

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

Steven Ongena *

University of Zurich, Swiss Finance Institute, KU Leuven and CEPR

Plattenstrasse 32, CH-8032 Zürich, Switzerland

Telephone: +41 44 634 3954, E-mail: steven.ongena@bf.uzh.ch

Alexander Popov

European Central Bank

Sonnemannstrasse 20, D 60314 Frankfurt am Main, Germany

Telephone: +49 69 13448428, E-mail: alexander.popov@ecb.europa.eu

Neeltje Van Horen

Bank of England and CEPR

Threadneedle Street, EC2R 8AH London, United Kingdom

Telephone: +44 20 3461 6107, E-mail: neeltje.vanhoren@bankofengland.co.uk

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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 cannot be explained by risk shifting, carry trading, or regulatory compliance. Banks under the influence of the government, small banks, and banks with weaker balance sheets were especially prone to 'moral suasion'. We also find some evidence of credit contraction to households following months with high government refinancing need.

JEL classification: F34, G21, H63.

Keywords: Sovereign debt; sovereign-bank loop; moral suasion

1. Introduction

At the onset of the global financial crisis during the fall of 2008, domestic sovereign bond holdings constituted about 2 percent of euro area banks' overall assets. This picture changed radically over the course of only a few years, and by 2013, domestic sovereign bond holdings 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 level predating 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”, whereby governments under fiscal stress pressure their banks to purchase additional amounts of domestic sovereign bonds because market demand is weak.¹ The need to do so 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

¹ „Time bomb? Banks pressured to buy government debt“(Jeff Cox, *CNBC*, 31 May 2012, <http://www.cnb.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”. Similarly Calvo and Mishkin (2003) argue that Argentinian “banks were encouraged and coerced into purchasing Argentine government bonds” (*op. cit.* p. 100) in the run-up to the full-scale banking crisis at the end of 2001.

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

have an incentive to comply as their funding costs are linked to sovereign spreads. By buying sovereign debt they can prevent sovereign spreads from rising further, which directly affects the spread they have to pay on their own bonds and can prevent a (further) drop in their stock price.³ 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 domestic 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 this idea (e.g., Battistini, Pagano and Simonelli, 2014; Acharya and Steffen, 2015; De Marco and Macchiavelli, 2015; Horvath, Huizinga and Ioannidou, 2015; Altavilla, Pagano, and Simonelli, 2017; Becker and Ivashina, 2018), it is intrinsically difficult to tightly identify the ‘moral suasion’ channel and to separate it from other mechanisms whereby domestic banks 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. Our identification strategy relies not only on exploiting differences between banks in their perceived likelihood to respond to pressure from the government (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 is critical to cleanly distinguish moral suasion from other drivers behind the increased demand for domestic sovereign debt during times of fiscal stress. In addition, our identification strategy enables us to shed light on the mechanisms behind moral suasion, and it allows us to examine how moral suasion affected lending to households and firms.

We find that during the acute phase of the sovereign debt crisis, domestic banks (that are arguably more susceptible to ‘moral suasion’ by their own government) were substantially more

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>).

³ During the recent political turmoil on Italy, Italian sovereign bond yields jumped and the stock prices of the three biggest Italian banks, each of them with large exposures to their sovereign, fell by about a fifth in a fortnight, *Financial Times*, 5 June 2018, <https://www.ft.com/content/64e07884-64e2-11e8-a39d-4df188287fff>)

likely to purchase domestically-issued sovereign debt than foreign banks in those months when the government had to roll over a relatively large amount of maturing sovereign debt. This divergence in behaviour for these banks did not take place outside of the period of the sovereign debt crisis. This effect is not only statistically significant but also economically relevant. During high-need months, and compared with foreign banks, domestic banks increased their holdings of domestically-issued sovereign debt by 7.1 percentage points more when their sovereign was facing severe stress. This corresponds to a 0.46 of a sample standard deviation.

