maturity date. This enables us to determine for each country in our sample how much sovereign debt is maturing in each month over the sample period.

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[5] Due to the strict confidentiality of the data it is not possible to provide a list of the banks in our sample.

Table 1 provides summary statistics for all variables. It indicates that 76 percent of the bank-month observations come from domestic banks. Over the sample period, the average bank in the sample experiences a relative growth in its holdings of domestic sovereign debt equal to 2 percent on a month-to-month basis. In addition, over the sample period the average bank had €89.7 billion in assets, a deposit-to-assets ratio of 0.54, a loan-to-deposit ratio of 1.32, and was very well-capitalized, with a capital-to-assets ratio of 0.11 (where capital in the IBSI dataset is defined as assets minus liabilities). It is worth noticing that there are some banks with zero capital, however, this is not inconsistent with positive regulatory capital as long as the latter is calculated at the level of the group and not at the level of the individual bank.

Table 2 illustrates the difference between domestic and foreign banks with respect to a number of observable characteristics (all measured as average values for the period before the European sovereign debt crisis). Interestingly, while domestic banks tend to hold a slightly higher share of their assets in debt securities issued by the domestic government already before the crisis (4.6 percent vs. 3.7 percent), this difference is not statistically significant. With respect to their balance sheet characteristics, domestic banks are on average larger, they issue more loans, relative to the deposits they hold, and they are considerably better capitalized (8.5 percent vs. 7 percent for foreign-owned banks). At the same time, they have a smaller deposit base. However, only two of these differences are significant in the statistical sense: size and regulatory capital. Nevertheless, this test confirms that domestic- and foreign-owned banks are not necessarily observationally equivalent across a number of observable bank-specific characteristics. However, the fact that domestic banks are on average better capitalized alleviates concerns that the propensity of domestic banks to load up on domestic sovereign debt is fully driven by risk-shifting motives.

4.   Empirical methodology

The goal of this paper is to study whether during the European sovereign debt crisis, peripheral governments sway "their" banks to purchase their own sovereign debt due to limited demand by other investors (moral suasion). To this end we exploit monthly data on the bank's net purchase of securities issued by the domestic sovereign. The monthly frequency of the data allows us to employ a difference-in-differences type of methodology whereby we differentiate between the behaviour of banks that are more and less likely to be swayed by the government

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during periods in which the government's need to sway banks to support it is plausibly high, relative to periods of low such need.

We start by identifying, for each of the five stressed countries in the dataset, the acute phase of the sovereign debt crisis. As a starting point we use the month in which each country became eligible for the Securities Markets Program (i.e., the moment these countries became "program countries" from the point of view of the ECB). This means that for Greece, Italy, and Portugal the sample period starts in May 2010 and for Italy and Spain in August 2011. We end the sample period for all countries in August 2012, the month after the well-known speech by the ECB's president, Mario Draghi, in which he implicitly announced the Outright Monetary Transactions program by vowing to do "whatever it takes" to keep the Eurozone together.[6]

While spreads were high in each country over the full sample period, there were large differences within the crisis period with respect to the amount of debt the government had to roll over. Such fluctuations are a natural feature of sovereign debt management not limited to crises periods. Figure 4 depicts the amount of sovereign debt that matured during each month between January 2009 and June 2013, as well as during the sample period (shaded area), for all countries in the sample. The figure shows large month-on-month fluctuations at all times, including during the sovereign crisis: for example, the government of Greece needed to roll over €2.6 billion in February 2012 and €22.4 billion the next month; the government of Portugal had to roll over €2.4 billion in May 2012 and €11.4 billion the next month; and the government of Spain had to roll over €24.3 billion in October 2011 and only €6.2 billion the next month. These sharp monthly fluctuations create an exogenous variation in the need of the government to find investors for the debt it needs to place. Hence, the first ingredient in our identification strategy exploits the idea that if the government needs banks to alleviate its funding pressures by purchasing sovereign bonds, it will be more likely to try to sway them during months when it needs to roll over a relatively large amount of debt.

The second element in our identification strategy exploits the idea (as previous studies have done) that some banks are more likely to be swayed by the domestic government than others. The most obvious distinguishing characteristic of banks that defines their likelihood of being prompted to buy domestic sovereign debt is whether they are domestic or foreign-owned.

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[6] Mario Draghi, Speech at the Global Investment Conference in London, 26 July 2012.
https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html

Governments are much more likely to successfully put pressure on domestic banks than on foreign branches or subsidiaries, as the former are more vulnerable to explicit or implicit threats. In addition, domestic banks have a stronger incentive to collude with the government when demand for sovereign bonds is weak as an undersubscribed auction would imply higher sovereign spreads, which would directly translate into higher funding costs. Finally, domestic banks more likely feel it is their "moral" or "patriotic" duty to buy sovereign bonds in times of fiscal stress.

As such, if banks are morally swayed by their own governments this should imply that during high-need months, domestic banks should purchase more domestic sovereign debt compared to foreign banks. Conversely, we expect to see little difference in the behaviour of domestic and of foreign-owned banks during low-need months, when the government does not need to roll over a large amount of maturing debt, and therefore does not need to sway any subset of banks.

Clearly, there are other reasons why—even in the absence of moral suasion—domestic banks would voluntarily choose to purchase more domestically-issued sovereign bonds than foreign-owned banks during a period of elevated sovereign stress. For example, they may be betting on their own survival by acquiring a riskier asset portfolio when their sovereign is close to default (Broner, Erce, Martin, and Ventura, 2014; Drechsler, Drechsel, Marques-Ibanez, and Schnabl, 2016). In addition, domestic banks—especially undercapitalized ones—may be pushed to beef up their regulatory capital by the regulator, who holds no similar control over affiliates of foreign banks. Acquiring more zero-risk sovereign debt can be one obvious way to achieve this. Furthermore, while not necessarily affecting domestic banks differently from foreign banks, some banks with access to short-term unsecured funding in wholesale markets might be more willing to engage in a carry-trade-type behaviour by establishing longer stressed countries' sovereign bond positions, hoping to pocket the spread between long-term bonds and short-term funding costs (Acharya and Steffen, 2015). They can also be more sensitive to changes in local economic conditions or credit demand. Finally, (large) domestic banks may act as primary dealers in their own country and as such are more likely to buy a larger share of the newly issued debt.

The crucial advantage of our month-to-month identification strategy is that it allows us to control for these alternative mechanisms as long as they are time-invariant (i.e. do not fluctuate

during the sovereign debt crisis) by including bank fixed effects. To assuage remaining concerns that our results are simply driven by monthly fluctuations in, for example, risk shifting or carry trading, we run in Section 5.3 additional tests in which we control for monthly changes in banks' incentives to increase their holdings of domestic sovereign debt other than driven by moral suasion.

We model the net purchase of domestic sovereign debt (relative to the stock of domestic sovereign debt in the previous month) by bank i from country j in month t as follows:

$$DomSovDebt_{ijt} = \beta_1 HighNeed_{jt} \times Domestic_{ij} + \beta_2 X_{ijt} + \beta_3 \varphi_i + \beta_4 \mu_{jt} + \varepsilon_{ijt}, \quad (1)$$

where $DomSovDebt_{ijt}$ is the ratio of the ratio of the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by the domestic sovereign at time t-1. $HighNeed_{jt}$ is a dummy variable equal to 1 if the total amount of maturing sovereign debt in country j in month t is above the country median for the sample period, and to 0 otherwise; $Domestic_{ij}$ is a dummy variable equal to 1 if bank i in country j is a domestic bank (private or state-owned), and to 0 if it is foreign-owned; X_{ijt} is a vector of time-varying bank-specific control variables; φ_i is a vector of bank fixed effects; μ_{jt} is a matrix of interactions of country and month dummies; and ε_{ijt} is an i.i.d. error term. $HighNeed_{jt}$ and $Domestic_{ij}$ are only included in the specification on their own in versions of Model (1) which exclude μ_{jt} and φ_i, respectively, because otherwise the effect of the latter is subsumed in the bank fixed effects, and the effect of the former is subsumed in the country-month fixed effects. Our model is estimated using OLS and we cluster standard errors at the bank level to account for the fact that banks' monthly net purchases of domestic sovereign debt are likely correlated over time.