Moreover, exploiting differences between domestic banks, we find that the effect is particularly strong for banks that received government support in the past, as well as for banks that were smaller, less well capitalized, and had a lower ratio of liquid assets to total assets. We do not find that state ownership or political affiliation matters. This suggests that moral suasion is not so much the result of a natural reaction to the governance relationship between banks and government, but is driven by weaker banks that either received assistance from the government in the past, or are trying to get on good terms with their government in anticipation of the need for future assistance.

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 granted less credit to households, and they did so at higher interest rates. Lending to firms, on the other hand, was 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-on-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).⁴

Therefore, the first building block of our identification strategy is the conjecture that during the sovereign debt crisis, and 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 bonds, because the risk of an undersubscribed auction—and consequently, of a resulting increase in debt servicing costs—is higher. Importantly, such month-on-month fluctuations in the government’s needs to roll over 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 to exert moral suasion. As the amount of maturing debt is pre-determined, it is exogenous to both current economic and financial conditions and to banks’ current 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 banks. Domestic banks are more likely to be swayed than foreign banks because 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. Furthermore, they are more likely, at some point, to need assistance from the government and are more vulnerable to explicit and implicit threats if they refuse to cooperate (Romans, 1966; Reinhart and Sbrancia, 2015). 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 banks that are under the influence of the government and those that are not, as well as between weak and strong banks, in order to examine which type of banks are 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 “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

⁴ Data on maturing debt come from the Eurosystem Securities Database.

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, Italy, Portugal, and Spain during the acute phase of the sovereign crisis for each 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 different types of domestic banks. We employ the Individual Balance Sheet Statistics (IBSI) dataset 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 January 2009, for 46 domestic, and 14 foreign banks active in Greece, Ireland, Italy, Portugal, and Spain. As such, it fulfils both criteria, making it possible to bring our novel identification strategy to the data. The dataset also includes information on the monthly lending to households and to firms. Combined with the Individual MFI Interest Rates (IMIR) dataset of the ECB, which contains information on the pricing of those same categories of loans by the same banks, we are able to analyse how the increase in banks' sovereign bond holdings 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 \times month fixed effects which enables us to control for unobservable time-varying country-specific factors, such as economic conditions or sovereign credit-worthiness.

Still, 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. First, 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 is not accompanied by an increase in bank holdings of foreign sovereign bonds or private debt securities. The divergence in behaviour 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. We also 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 using different cut-offs to identify the sovereign debt crisis period, to only taking long-term maturing debt into account, to using a continuous measure of maturing debt, 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 weaker domestic banks were particularly susceptible to moral suasion, the governance of banks seems to have played less of a role. We also document a reduction in lending to households, suggesting that moral suasion can crowd out some lending to the real sector.

The remainder of the paper is organized as follows. Section 2 provides an overview of the literature. Section 3 describes the methodology and Section 4 the data. 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 the sovereign is in distress. Several arguments have been put forward in the literature that can explain this mechanism. 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). Lender-of-last-resort (LOLR) operations incentivize banks to purchase domestic government bonds in order to obtain central bank liquidity (Crosignani, Faria-e-Castro, and Fonseca, 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 domestic sovereign bonds because their government—being under fiscal stress—pressures them to do so at times when demand for its debt by other investors is too limited (Chari, DAVIS and Kehoe, 2016), so-called ‘moral suasion’.

Our paper adds to this literature by documenting the last channel and 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; De Marco and Macchiavelli, 2015; Horvath, Huizinga and Ioannidou, 2015; Altavilla, Pagano, and Simonelli, 2017; Ohls, 2017; Becker and Ivashina, 2018). These papers tend to identify moral suasion by differentiating between banks with respect to their level of government control (e.g., government ownership) and by examining how this margin influences their behaviour. While they provide 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 differentiate not only between how likely it is that different banks to be morally swayed, but also between months (during the height of the sovereign debt crisis) in which moral suasion was more or less likely to take place. This novel “across-banks month-on-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 (Giannetti 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 why they do so is pressure 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 (Bottero, Lenzu, and Mezzanotti, 2015; Popov and Van Horen, 2015; Altavilla, Pagano and Simonelli, 2017; De Marco, 2018) with a negative impact on the performance of firms (Acharya, Eisert, Eufinger, and Hirsch, 2018). 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, 2018). 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 some private borrowers (notably, to households).

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-Silanes, and Shleifer (2002) shows that government ownership reduces banks'

profitability and gives rise to politically-motivated lending decisions.⁵ In addition, a number of papers have shown that political interests can affect the timing of the removal of barriers to entry in the banking industry (Kroszner and Strahan, 1999), delay foreclosures on mortgages (Agarwal, Amromin, Ben-David, and Dinc, 2012), and lead to a delay in the release of bad news about problems in the banking sector (Brown and Dinc, 2005; Imai, 2009; Liu and Ngo, 2014). Furthermore, government owned banks exhibit lower default risk but higher operating risk, suggesting that government ownership incentivizes banks to take more risk (Iannotta, Nocera and Sironi, 2013). 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. Empirical methodology

The goal of this paper is to study whether during the European sovereign debt crisis, governments under fiscal stress pressured “their” banks to purchase their own sovereign debt due to limited demand by other investors (moral suasion). To this end we exploit a novel dataset collected by the ECB which captures monthly balance sheet data of European banks (we will describe the data in more detail in the next section). We use these data to examine banks' net purchases of securities issued by the domestic sovereign over the period January 2009-September 2012.⁶ This period includes both the pre-sovereign debt crisis, or low-risk, period and the sovereign debt crisis—or high-risk—period. The monthly frequency of the data allows us to employ a difference-in-difference-in-differences type of methodology whereby we compare the behaviour of banks that are more and less likely to be swayed by the government during months in which the government's need to sway banks to support it is plausibly high, relative to months of low such need. Effectively we compare in one regression the differential behavior of domestic and foreign banks in the pre-crisis (low risk) environment where we do not expect moral suasion to play a role, with their behavior during the sovereign debt crisis where we do expect moral suasion to play a role during some months of high need.

We first identify, for each of the five stressed countries in the dataset, the acute phase of the sovereign debt crisis, the so-called high-risk period. As is evident from Figure 5, sovereign

⁵ 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).

⁶ January 2009 is the first month for which comprehensive data on maturing debt are available.

debt problems did not arise at the same time in the five countries. While in Greece spreads already started to increase in the beginning of 2010, spreads in Italy and Spain only started to really take off in mid-2011. To capture as adequately as possible the perception in the market of significant concerns as regards the sovereign, we use for each country as the start of the high-risk period the first month when the country's average CDS spread on a 10-year sovereign bond breaches the 300 basis points (bps) mark and stays there. This means that for Greece the high-risk period starts in January 2010; for Ireland in September 2010; for Italy in September 2011; for Portugal in May 2010; and for Spain in August 2011. We end the sample period for all countries in September 2012, the month during which the details of the Outright Monetary Transactions (OMT) Program of the ECB was announced.^{7 8}

While spreads were high in each country during the sovereign debt crisis, there were large fluctuations within the crisis period with respect to the amount of debt each 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 September 2012, as well as during the sovereign debt crisis period (shaded area), for all countries in the sample. The figure shows large month-on-month fluctuations at all times, including during the sovereign debt 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 bonds 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 pressure them during months when it needs to roll over a relatively large amount of debt ("high-need" months).

⁷ The OMT Program was first hinted to by the ECB's President, Mario Draghi, in a speech at the Global Investment Conference in London on 26 July 2012, in which he vowed to do "whatever it takes" to keep the Eurozone together. <https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html>.