Our coefficient of interest is β_1. In a classical difference-in-differences sense, it captures the difference in the net purchase of domestic sovereign debt between high-need and low-need months for domestic banks (the treatment group) relative to foreign banks (the control group). A positive coefficient β_1 would imply that—all else equal—domestic banks purchase more domestic sovereign debt in high-need months versus low-need months compared to foreign banks. Put differently, the numerical estimate of β_1 captures the difference in the overall

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acquisition of domestic sovereign debt between high- and low-need months induced by switching from the control group to the treatment group.

The vector of bank-level controls X_{ijt} allows us to control for a number of time-varying bank-specific factors, including changes in bank size, funding sources, and capital ratios that can impact a bank's decision to purchase domestic sovereign debt. In order to account for the fact that the effect of accounting variables may not be immediate, we use 1-year lags of these variables in the regression. In addition to bank fixed effects we also include the interaction of country and month fixed effects. This alleviates concerns that our results might be driven by time-varying differences in the demand for sovereign debt or by differences in its quality (at the country level) that affects both domestic and foreign banks equally. Identification therefore comes from comparing the behaviour of domestic and foreign banks in the same country during the same month.

5.   Moral suasion during the sovereign debt crisis

5.1 Main result

The headline results of the paper are reported in Table 4. We estimate a number of different permutations of Equation (1). In column (1), we use the simplest version of this model without any control variables and without any fixed effects. The results show that, as expected, the net purchase of domestic sovereign debt securities during the crisis period is higher for domestic banks compared to foreign-owned banks. This likely reflects a home bias, or a persistently higher need for domestic banks to comply with regulatory capital requirements through the purchase of sovereign debt with zero-risk weight. Crucially, when examining the differential purchase of new domestic sovereign debt in high- versus low-need months, the difference between domestic and foreign banks is striking. Domestic banks dramatically increase their holdings of sovereign debt during high-need months, relative to foreign banks.

In column (2), we show that this effect is robust to adding time-varying bank-specific controls. Some of these also turn out to be associated with a higher propensity to increase the bank's holdings of domestic sovereign bonds; in particular, smaller banks and banks with too little deposits relative to assets are more likely to do so. Finally, the main result still obtains in

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our preferred specification with bank fixed effects and interactions of country and month dummies (column (3)).

In all cases, the effect is significant at the 5 percent statistical level and economically large too. In the most saturated (and therefore preferred) specification in column (3), the point estimate on β_1 implies that during high-need months, domestic banks increase their holdings of domestically-issued sovereign debt by 0.45 of the within-sample standard deviation. Because we control for bank fixed effects, for country $\times$ month fixed effects, and for time-varying bank-specific characteristics, it is unlikely that our results are driven by unobservable time-invariant bank heterogeneity, by country-specific changes in the demand for domestic sovereign debt, or by the propensity of banks to adjust their holdings of domestic sovereign bonds in response to capital or liquidity shocks. Our results thus strongly suggest that during periods of elevated sovereign stress, when it is potentially hard to find interested investors, governments having to roll over a relatively large amount of new debt sway domestic banks to purchase this debt (moral suasion).

5.2. Falsification tests

The mechanism we aim to uncover is related to the propensity of domestic banks—relative to foreign banks and during months of high sovereign funding need—to engage in a behavior that has three components: 1) they are only purchasing government bonds; 2) these bonds are issued by the domestic sovereign; and 3) this only takes place during times of fiscal stress.

To make sure that we are indeed picking up this mechanism, we conduct in Table 5 a number of falsification tests. We first test for differences in the propensity of domestic versus foreign banks to purchase *foreign* sovereign bonds, in high- versus low-need months. We find that there is no statistical difference in the behaviour of domestic and foreign banks, in high- versus low-need months, with respect to their purchases of *foreign* sovereign bonds (column (1)), suggesting that the difference in behaviour we have documented so far is restricted to the elevated propensity of domestic banks to purchase *domestic* sovereign bonds during high-need months rather than part of a broader switch away from lending, for instance.[7]

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[7] The evidence further suggests that our results are not contaminated by a carry-trade-type behaviour whereby banks use cheap wholesale funds to buy high-yield government debt. If this was the case, there would be no reason for banks in all five countries to increase their holdings of *domestic* debt, but they would rather go for the riskiest sovereign debt at the time (e.g., Greek government debt).

Our identification strategy is motivated by the hypothesis that governments only have an incentive to "morally sway" their banks during months when the government needs to roll over large amounts of debt securities and it needs investors to step up their purchases at reasonable prices. In other words, it is not just about sovereigns needing additional funding in general. If banks simply wished to support their government in months of high financial need, they could also do so by lending directly to it. In the next regression, we construct a new dependent variable which equals the ratio of the loans issued by the bank to the domestic sovereign at time t to the stock of the bank's total loans to the domestic sovereign at time t-1. The results show that during times of sovereign stress and in periods when the government needs to issue a relatively large amount of debt, domestic banks do not lend relatively more than foreign banks to the domestic sovereign (column (2)). In other words, the effect that we find is really about purchasing domestic sovereign bonds. This finding is consistent with the idea that regulatory considerations strengthen the domestic sovereign's motive to sway banks to purchase sovereign bonds, because these are zero-risk-weighted, unlike loans to the government.

Finally, we expect that a government will only put pressure on domestic banks to buy more domestic sovereign bonds during times of elevated sovereign stress, when overall demand for the government's debt is low. This allows us to conduct two additional falsification tests. First, we run exactly the same regression model for our sample of 47 domestic and 13 foreign banks active in Greece, Ireland, Italy, Portugal and Spain but let the sample period start in January 2009, end in June 2013, and exclude the sovereign debt crisis period (i.e., May 2010 – August 2012 for Greece, Ireland, and Portugal, and August 2011 – August 2012 for Italy and Spain). While during the period outside of the sovereign debt crisis domestic banks might still increase their holdings of sovereign debt for risk-shifting or regulatory purposes, there was sufficient demand for sovereign debt, and so one would not expect the sovereign to put any additional pressure on domestic banks.

We once more define the high-need months for *this* period as a month in which the total amount of maturing debt in that particular month is above the median for *this* period. The results, reported in regression (3), show that the interaction between $High\ need \times Domestic$ during this period is negative but insignificant. Hence, the divergence in behaviour between domestic and foreign banks during high- versus low-need months does not exist outside the sovereign debt crisis, suggesting that the higher propensity of domestic banks to purchase domestic sovereign

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bonds during high-need months is not a long-run feature of government bond markets. The test also implies that the parallel trends assumption which is crucial for our difference-in-differences strategy to succeed is not violated. Furthermore, it shows that our results are not driven by domestic banks functioning as primary dealers (or underwriters) which therefore always pick up excess liquidity in domestic government bond markets during periods of high supply, re-selling those bonds later on.

As a final falsification test, we estimate the model for 49 domestic and 7 foreign banks active in Germany during our main sample period (May 2010 – August 2012). During this period there was ample demand for German bonds. Therefore, even if domestic banks were increasing their holdings of sovereign debt for other reasons, there was no need for the German government to put additional pressure on their banks. Indeed, our results show that in those months when relatively large volumes of German government debt matured, domestic banks did not buy more German sovereign debt relative to foreign banks (column (4)).

To summarize, the phenomenon that we document that domestic banks have a higher propensity to purchase domestic sovereign debt compared to foreign banks during months in which the government has to roll over a relatively large amount of sovereign debt, only occurs in periods when the sovereign is fiscally stressed and only affects domestically issued sovereign bonds. Therefore, this finding is fully consistent with the occurrence of moral suasion in sovereign debt markets.

5.3. Moral suasion within the group of domestic banks

Our main identification strategy is based on the idea that domestic banks are more likely to be swayed by their government than foreign affiliates of banks headquartered in another country. However, domestic banks as a group differ widely in their ownership structure and extent of government interventions during the crisis, and this could potentially affect the likelihood of a particular bank being pressured. As a way of further bolstering our argument, we now proceed to test for moral suasion within the sample of domestic banks, based on natural priors as to which categories of banks are more likely to be swayed.