⁸ We let our sample period end here because even though stress in government bond markets subsided, the period after Draghi's speech is still fundamentally different from the pre-sovereign debt crisis. As a result comparing only with the period directly preceding the sovereign debt crisis is more appropriate.

The second element in our identification strategy exploits the idea (as previous studies have done) that some banks are more susceptible to pressure 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. Domestic banks have a stronger incentive to collude with the government when demand for domestic sovereign bonds is weak as an undersubscribed auction would imply higher sovereign spreads, which would directly translate into higher funding costs. Furthermore, they are more likely, at some point, to need assistance from the government, and are more vulnerable to explicit or implicit threats if they refuse to cooperate (Romans, 1966; Reinhart and Sbrancia, 2015). Finally, domestic banks are more likely to feel that 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 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 pressure any subset of banks. This difference should only play up during a period when the sovereign is under severe stress and not during other periods.

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 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 branches of foreign banks. Acquiring more zero-risk sovereign bonds 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-on-month identification strategy is that it allows us to control for these alternative mechanisms. First, we include bank fixed effects that capture any time-invariant differences between banks that affect their net purchase of domestic sovereign debt. By including an interaction between high-need months and the domestic dummy we control for any dynamics throughout the sample period that might lead domestic banks to purchase more domestic sovereign bonds in high-need months, compared to foreign banks. By including an interaction between high-risk and domestic we control for a higher propensity of domestic banks to purchase domestic sovereign debt during the sovereign debt crisis because of, for example, risk shifting. To assuage remaining concerns that our results are 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:

$$\begin{aligned} \Delta Domestic\ sovereign\ bonds_{ijt} = & \beta_1 High\ risk_{jt} \times High\ need_{jt} \times Domestic_{ij} + \\ & \beta_2 High\ risk_{jt} \times Domestic_{ij} + \\ & \beta_3 High\ need_{jt} \times Domestic_{ij} + \\ & \beta_4 X_{ijt} + \beta_5 \varphi_i + \beta_6 \mu_{jt} + \varepsilon_{ijt}, \end{aligned} \tag{1}$$

where $\Delta Domestic\ sovereign\ bonds_{ijt}$ is the bank's net flow of securities issued by the domestic sovereign at time t , divided by the bank's total holdings of securities issued by the domestic sovereign at time $t-1$. $High\ risk_{jt}$ is a dummy variable equal to one in all the months after the country's average CDS spread breaches permanently 300 bps, and to zero before this moment; $High\ need_{jt}$ is a dummy variable equal to one if the total amount of maturing outstanding domestic sovereign debt in country j in month t is above the country median for the sample period, and to zero otherwise; $Domestic_{ij}$ is a dummy variable equal to one if bank i in

country j is a domestic bank, and to zero 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.

The independent effect of the variables $High\ risk_{jt}$, $High\ need_{jt}$, and $Domestic_{ij}$ is not identified because the effect of the first two variables is subsumed in the country-month fixed effects, and the effect of the third variable is subsumed in the bank fixed effects. The 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-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), during the high-risk period relative to the low-risk period. A positive coefficient β_1 would imply that—all else equal, and relative to foreign banks—domestic banks purchase more domestic sovereign debt in high-need months, compared with low-need months, when the sovereign is under pressure. Put differently, the numerical estimate of β_1 captures the difference in the overall acquisition of domestic sovereign debt between high- and low-need months, during periods of elevated sovereign stress, induced by switching from the control group to the treatment group. The coefficient β_2 captures the effect of “risk shifting”, i.e., the propensity of domestic banks, relative to foreign banks, to increase their holdings of domestic sovereign bonds when the risk of the underlying asset increases. Finally, the coefficient β_3 captures the extent to which domestic banks, relative to foreign banks, are more likely to increase their holdings of domestic sovereign bonds during months when an above-median amount of outstanding domestic sovereign bonds is maturing.

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.