A priori, we expect that banks that are under the direct influence of the government, either because they are state-owned or because they recently received government support, are more likely to be swayed to buy sovereign bonds (e.g., Acharya and Steffen, 2015; Becker and

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Ivashina, 2014). To that end, we first determine whether a domestic bank is state-owned or not. Of the 47 domestic banks in our sample, 18 are state-owned. All state-owned banks are in Ireland, Italy, Portugal, and Spain, meaning that a comparison between state-owned and privately-owned banks excludes Greece. Next, we collect data on government support extended to domestic banks during the global financial crisis of 2008-09. 16 domestic banks in our sample received such support, and there is at least one such bank in each country in our data set.

In column (1) of Table 6, we compare state-owned banks to private domestic banks during high-need versus low-need months, in terms of their propensity to increase their holdings of domestic sovereign bonds. The data suggest that state-owned banks are more likely to do so, but the effect is not statistically significant. However, when in column (2) we compare state-owned or supported banks to private domestic banks, we find that the former are considerably more likely than the latter to increase their holdings of domestic sovereign bonds during high-need months. This also explains the null result in column (1), which is plausibly driven by the fact that supported banks are likely to face pressure from the government, too. This intuition is confirmed in column (3) where we drop the group of supported banks. We now find that state-owned banks are strictly more likely to purchase domestic sovereign bonds during high-need months compared to private banks that did not receive government support during the crisis. Coming off a comparison between banks that are most likely and banks that are least likely to be under the influence of the government, this result lends additional support to the moral suasion hypothesis.

5.4. Alternative mechanisms

Our identification strategy is based on exploiting the fact that during the height of the sovereign debt crisis, there were months during which—because of decisions made by previous governments—governments had to roll over a relatively large amount of debt, and months during which this amount was relatively low. This strategy allows us to control for both unobservable time-invariant and observable time-varying bank characteristics that can impact the decision of banks to buy sovereign bonds during the sovereign debt crisis, while at the same time controlling for unobservable time-varying country-specific factors that can impact all banks active in a particular country. However, there can still be lingering concerns related to the possibility that during high-need months, domestic banks are facing concurrent shocks to their propensity to increase their holdings of domestic sovereign bonds—unrelated to moral suasion—that foreign

banks are not experiencing. The most obvious such alternative mechanisms include shocks to banks' net worth, risk shifting, the role of primary dealers, and shocks to investment opportunities. We address these in Table 7.

The fact that the high-need months are distributed rather randomly over the course of the sample period (Figure 4), suggests that our results are highly unlikely to be driven by a mechanism whereby domestic banks are buying more bonds for regulatory purposes, or are facing shocks that hit banks' net worth during the same months when the government's refinancing needs are particularly high. However, to make sure that this mechanism is indeed not driving our results, we allow the impact of our bank-specific control variables to vary across domestic and foreign banks. As can be seen in column (1), the parameter of the interaction $High\,need \times Domestic$ hardly changes. The effect of all other interaction variables is insignificant, including the interaction between regulatory capital and the $Domestic$ dummy, confirming that undercapitalized domestic banks are not more likely to purchase domestic sovereign debt than undercapitalized foreign banks during the same (high-need) month.

Another confounding mechanism is related to risk shifting, whereby riskier banks have an incentive to increase their holdings of risky sovereign bonds, in order to place a bet on their own survival (Drechsler, Drechsel, Marquez-Ibanez, and Schnabl, 2016). If domestic banks are closer to default in months of high government refinancing needs, then our estimates may be picking up a mechanism whereby domestic banks buy more domestic sovereign bonds during high-need months for reasons unrelated to moral suasion. In column (2), we add an interaction of the $Domestic$ dummy with each bank's CDS spread in each particular month. As we do not have information on all banks' CDSs, the number of observations is reduced to 775. We do not find evidence that domestic banks are more likely to purchase domestic sovereign bonds in months when their own risk is elevated (if anything, the coefficient is negative). Importantly, the coefficient on the $High\,need \times Domestic$ interaction is once again positive, and significant at the 10 percent statistical level.[8]

If domestic banks have an incentive to engage in an investment strategy that yields a low (even negative) expected return, but a high return in low-probability states of the world, they likely have a stronger interest to do so when the government itself is closer to default. If

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[8] Note that the bank fixed effects already pick up the fact that some banks were perceived as much riskier than others by the market during the height of the sovereign debt crisis. Therefore, it is not entirely surprising that a shift in the bank's CDS spread does not have a statistically significant independent effect.

governments are perceived by investors to be riskier during months with high refinancing needs, our moral suasion mechanism would be contaminated by a risk-shifting one. However, the unconditional correlation between the *High need* dummy and the spread on 10-year government bond yields in our sample is -0.4, suggesting that government default risk is actually *lower* during high-need months. Moreover, in column (3) we formally test whether the incentives of (some) domestic banks to shift risk is affecting our results by adding an interaction between the spread on a 10-year domestic sovereign bond and the *Domestic* dummy.[9] The estimates suggest that our baseline result is hardly affected, and moreover, the interaction with the 10-year bond spread is insignificant.

One other concern is that domestic banks can face lower returns on private investment during high-need months, for example, because of poorer investment opportunities during high-need months which disproportionately affect domestic banks that have stronger ties to the local economy. If so, then domestic banks may have an incentive to move their funds toward domestic sovereign bonds during such months, for reasons unrelated to moral suasion. In column (4), we test formally for this possibility by adding an interaction of the *Domestic* dummy with the country-specific Economic Sentiment Index published each month by the European Commission. The coefficient on that interaction implies that domestic banks tend to buy more domestic sovereign bonds when economic sentiment is higher. Importantly, the coefficient on the interaction term capturing the moral suasion channel is still positive and significant.

In column (5), we account for the fact that some banks may be serving as primary dealers, being certified by the government to purchase sovereign debt in primary markets while other banks are not eligible to do so. If mainly domestic banks are acting as primary dealers, then our main result may be contaminated by the fact that during high-need months, domestic primary dealers are purchasing elevated amounts of domestic sovereign debt not because they are pressured by the government, but because they are acting on behalf of non-eligible banks behest. We first go through the websites of the Ministry of Finance in each country and through the European Primary Dealers Handbook in order to determine the certified primary dealers in each country and in each year. For example, in 2011, these include 22 banks in Greece, 16 banks in Ireland, 20 banks in Italy, 18 banks in Portugal, and 22 banks in Spain. Interestingly, most

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[9] In unreported regressions, we control for the domestic sovereign CDS spread instead of bond yields. The main result is unchanged (available upon request).

primary dealers are foreign rather than domestic banks. In particular, there are 14 global players (Barclays, BNP Paribas, Citigroup, Credit Agricole, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, ING, J.P. Morgan, Morgan Stanley, Nomura, Royal Bank of Scotland, and Société Générale) that are active in at least four of the GIIPS.

With this information in hand, we create an interaction term $High\ need \times Primary\ dealer$, which we then include as a control in our main specification. The coefficient on the interaction is negative and significant, which reflects the fact that most primary dealers are large (foreign) banks with substantial stock of sovereign debt, and so the changes in their stock month-to-month are relatively smaller than changes in the stock of sovereign bonds held by small domestic banks. Importantly, the main effect—that domestic banks are more likely than foreign banks to purchase domestic sovereign bonds during high-need months—obtains in this specification, too.

Finally, systematic differences in the propensity of domestic and foreign banks to load on domestic sovereign debt may not be because domestic banks are increasing their holdings of domestic debt, but because foreign banks are asked by their regulators to decrease their holdings of risky foreign debt. While this would also constitute a case of moral suasion, it would be different from the mechanism we are after. However, our identification strategy is based on the comparison of domestic and foreign banks across high- and low-need months, and it is highly unlikely that, e.g., the French regulator would ask the subsidiary of BNP Paribas in Italy to decrease its holdings of Italian government debt *relatively more* in months when the Italian government is facing high refinancing needs. Nevertheless, we can formally test whether the purchase of domestic subsidiaries is lower for foreign banks in high- versus low-need months. Restricting our sample to foreign banks only (and replacing country-month fixed effects with month fixed effects) we show that for this group of banks there is no significant difference in the purchase of domestic sovereign debt between high-need and low-need months (column (6)).