4. Data and descriptive statistics

The main dataset 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 18 European countries, comprising about 70 percent of the domestic banking sector. Banks are observed at the unconsolidated level. These data are later merged with data on bank ownership from Claessens and van Horen (2015) and from Bankscope, data on bank CDS spreads from Bloomberg, with data on the political affiliation of bank boards from Boardex, as well as with hand-collected data on state financial assistance from the EU Commission state aid database. We also merge the individual bank data with monthly data on maturing sovereign debt from the ECB's Centralized Securities Database, on the benchmark 10-year sovereign yields from Bloomberg, and on changes in business sentiment from the European Commission.

This bank-level dataset has a number of important advantages compared to other datasets used in the literature that make it particularly well-suited to 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., Horvath, Huizinga and Ioannidou, 2015; Popov and Van Horen, 2015; De Marco, 2018) 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 therefore include changes in sovereign bond holdings of both domestic banks and 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 for both sectors. This is a 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 then apply two data availability criteria which further concentrate the list of banks in the sample. First, we set aside five 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 (January 2009 – September 2012). 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 if at least 50 percent of its shares are owned by foreigners (a definition commonly used in the literature). We measure ownership at the start of our sample period. Of our sample of banks 46 are domestic and 14 are foreign. Appendix Table 1 gives for each country the number of domestic and foreign banks included in our sample. There is at least one domestic and at least one foreign bank active in each of our sample countries.

Our main variable of interest is Δ *Domestic sovereign bonds*, 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 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 $t-1$ (Δ *Foreign sovereign bonds*). 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 also look at the ratio of the bank's net flow of securities issued by the private sector at time t to the stock of the bank's total holdings of private securities at time $t-1$ (Δ *Private securities*). Domestic banks should not have a higher propensity to buy private

securities in high-need months during the sovereign debt crisis. 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 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/Assets*). 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 all active and matured securities relevant to the European System of Central Banks, starting in January 2009. 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. We define a high-need (low-need) month as a month in which the total amount of maturing debt is above (below) the country median for the sample period. Table 1 presents summary statistics for monthly maturing sovereign debt in Greece, Ireland, Italy, Portugal, and Spain over the sample period.

Table 2 provides summary statistics for all variables used throughout the paper, and Appendix Table 2 provides their definitions and sources. It indicates that 68 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 3 percent on a month-on-month basis. In addition, over the sample period the average bank had €77.8 billion in assets, a deposit-to-assets ratio of 0.54, a loan-to-deposit ratio of 1.50, and was very well-capitalized, with a capital-to-assets ratio of 0.10 (where capital in the IBSI dataset is defined as assets minus liabilities divided by assets). 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 3 illustrates the difference between domestic and foreign banks with respect to a number of observable characteristics. For each variable in the table we first calculate the average per bank over the period before the sovereign debt crisis. We then take the average for the group

of domestic and the group of foreign banks. We find that domestic banks are on average larger and have a smaller deposit base; both of these differences are significant. We also find that domestic banks issue more loans, relative to the deposits they hold, but the difference is not significant. The capitalization of both groups is virtually the same. This test confirms that while not necessarily observationally equivalent across all dimensions, domestic and foreign banks are relatively similar across a number of observable characteristics.

Next we look at the differences across both types of banks in their propensity to purchase domestic sovereign bonds prior to the sovereign debt crisis. One potential concern with our identification strategy is that foreign banks are not a proper control group because few foreign subsidiaries hold sovereign debt issued by the country where they operate, or because they do not respond to new buying opportunities of sovereign bonds in the local market. We first find that domestic banks held on average a higher share of their assets in debt securities issued by the domestic government already before the crisis (3.8 percent vs. 2.6 percent). However, this difference is not statistically significant, suggesting that before the crisis, foreign subsidiaries had comparable holdings of domestic sovereign bonds.