5.5. Robust government need

Our identification strategy, which relies on splitting the sample period in high need versus low need months based on the total amount of debt maturing during that month, raises three potential concerns. First, we have argued that the amount of maturing debt in each month is exogenous to current economic circumstances and to fluctuations in the demand for bonds of

local banks as it typically results from choices made in the past by previous governments. However, because some governments during the crisis were forced to shorten the maturity of the debt they auctioned, some of the maturing debt was plausibly issued by the current government only recently, casting doubt on our identification strategy. To address this point, in column (1) of Table 8 we recalculate the $High\ need$ variable based on only maturing long-term (i.e., with a maturity higher than 5 years) bonds. We find that the main moral suasion result still obtains in this alternative specification.

Second, choosing the mid-point of the distribution to separate months in high- and low-need is an arbitrary choice. In column (2) of Table 8, we re-run our preferred specification using a different cut-off for high- versus low-need months. In particular, we replace the $High\ need$ dummy with one equal to 1 in months when the government's refinancing need is in the top country-specific quartile for the sample period, and equal to 0 otherwise. In this way, we attempt to gauge the impact of severe refinancing needs. The point estimate is of similar magnitude, relative to the one in Table 4, column (3)), and is still significant at the 1 percent statistical level.

Finally, governments should arguably put more pressure on banks to purchase sovereign debt in months when more new debt is being *auctioned*, and due to idiosyncratic shocks, auctioned debt and maturing debt are not perfectly correlated. For example, faced with a sudden decline in tax revenues or an increase in social spending due to recessionary pressures, the government may need to issue new sovereign debt in excess of its refinancing need. While this makes auctioned debt less exogenous than maturing debt, it may more adequately capture the government's true need to sway banks during a particular month. We note that the correlation between maturing and auctioned debt is very high (0.78), indicating that most newly auctioned debt is indeed determined by the need to roll over maturing debt. In column (3) of Table 8, we reclassify months of high versus low government refinancing need based on the amount of government bonds that are auctioned in each month. Then we create a new $High\ need$ dummy derived from this alternative classification, and interact it with the $Domestic$ dummy. The main result of the paper still obtains, and the effect is significant at the 1 percent statistical level.[10]

5.6. Sample robustness

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[10] Appendix Tables 1 – 3 replicate Tables 5 – 7 of the paper, and show that the main result of the paper is robust to falsification tests, to alternative mechanisms, and to a comparison across the sub-sample of domestic banks, when government refinancing needs are defined based on *auctioned* instead of *maturing* debt.

Finally, we check how robust our results are to analysing different samples. In Table 9, we first exclude the country that was most affected by the crisis, Greece (column (1)). Dropping this country does not affect our results and does not change the economic magnitude of the effect.

In column (2), we address the concern that the observed patterns are driven by the ECB's two Long Term Refinancing Operations (LTRO) in December 2011 and March 2012, whereby the ECB distributed around €1 trillion to euro area banks in loans of longer-than-usual maturities at fixed rates. Acharya and Steffen (2015) point out that access to cheap wholesale funding may be one of the main determinants of European banks' increased propensity to load on high-yield sovereign bonds during the crisis. Andrade, Cahn, Fraisse, and Mesonnier (2015) show that only about 15 percent of the funds absorbed by banks in these operations were converted into loans, making it plausible that the majority of the allotted funds may have indeed been used to purchase freshly issued government debt. Figure 3 also shows an above-trend increase in sovereign bond holdings by banks in stressed countries in January 2012. However, we find that domestic banks are more likely than foreign banks to purchase domestic debt even outside of the two months immediately following the two ECB's LTROs.

In column (3) we estimate a difference-in-difference-in-difference model where instead of focusing on the crisis period only, we make use of the whole sample period we have access to (January 2009 – June 2013). The variable of interest now is the triple interaction between the $Domestic$ dummy, the $High\ need$ dummy, and a $High\ risk$ dummy equal to 1 for the period of the crisis (May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain), and to 0 otherwise. This approach primarily addresses the concern that our main estimation relies on a relatively small number of observations per country; in this specification, the number of bank-month observations increases to 3,244. Moreover, it also allows us to compare the behaviour of foreign and domestic banks during periods of sovereign stress and periods of calm. The point estimate on the double interaction $High\ need \times Domestic$ is insignificant, suggesting that in times when sovereigns are not stressed, domestic banks are on average not more likely than foreign banks to purchase domestic government bonds in months when the government has to roll-over a relatively large amount of sovereign debt. On the other hand, the double interaction $High\ risk \times Domestic$ is positive and significant, indicating that domestic banks on average were more likely to purchase domestic sovereign debt in periods of sovereign stress, a behaviour consistent with risk-shifting

by banks. Importantly, the positive and significant coefficient on the triple interaction suggests that this difference is especially strong in months when the sovereign has to issue a relatively large amount of sovereign debt and therefore points towards moral suasion playing an important role during the sovereign debt crisis.

Finally, as shown in Table 2, while before the start of the sovereign debt crisis domestic and foreign banks do not differ with respect to their holdings of domestic sovereign debt, they are systematically different with respect to their size and capital ratios. We control for these differences by including time-varying bank controls and we control for unobserved bank-specific time-invariant heterogeneity by including bank fixed effects. However, to account for the fact that the bank's size and capital adequacy can potentially predict whether a bank is likely to be swayed, we also estimate our model using a sample which is chosen based on a Propensity Score Matching procedure. In practice, we calculate a propensity score for each bank's likelihood of being domestic versus foreign-owned, based on pre-crises values of the bank-specific controls. We next reduce the sample of domestic banks to the subset that is most similar to the sample of foreign banks. This allows us to estimate the effect of moral suasion as captured by the interaction $High\ need \times Domestic$ while still accounting for all bank-specific variables that can predict whether the bank faces government pressure to buy domestic sovereign debt. The results, reported in column (4), show that even within the matched sample, domestic banks increase their holdings of domestic sovereign bonds during high-need months, compared to their foreign counterparts.

6.   Implications for private lending

A number of recent papers have studied to what extent banks' (rise in) sovereign debt holdings (driven by various factors) has affected their lending to the real sector. For example, Gennaioli, Martin, and Rossi (2014b) find that during sovereign defaults banks that increase their holdings of sovereign debt tend to lower their lending. Popov and Van Horen (2015) show that banks with high levels of GIIPS sovereign bonds on their balance sheet reduced (cross-border) lending more during the sovereign debt crisis. Altavilla, Pagano, and Simonelli (2016) show that in stressed countries banks more exposed to the sovereign featured sharper reductions in loans and more pronounced rises in lending rates to non-financial corporates. Furthermore, Acharya Eisert, Eufinger, and Hirsch (2014)—albeit not specifically focusing on exact holdings of

sovereign debt—show that firms with a higher exposure to banks headquartered in stressed countries became financially constrained, and that this had a negative impact on their employment growth, capital expenditure, and sales growth. Finally, Becker and Ivashina (2014) provide evidence indicating that financial repression in the European periphery led to a crowding out of corporate lending.

In this section we add to this literature by examining whether the increase in sovereign bonds on the balance sheets of banks due to moral suasion has an *immediate* negative impact lending to both firms and households. We exploit once again the detailed monthly frequency of our bank balance sheet data and study whether in the months directly following months with high government refinancing needs (i.e., months in which we show moral suasion occurred), domestic banks grant less credit to the private sector.

A big advantage of our database is that it allows us to study the adjustment in lending to both households and to firms. This is important, as banks may not adjust lending to both groups equally due to key differences between them. Lending to households is transactional in nature and banks do not acquire proprietary information about the borrowing households. In other words, there is no learning involved regarding the quality of the borrowing households. At the same time, a bank acquires valuable proprietary information on the quality of a firm over the course of a lending relationship. This may allow them to continue to lend on more favorable terms to profitable firms when a crisis hits (Rajan, 1992; von Thadden, 1995). Indeed, as shown by Beck, Degryse, De Haas, and Van Horen (2014), relationship lending tends to be more stable when a credit cycle turns. Furthermore, as banks tend to engage in a long-term lending relationship with firms—which often involves providing a variety of products—they are likely inclined to continue lending to them in order to also take advantage of being able to provide auxiliary business now and in the future. In the case of lending to households, which often is a one-off loan, this mechanism is not relevant. This suggests that banks might adjust their lending to households more than to firms. To the best of our knowledge this is the first paper to study the impact of increased exposures to domestic sovereign debt on lending to both households and firms.

To examine whether the moral suasion that we document results in a crowding out of lending to the real economy, we study adjustments in both loan volumes and interests rates charged to households and firms. To estimate the impact on loan volumes, we construct three

new dependent variables which are the same as our baseline dependent variable, but measure the flow in loans to households, loans to non-financial corporates with maturity of less than 1 year, and loans to non-financial corporates with maturity of more than 1 year. All of these are divided by the stock of holdings of these particular assets in the previous month. To estimate the impact on interest rates we construct three additional dependent variables which equal the average interest rate on loans issued by the bank to households, to non-financial corporates with maturity of less than 1 year, and to non-financial corporates with maturity of more than 1 year.

As in our baseline model, we differentiate between the behavior of domestic and foreign banks, and examine whether these banks adjust their loan portfolios differently in months directly following months with high government refinancing (high-need months). We study the one-period-ahead adjustment to allow for the possibility that portfolio readjustments may not be immediate (especially as in many countries sovereign debt auctions take place at the end of the month). We again include bank fixed effects, bank level controls and country-month fixed effects which should control for differences in the riskiness of the bank and for demand at the country level.

The results in the first three columns of Table 10 show that although the parameter of the interaction of $HighNeed_{t-1} \times Domestic$ is negative for all specifications, it is only significantly so for loans to households. In other words, during the acute phase of the European sovereign debt crisis, domestic banks granted significantly less credit to households—but not to firms—in months directly following high-need months when they increased their holdings of domestic sovereign bonds, compared to foreign banks. Furthermore, we also find that these same banks raised their interest rates to households (column (4)) but not to firms (columns (5)–(6)).

Our results thus suggest that moral suasion did crowd out lending to the real sector but only of the type that is less costly to cut because it is more transaction-based, i.e., lending to households. This result is in line with the finding of Tripathy (2016) who shows that in response to tightening macro-prudential regulation in Spain, Spanish firms contracted their lending to Mexican households, but not to Mexican firms. It shows that when faced with a shock, banks are more likely to adjust on loans that are based on weaker credit relationships.

7.   Conclusion

Using a unique new high-frequency dataset of monthly securities holdings by 60 banks in Greece, Ireland, Italy, Portugal, and Spain, we show that during the sovereign debt crisis of 2010–2012, domestic banks—and in particular, state-owned banks and banks that received government support during the financial crisis—were considerably more likely than foreign banks to increase their holdings of domestic sovereign debt in months when their government needed to roll over a large amount of maturing debt. Our identification strategy exploits exogenous variations in governments' refinancing needs, and our dataset contains month-to-month changes in banks' purchases of domestic sovereign bonds. This makes it possible to implement a rich empirical specification whereby we control for bank fixed effects, country $\times$ month fixed effects, and time-varying bank-specific factors. As such, it allows us to account for an exhaustive set of alternative explanations for why banks choose to hold domestic sovereign debt, such as risk shifting, carry trading, regulatory distortions, shocks to banks' net worth, and fluctuation in the return on private investment. Even after controlling for such concurrent mechanisms, our results remain consistent with the idea of governments swaying domestic banks to buy domestic sovereign bonds during periods when the supply of such bonds exceeds the demand for them (moral suasion). Our analysis also shows that months when banks stepped in to purchase large amounts of sovereign bonds were followed by a reduction in the credit supply to households, both in terms of lower lending and in terms of higher interest rates, but we find no reduction in the credit supply to non-financial corporations. Our results thus suggest that moral suasion can crowd out those types of private lending which are less costly to cut because they are based on weaker credit relationships.

Our results inform the policy debate surrounding the "deadly embrace" between sovereigns and banks. First, our findings show that banks and sovereigns can and do collude in times of fiscal stress. This can help stabilize the system at a moment when many other players (i.e., foreign banks and insurance companies, asset managers, money market funds, etc.) are retreating from the market. That is, domestic banks can and do act as a "buyers of last resort" for their sovereigns' debt, reducing fiscal stress by stabilizing yields and spreads. This is especially beneficial when markets are overreacting as it lowers the risk of self-confirming expectations.

However, this comes at a cost as it reinforces the link between banks and their sovereigns in a period when sovereign bond spreads are already high. This increases the risk on the banks'

balance sheets which in turn heightens systemic risk. To reduce this risk some change in regulation is warranted. An obvious first step is to reduce the chance that banks need to be bailed out by their governments. To this end, the introduction of higher capital ratios and the establishment of the European Banking Union with a common supervision and resolution system are important steps forward to break the sovereign-bank "doom loop". Supervision at European level will at the same time reduce the scope for moral suasion.

At the same time, as long as governments rely to a large extent on domestic banks for financing and banks have clear incentives to purchase sovereign debt for its favourable credit and liquidity characteristics and its use as collateral, common supervision and resolution will not be enough to break the sovereign-bank "doom loop". Therefore, to reduce the potential disruptive effect of large holdings of (domestic) sovereign debt on banks' balance sheets, a number of proposals for regulatory reform, which can complement the Banking Union, have been put forward.[11] These include putting a positive risk weight on sovereign debt, which takes into account that sovereign debt is in fact, as has become clear during the sovereign debt crisis, not risk free. In addition, introducing an exposure limit similar as the one applicable to holdings of other asset classes will potentially reduce banks' sovereign exposures and increase banks' resilience to sovereign risk. These regulatory reforms should enhance banks' incentives to take sovereign risk into account and limit systemic risk at EU-wide level, while at the same time allow banks to continue playing their market-maker and stabilizing roles in sovereign debt markets.

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[11] See for example, ESRB report on the regulatory treatment of sovereign exposures (March 2015) or Viral Acharya on the "Banking Union in Europe and other reforms", VoxEU, 16 October 2012.

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Figure 1. Domestic and foreign sovereign securities holdings: All euro area banks
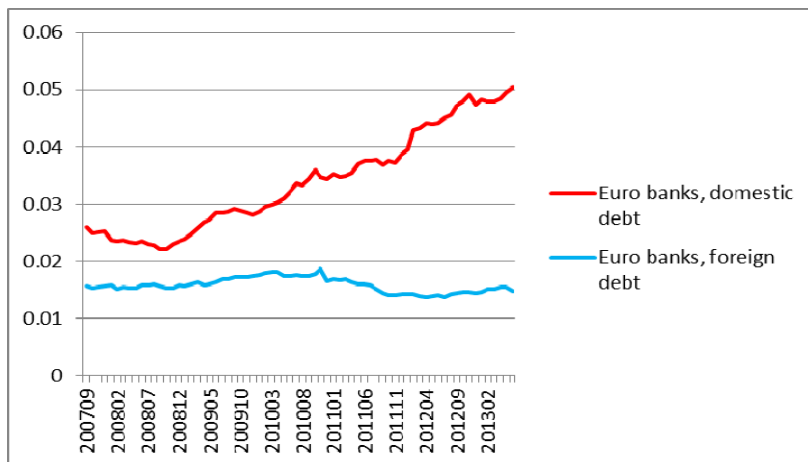