We next compare the net purchase of domestic sovereign debt for the two groups of banks, both on average as well as during high-need and during low-need months. We find that prior to the crisis there is no statistical difference in the propensity to increase holdings of domestic sovereign bonds between domestic and foreign banks. Finally, we also document a similar pattern between domestic and foreign banks when we compare the bank-specific variation over time in the propensity to acquire domestic sovereign bonds. This again holds for both low- and high-need months. The table thus suggests that there is sufficient variation both between and within banks over time. These statistical regularities strongly suggests that foreign banks are a proper control group to domestic banks, both in terms of their overall exposure to domestic sovereign debt, as well as in terms of their response to bond buying opportunities, before the crisis.

Finally, to assuage concerns that foreign affiliates only hold a very small amount of the domestic sovereign debt, we also compare the stock of domestic sovereign debt at the foreign affiliated level with that of the stock of that same debt at the holding level from the first EBA stress test (March 2010). That is we compare the holdings of Spanish debt (as recorded in IBSI) of bank X which is a subsidiary of bank Y in Spain with the total holdings of Spanish debt by

bank Y reported in the EBA stress test. We find that on average, the foreign affiliates of the banks included in the EBA stress test hold 43.3 percent of the host-country debt that the group as a whole reported to the EBA. For each individual country, the respective numbers are 7.4 percent in Greece, 7.3 percent in Ireland, 50.1 percent in Italy, 41.6 percent in Spain, and 62.7 percent in Portugal.⁹

5. Empirical evidence

5.1. Moral suasion: Main result

The headline results of the paper are reported in Table 4. We estimate three different permutations of Equation (1). In column (1), we only include on the right-hand side *High need* \times *Domestic* and *High risk* \times *Domestic*, as well as bank fixed effects and interactions of country and month dummies. The results show that the net purchase of domestic sovereign debt securities during the crisis period is significantly higher for domestic banks compared to foreign banks. The effect is economically meaningful, too: compared to foreign banks, domestic banks' monthly net increase in domestic sovereign bond holdings is on average 7.9 percentage points higher. Given that any time-invariant home bias by domestic banks is captured by the bank fixed effects, the coefficient on the variable *High risk* \times *Domestic* captures an asset substitution effect whereby domestic banks have a higher average propensity than foreign banks to increase their holdings of domestic sovereign bonds when the risk of the underlying asset is higher (i.e., risk shifting). At the same time, we find that on average, domestic banks are not more likely to load on domestic sovereign bonds during months of elevated government refinancing need.

In column (2), we add the triple interaction *High risk* \times *High need* \times *Domestic*. The point estimate strongly suggests that during the high-risk period, and relative to foreign banks, domestic banks are significantly more likely to increase their holdings of domestic sovereign bonds during high-need months, compared with low-need months. Importantly, in periods when the sovereign is not under fiscal stress, domestic banks do not have a higher propensity to buy domestic sovereign debt during high-need months. The main effect still obtains in our preferred specification where we include 1-year lagged bank-specific balance sheet characteristics, in

⁹ Unfortunately, we are not at liberty to disclose this information at the individual bank level.

addition to the bank fixed effects and the interactions of country and month dummies (column (3)). In this specification, we find that banks are on average less likely to increase their holdings of domestic sovereign bonds if they have a higher ratio of deposits to total assets.

Both in columns (2) and (3), the ‘moral suasion’ effect is significant at the 5 percent statistical level and economically large. In the most saturated specification in column (3), the point estimate on β_1 implies that during high-need months, and compared with foreign banks, domestic banks increase their holdings of domestically-issued sovereign debt by 7.1 percentage points more. This corresponds to a 0.46 of a 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 difficult for the government to find interested investors, domestic banks are considerably more likely to support their government during months when it needs to roll over a relatively large amount of outstanding debt. Importantly, this moral suasion effect co-exists with the risk shifting effect, and the latter is still significant at the 5-percent statistical level in column (3). However, the risk shifting effect itself declines by around 40 percent when we control for the moral suasion channel, suggesting that empirical tests which do not properly identify the moral suasion channel will overestimate the extent of risk shifting by banks.

5.2. Moral suasion: Mechanisms

We next turn to analysing the mechanisms driving moral suasion. Ex ante, there are two such mechanisms. First, moral suasion might be a natural reaction to the governance relationship between banks and government. If banks are connected to the government or are governed by government officials, they are under the government’s direct influence and as a result may react to its needs (e.g., Acharya and Steffen, 2015; Becker and Ivashina, 2018). Second, moral suasion might be the natural reaction of relatively weak banks who either have a strong incentive to keep sovereign spreads from rising too much in order to keep their own funding cost in check or who anticipate the need for government assistance in the near future (but cannot be sure to receive it).

To examine the relative importance of both mechanisms, we test for moral suasion within the sample of domestic banks and create sub-groups of banks that are more likely to be swayed, based on the above natural priors. If the ‘political connections’ mechanism is driving moral suasion, its effect will be concentrated in banks that are connected to the government, either through direct ownership or via board relationships. If the ‘bank health’ mechanism is driving moral suasion, banks of worse quality—e.g., poorly capitalized banks or banks with a less stable funding structure—would be the ones driving the result.¹⁰

To examine the importance of the first mechanism we construct a number of variables capturing different levels of government control. First, we determine whether a domestic bank is state-owned or not, the most direct measure of government influence. We follow De Marco and Macchiavelli (2016) and Altavilla, Pagano and Simonelli (2017) by denoting a bank as state-owned if at least some bank equity is held by the national or local government or by publicly controlled institutions (such as Fondazioni in Italy and Fundaciones and Cajas in Spain).¹¹ Using this approach, we identify 23 banks as state-owned. We also create a continuous measure of this variable which captures the fraction of the bank’s shares held by the local or national government or by publicly controlled institutions.¹² Government ownership is measured at the start of the sovereign debt crisis.

Next, we determine the extent of government support extended to domestic banks during the global financial crisis of 2008-09 or in its direct aftermath. This information is hand-collected using several sources including the EU Commission State Aid Database. We classify a bank as ‘supported’ if it received any kind of government assistance (e.g., recapitalization, liquidity injection guarantee, etc.) and regardless of the size of the support. All in all, 16 domestic banks in our sample received such support, and there is at least one such bank in each country in our data set.

¹⁰ Focusing only on the group of domestic banks also helps alleviate any residual concerns that foreign banks are not an appropriate control group. Our 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. This underlying assumption is subject to a number of concerns. Domestic banks as a group differ significantly in their ownership structure and extent of government interventions during the crisis, as well as in their underlying characteristics, and this could potentially affect the likelihood of a particular bank being pressured.

¹¹ Iannotta, Nocera and Sironi (2012) use a stricter definition and only classify a bank as state-owned when bank equity is held by the national or local government.

¹² This information is manually collected from bank’s annual reports.

Finally, we classify banks based on the political connections of their board. This allows us to capture the fact that board members with past or current affiliation with the government might have a strong influence on the management of a bank even when the bank is not state-owned (see De Marco and Macchiavelli, 2016). We use two definitions: the share of the executive board that is or has been politically affiliated with the central government, and the share of the supervisory board that is or has been politically affiliated with the central government. This share ranges from zero in both cases to 86 percent in the case of the executive board and to 41 percent in the case of the supervisory board (see Table 2).¹³