Figure 2. Domestic sovereign security holdings: Stressed versus non-stressed countries
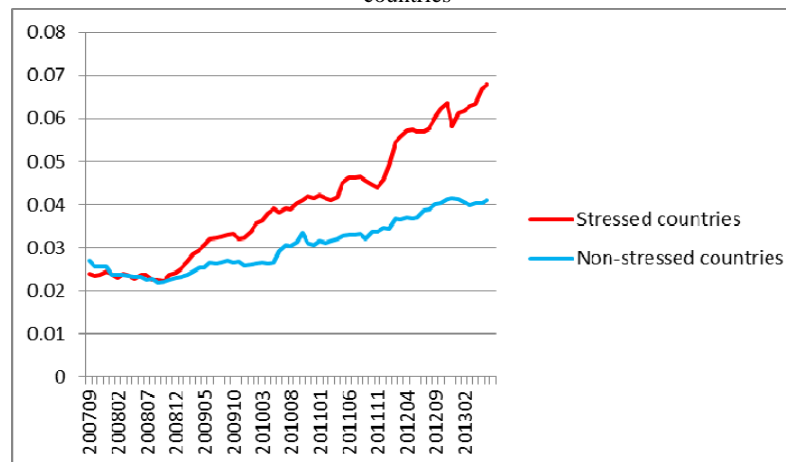
Figure 3. Domestic sovereign security holdings: Domestic versus foreign banks in stressed countries
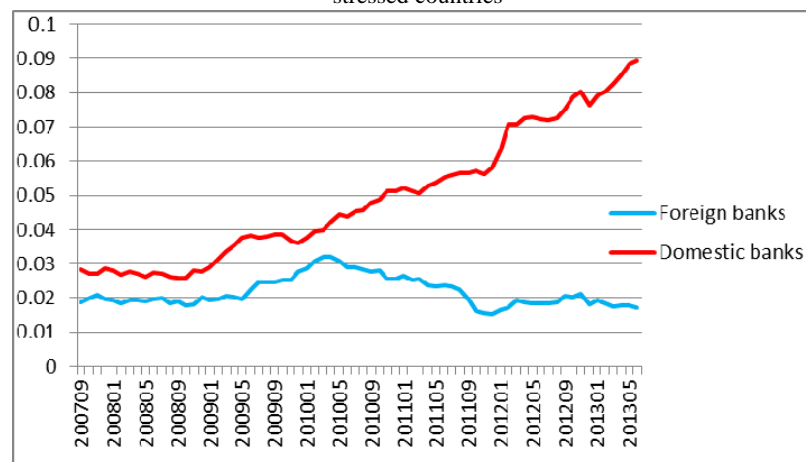
Notes: Average holdings of domestic and foreign sovereign securities, divided by total assets, for 207 banks in eleven euro area countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain), for the period August 2007 – June 2013 (Figures 1 and 2). Average holdings of domestic sovereign securities, divided by total assets, for 47 domestic banks in 13 foreign banks in five stressed euro area countries (Greece, Ireland, Italy, Portugal, and Spain), for the period August 2007 – June 2013 (Figure 3). Source: IBSI.

Figure 4. Maturing debt, by month: Stressed countries
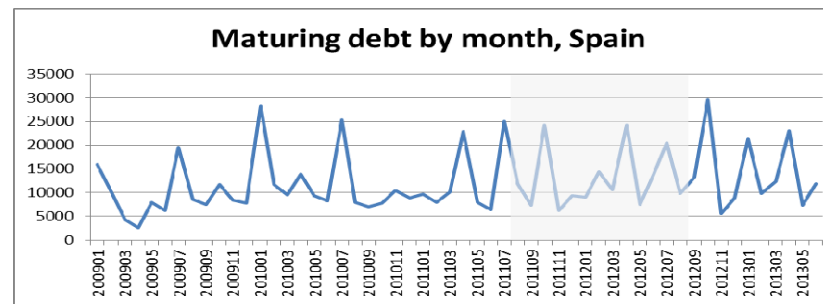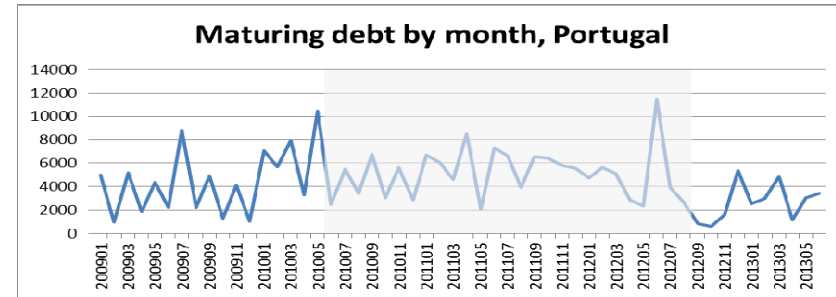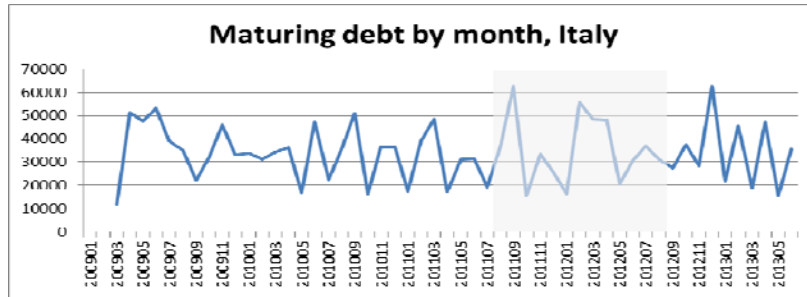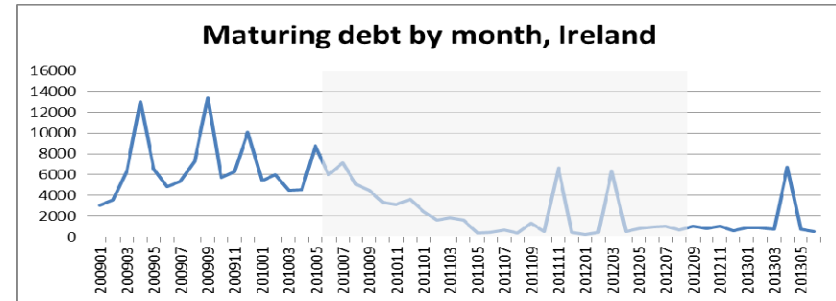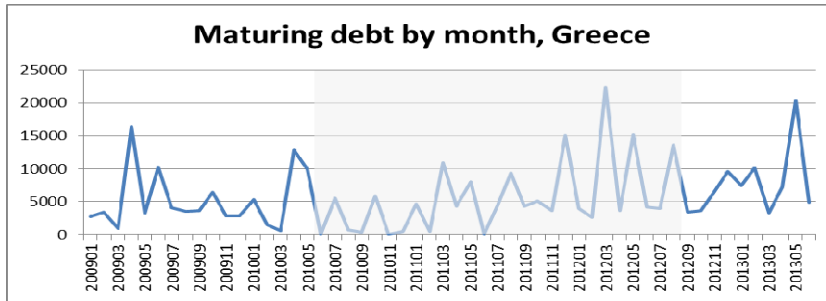
Notes: Amount of sovereign bonds, in €millions, maturing during each month between January 2008 and June 2013. Shaded areas represent the sample period (May 2010 – August 2012 for Greece, Ireland, and Portugal, and August 2011 – August 2012 for Italy and Spain). Source: Bloomberg.

Table 1. Summary statistics

Variable	Mean	Median	St. dev	Min	Max
Domestic bank	0.76	1.00	0.43	0.00	1.00
Flow_t/Stock_t-1 domestic sovereign securities	0.02	0.00	0.15	-0.83	0.99
Flow_t/Stock_t-1foreign sovereign securities	-0.03	0.00	0.18	-1.00	0.88
Flow_t/Stock_t-1 loans to sovereigns	-0.01	0.00	0.17	-0.91	0.95
Flow_t/Stock_t-1 loans to households	-0.01	-0.01	0.04	-0.34	0.87
Flow_t/Stock_t-1 loans to NFCs <= 1 year	-0.01	-0.01	0.11	-0.87	0.95
Flow_t/Stock_t-1 loans to NFCs > 1 year	-0.01	-0.01	0.03	-0.18	0.59
Average rate on loans to households	3.56	3.82	3.55	0.00	14.48
Average rate on loans to NFCs <= 1 year	3.87	4.40	2.60	0.00	14.29
Average rate on loans to NFCs > 1 year	3.35	3.31	3.88	0.00	13.24
Domestic sovereign securities/Assets	0.05	0.05	0.05	0.00	0.25
Assets (mln.)	89,689.00	55,910.00	97,511.00	3,660.00	533,849.00
Deposit/Assets	0.54	0.53	0.16	0.04	0.90
Loans/Deposits	1.32	1.27	0.87	0.36	10.00
Capital/Assets	0.11	0.10	0.06	0.00	0.51
Bank CDS	640.64	474.37	504.71	71.10	3,884.53
Economic sentiment index	87.64	88.70	5.63	77.20	100.70
Maturing debt (mln.)	13,829.77	7,534.97	15,128.83	68.00	62,721.70
Auctioned debt (mln.)	10,505.20	4,560.00	11.330.60	0.00	36,322.90
10-year bond yield spread	9.25	6.76	6.56	5.23	48.60

Notes: This table presents summary statistics for the variables used in the empirical tests. The sample includes 47 domestic and 13 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain. All variables are observed with monthly frequency. 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned and to 0 otherwise. 'Flow_t/Stock_t-1 domestic sovereign securities' denotes the ratio of the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by the domestic sovereign at time t-1. 'Flow_t/Stock_t-1 foreign sovereign securities' denotes the ratio of the bank's net flow of securities issued by foreign sovereigns at time t to the bank's total holdings of securities issued by foreign sovereigns at time t-1 'Flow_t/Stock_t-1 loans to sovereigns' denotes the ratio of the loans issued by the bank to sovereigns at time t to the stock of the bank's total loans to sovereigns at time t-1. 'Flow_t/Stock_t-1 loans to households' denotes the ratio of the loans issued by the bank to households at time t to the stock of the bank's total loans to households at time t-1. 'Flow_t/Stock_t-1 loans to NFCs <= 1 year' denotes the ratio of the loans with maturity of less than 1 year issued by the bank to non-financial corporations at time t to the stock of the bank's total loans with maturity of less than 1 year to non-financial corporations at time t-1. 'Flow_t/Stock_t-1 loans to NFCs > 1 year' denotes the ratio of the loans with maturity of more than 1 year issued by the bank to non-financial corporations at time t to the stock of the bank's total loans with maturity of more than 1 year to non-financial corporations at time t-1. 'Average rate on loans to households' denotes the average rate on the loans issued by the bank to households at time t. 'Average rate on loans to NFCs <= 1 year' denotes the average rate on the loans with maturity of less than one year issued by the bank to NFCs at time t. 'Average rate on loans to NFCs > 1 year' denotes the average rate on the loans with maturity of more than one year issued by the bank to NFCs at time t. 'Domestic sovereign securities/Assets' denotes the ratio of the bank's total holdings of securities issued by the domestic sovereign to total assets. 'Assets' denotes the bank's total assets, in mln. euro. 'Deposit/Assets' denotes the ratio of the bank's total deposits to total assets. 'Loans/Deposits' denotes the ratio of the bank's total loans issued to total assets. 'Capital/Assets' denotes the ratio of the bank's equity to total assets. 'Bank CDS' denotes the bank's CDS spread. 'Economic sentiment index' denotes the values of the monthly indicator of economic sentiment reported by the European Commission. 'Maturing debt' denotes the amount of existing government debt that is currently maturing. 'Auctioned debt' denotes the amount of newly issued government bonds. 10-year bond yield spread' denotes the difference between the yield on a 10-year spread in a particular country and the yield on a German Bund.

Table 2. Domestic vs. foreign banks, pre-sovereign debt crisis

Variable	Foreign	Domestic	Difference
Domestic sovereign securities/Assets	0.046	0.037	0.010
Log (Assets)	10.195	10.949	-0.754**
Deposit/Assets	0.548	0.503	0.044
Loans/Deposits	1.518	1.576	-0.058
Capital/Assets	0.070	0.085	-0.015*

Notes: This table presents difference-in-differences estimate from a Mann-Whitney two-sided *t*-test on pre-May 2010 mean values of the variables used in the empirical tests, for domestic vs. foreign banks. The sample includes 47 domestic and 13 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is August 2007 – April 2010 for banks in Greece, Ireland, and Portugal, and September 2007 – July 2011 for banks in Italy and Spain. All variables are observed with monthly frequency. 'Domestic sovereign securities/Assets' denotes the ratio of the bank's total holdings of securities issued by the domestic sovereign to total assets. 'Log (Assets)' denotes the natural logarithm of the bank's total assets. 'Deposit/Assets' denotes the ratio of the bank's total deposits to total assets. 'Loans/Deposits' denotes the ratio of the bank's total loans issued to total assets. 'Capital' denotes the ratio of the bank's equity to total assets. *** indicates significance at the 1% level, and ** at the 5% level.

Table 3. Maturing sovereign debt, by country: Summary statistics

Country	Mean	Median	St. dev	Min	Max
Greece	6,268.86	4,385.34	5,379.31	68.00	22,406.12
Ireland	2,544.12	1,490.33	2,458.09	280.00	8,800.63
Italy	35,557.10	33,314.80	14,197.00	15,675.00	62,721.70
Portugal	5,334.48	5,529.51	2,301.64	2,104.34	11,483.70
Spain	12,993.80	10,634.40	5,999.65	6,204.00	24,275.85

Notes: This table presents summary statistics for monthly maturing sovereign debt in Greece, Ireland, Italy, Portugal, and Spain, in mln. euro. The sample period is May 2010 – August 2012 for Greece, Ireland, and Portugal, and August 2011 – August 2012 for Italy and Spain.

Table 4. Change in domestic sovereign security holdings: Main results

	Flow_t/Stock_t-1 domestic sovereign securities		
	(1)	(2)	(3)
High need × Domestic bank	0.064**	0.065**	0.068**
	(0.031)	(0.031)	(0.035)
High need	-0.062**	-0.062**	
	(0.030)	(0.029)	
Domestic bank	0.036***	0.038***	
	(0.013)	(0.013)	
Log (Assets)		-0.011**	-0.013
		(0.006)	(0.022)
Deposits/Assets		-0.043	0.025
		(0.042)	(0.147)
Loans/Deposits		0.011***	0.022
		(0.003)	(0.041)
Capital/Assets		-0.023	0.087
		(0.104)	(0.105)
Bank fixed effects	No	No	Yes
Country × Month fixed effects	No	No	Yes
R-squared	0.05	0.06	0.31
No. observations	1,011	997	997

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold debt securities issued by the domestic government. The sample includes 47 domestic and 13 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain. All variables are observed with monthly frequency. The dependent variable is the ratio of the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by the domestic sovereign at time t-1. 'High need' is a dummy variable equal to 1 if the amount of maturing sovereign debt in a particular month is above the country-specific median for the sample period. 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned and to 0 otherwise. 'Log (Assets)' denotes the natural logarithm of the bank's total assets, in mln. euro. 'Deposit/Assets' denotes the ratio of the bank's total deposits to total assets. 'Loans/Deposits' denotes the ratio of the bank's total loans issued to total assets. 'Capital/Assets' denotes the ratio of the bank's equity to total assets. All bank controls are 1-year lagged. All regressions include fixed effects as specified. Standard errors clustered at the bank level appear in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 5. Change in domestic sovereign security holdings: Falsification tests

	Flow_t/Stock_t-1 foreign sovereign securities	Flow_t/Stock_t-1 loans to sovereign	Flow_t/Stock_t-1 domestic sovereign securities	
	Crisis period	Crisis period	Non-crisis period	Germany, crisis period
	(1)	(2)	(3)	(4)
High need × Domestic bank	-0.001	-0.024	-0.022	0.006
	(0.022)	(0.029)	(0.017)	(0.008)
Bank controls	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Country × Month fixed effects	Yes	Yes	Yes	Yes
R-squared	0.27	0.26	0.16	0.10
No. observations	707	1,002	2,002	1,529

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold government debt securities or to issue loans to sovereigns. The sample includes 47 domestic and 13 foreign banks in Greece, Ireland, Italy, Portugal, and Spain (columns (1) – (3)), and 49 domestic and 7 foreign banks in Germany (column (4)). The sample period is May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain (columns (1) – (2)); January 2009 – April 2010 and September 2012 – June 2013 for banks in Greece, Ireland, and Portugal, and January 2009 – July 2011 and September 2012 – June 2013 for banks in Italy and Spain (column (3)); and May 2010 – August 2012 for banks in Germany (column (4)). The dependent variable is the ratio of the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by foreign sovereigns at time t-1 (column (1), the ratio of the bank's net flow of loans to sovereigns at time t to the bank's total stock of loans to sovereigns at time t-1 (column (2)), and the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by the domestic sovereign at time t-1 (columns (3) and (4)). 'High need' is a dummy variable equal to 1 if the amount of maturing sovereign debt in a particular month is above the country-specific median for the sample period. 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned and to 0 otherwise. All regressions include all bank-specific variables from Table 4, as well as fixed effects as specified. Standard errors clustered at the bank level appear in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 6. Change in domestic sovereign security holdings: Moral suasion across domestic banks

| | Flow_t/Stock_t-1 domestic sovereign securities | | |
	State-owned versus private domestic	State-owned and supported versus private domestic	State-owned versus non-supported private
	(1)	(2)	(3)
High need × State-owned bank	0.006		0.046*
	(0.022)		(0.032)
High need × State-owned or supported bank		0.027*	
		(0.019)	
Bank controls	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes
Country × Month fixed effects	Yes	Yes	Yes
R-squared	0.34	0.34	0.36
No. observations	758	758	350

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold debt securities issued by the domestic government. The sample includes 47 domestic banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain. All variables are observed with monthly frequency. The dependent variable is the ratio of the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by the domestic sovereign at time t-1. 'High need' is a dummy variable equal to 1 if the amount of maturing sovereign debt in a particular month is above the country-specific median for the sample period. 'State-owned bank' is a dummy variable equal to 1 if the bank is more than 50% owned by the domestic government. 'State-owned or supported bank' is a dummy variable equal to 1 if the bank is more than 50% owned by the domestic government or if it received government support during the financial crisis of 2008-09. In column (3), all domestic banks that received government support during the financial crisis of 2008-09 are excluded. All regressions include all bank-specific variables from Table 4, as well as fixed effects as specified. Standard errors clustered at the bank level appear in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 7. Change in domestic sovereign security holdings: Alternative mechanisms

	Flow_t/Stock_t-1 domestic sovereign securities					
	Balance sheet shocks	Bank risk	Sovereign risk	Business sentiment	Primary dealers	Foreign banks' suasion
	(1)	(2)	(3)	(4)	(5)	(6)
High need×Domestic bank	0.073**	0.034*	0.065**	0.077*	0.069**	
	(0.035)	(0.021)	(0.035)	(0.041)	(0.036)	
Log (Assets)×Domestic bank	-0.267					
	(0.185)					
Deposits/Assets×Domestic bank	0.137					
	(0.214)					
Loans/Deposits×Domestic bank	0.146					
	(0.117)					
Capital/Assets ×Domestic bank	0.081					
	(0.207)					
Bank CDS×Domestic bank		-0.001				
		(0.001)				
Bank CDS		0.001				
		(0.001)				
10-year bond yield spread× Domestic bank			-0.027			
			(0.020)			
Economic sentiment index× Domestic bank				0.128***		
				(0.035)		
High need×Primary dealer					-0.083***	
					(0.034)	
High need						0.092
						(0.071)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country×Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.31	0.30	0.31	0.34	0.32	0.66
No. observations	997	775	997	791	997	239

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold debt securities issued by the domestic government. The sample includes 47 domestic and 13 foreign banks (columns (1)–(5)) and 13 foreign banks (column (6)) in Greece, Ireland, Italy, Portugal, and Spain. The sample period is May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain. The dependent variable is the ratio of the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by the domestic sovereign at time t-1. 'High need' is a dummy variable equal to 1 if the amount of maturing sovereign debt in a particular month is above the country-specific median for the sample period. 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned and to 0 otherwise. All bank controls are 1-year lagged. '10-year bond yield spread' is the spread on a 10-year domestic sovereign bond. 'Bank CDS' is the bank's own CDS spread. 'Business sentiment' is the monthly percentage change in an index based on enterprises' assessment of economic conditions in the current month. 'Primary dealer' is a dummy variable equal to 1 if the bank is certified by the government to participate in government bond auctions. All regressions include all bank-specific variables from Table 4, as well as fixed effects as specified. Standard errors clustered at the bank level appear in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 8. Change in domestic sovereign security holdings: Robust government need

	Flow_t/Stock_t-1 domestic sovereign securities		
	Long-term maturing debt	75% cut-off	Auctioned debt
	(1)	(2)	(3)
High need × Domestic bank	0.040*	0.077***	0.068***
	(0.024)	(0.030)	(0.027)
Bank controls	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes
Country × Month fixed effects	Yes	Yes	Yes
R-squared	0.30	0.31	0.30
No. observations	997	997	997

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold debt securities issued by the domestic government. The sample includes 47 domestic and 13 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain. All variables are observed with monthly frequency. 'High need' is a dummy variable equal to 1 if the amount of maturing sovereign debt with maturity of more than 5 years in a particular month is above the country-specific median for the sample period (column (1)); a dummy variable equal to 1 if the total amount of maturing sovereign debt in a particular month is above the country-specific 75th percentile, for the sample period (column (2)); and a dummy variable equal to 1 if the total amount of auctioned sovereign debt in a particular month is above the country-specific median for the sample period (column (3)). 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned and to 0 otherwise. 'Maturing debt' denotes the total amount of maturing sovereign debt in a particular month. All regressions include all bank-specific variables from Table 4, as well as fixed effects as specified. Standard errors clustered at the bank level appear in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 9. Change in domestic sovereign security holdings: Robust sample

	Flow_t/Stock_t-1 domestic sovereign securities			
	Excluding Greece	Excluding LTRO months	January 2009 – June 2013	Matched sample
	(1)	(2)	(3)	(4)
High need×Domestic bank	0.067*	0.064**	0.012	0.058**
	(0.041)	(0.033)	(0.016)	(0.027)
High risk×High need×Domestic bank			0.032*	
			(0.023)	
High risk×Domestic bank			0.051***	
			(0.015)	
Bank controls	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Country×Month fixed effects	Yes	Yes	Yes	Yes
R-squared	0.30	0.33	0.18	0.32
No. observations	858	885	3,244	711

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold debt securities issued by the domestic government. The sample includes 47 domestic and 13 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain (column (1)–(2) and column (4)), and August 2007 – June 2013 (column (3)). All variables are observed with monthly frequency. The dependent variable is the ratio of the bank's net flow of securities issued by the domestic sovereign at time t to the bank's total holdings of securities issued by the domestic sovereign at time t-1. 'High need' is a dummy variable equal to 1 if the amount of maturing sovereign debt in a particular month is above the country-specific median for the sample period. 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned and to 0 otherwise. 'High risk' is a dummy variable equal to 1 during May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain. In column (1), all banks from Greece are excluded. Column (2) excludes the month immediately after the ECB's first LTRO (January 2012) and the month immediately after the ECB's second LTRO (April 2012). In column (4), the sample is chosen based on a Propensity Score Matching procedure using pre-crisis values of all explanatory variables. All regressions include all bank-specific variables from Table 4, as well as fixed effects as specified. Standard errors clustered at the bank level appear in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 10. Change in domestic sovereign security holdings: Crowding out of lending to the real sector

	Flow_t/Stock_t-1 loans to households	Flow_t/Stock_t-1 loans to NFCs <= 1 year	Flow_t/Stock_t-1 loans to NFCs > 1 year	Average rate on loans to households	Average rates on loans to NFCs <= 1 year	Average rates on loans to NFCs > 1 year
	(1)	(2)	(3)	(4)	(5)	(6)
High need_t-1×Domestic bank	-0.017**	-0.165	-0.066	0.457*	-0.389	-0.202
	(0.009)	(0.220)	(0.058)	(0.308)	(0.271)	(0.311)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country×Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.38	0.13	0.15	0.78	0.91	0.86
No. observations	1,101	1,100	1,163	1,045	1,045	1,045

Notes: This table presents difference-in-differences estimates of the propensity of banks to lend to households and corporates. The sample includes 47 domestic and 13 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is May 2010 – August 2012 for banks in Greece, Ireland, and Portugal, and August 2011 – August 2012 for banks in Italy and Spain. All variables are observed with monthly frequency. The dependent variable is the ratio of the loans issued by the bank to households at time t to the stock of the bank's total loans to households at time t-1 (column (1)), the ratio of the loans with maturity of less than one year issued by the bank to NFCs at time t to the stock of the bank's total loans to NFCs with maturity of less than one year at time t-1 (column (2)), the ratio of the loans with maturity of more than one year issued by the bank to NFCs at time t to the stock of the bank's total loans to NFCs with maturity of more than one year at time t-1 (column (3)), the average rate on the loans issued by the bank to households at time t (column (4)), the average rate on the loans with maturity of less than one year issued by the bank to NFCs at time t (column (5)), and the average rate on the loans with maturity of less than one year issued by the bank to NFCs at time t (column (6)). 'High need' is a dummy variable equal to 1 if the amount of maturing sovereign debt in month t-1 is above the country-specific median for the sample period. 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned and to 0 otherwise. All regressions include all bank-specific variables from Table 4, as well as fixed effects as specified. Standard errors clustered at the bank level appear in parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.