To test the impact of the ‘bank health’ mechanism we construct a number of balance sheet variables. As balance sheet data in IBSI are limited, we download additional (annual) balance sheet data from Bankscope for the domestic banks in the dataset. We focus on variables that are accepted empirical proxies for bank health and net worth: total assets, Tier 1 and Tier 2 capital, the ratio of liquid assets to total assets, the ratio of loans to deposits, and the ratio of non-performing loans (NPLs) to total assets.¹⁴ In addition, we also use information from IBSI on each bank’s holdings of domestic sovereign bonds to total assets. For each variable we use its value as of end-2009, before the eruption of the sovereign debt crisis in Greece. We then create dummy variables equal to one whenever the value of the respective balance sheet variable is below the sample median (in the case of assets, Tier 1 capital, Tier 1 + Tier 2 capital, and liquid assets) or above the sample mean (in the case of loans to deposits, NPLs, and sovereign bond holdings), and to zero otherwise. Therefore, in each case, a value of one corresponds to a weaker bank that can plausibly face a higher recapitalization need in the future or is more vulnerable to an increase in its funding costs, but may not necessarily be assured of future government assistance (given for example its small asset size).

We then replicate Model (1), entering each of the above dummies one at a time in the place of $Domestic_{ij}$, in the sample of domestic banks. We test the ‘political connection’ mechanism in Panel A of Table 5. We first 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 statistically not more likely to do

¹³ We thank Victoria Ivashina for kindly sharing with us her dataset, which (unfortunately for us) only captures banks included in the EBA stress tests.

¹⁴ Total assets and loan-to-deposit ratio are also available in IBSI, but to assure consistency between the different bank characteristics we categorize banks according to the different balance sheet items as provided by Bankscope.

so. Whether we measure state ownership as a dummy (column (1)) or as a continuous variable (column (2)), does not make a difference.

However, when we compare supported to non-supported domestic banks, we find that the former 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 (column (3)). This exercise partially explains the null result in columns (1) and (2), which is plausibly driven by the fact that privately owned supported banks are likely to face pressure from the government, too. Furthermore, we find that the extent of political affiliation of neither the bank's executive board (column (4)) nor the bank's supervisory board (column (5)) helps explain the 'moral suasion' effect which we documented in Table 4. The evidence in Panel A of Table 5 thus suggests that while the government's influence as a result of bank assistance during the financial crisis is a perceptible driver of bank behaviour consistent with 'moral suasion', political connections on their own are not.

The estimates reported in Panel B of Table 5 suggest that for a number of empirical proxies for bank vulnerability, weaker domestic banks are more likely to increase their purchases of domestic sovereign bonds during months in which the government is facing higher refinancing needs. In particular, this is the case for smaller banks (column (1)), for less well capitalized banks (columns (2) and (3)), and for banks with a lower ratio of liquid to total assets (column (4)). We do not document any difference between the two groups of domestic banks along the dimension of loans to deposits, NPLs, or their pre-crisis exposure to domestic sovereign bonds.

Finally, in Panel C we run a series of regressions where we juxtapose the effect of the bank-specific variables which turned out to have a significant impact on bond buying in Panels A and B. We do so by including the dummy for whether a bank was supported or not alongside each of the four significant balance sheet variables (size, Tier 1, Tier 1+2, and the ratio of liquid-to-total assets), first adding them one at a time (columns (1)–(4)) and then in a horse race (column (5)). We find that in various combinations, both the degree of political dependence and the degree of balance sheet vulnerability matter. The evidence thus strongly supports the notion that both political pressure through government support and balance sheet weakness are a first-order determinant of banks' willingness to accommodate the domestic government's financing needs. Therefore, the 'moral suasion' motive is not exhibited by all domestic banks equally, but

is only present for those domestic banks that received government assistance in the past, or are weak and thus plausibly hope to benefit from government assistance in the future.

5.3. Robustness

5.3.1. 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 behaviour that has three components: 1) they are 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 6 a series of falsification tests. We first test for differences in the propensity of domestic versus foreign banks to purchase *foreign* sovereign bonds.¹⁵ We find that during the high-risk period, 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)). This suggests that the difference in behaviour we documented in Table 4 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.¹⁶

Our identification strategy is motivated by the hypothesis that domestic banks have an incentive to assist their government (‘moral suasion’) during months when the government needs to roll over large amounts of sovereign debt and it needs banks to step up their purchases at reasonable prices. In other words, while we expect—and our results so far confirm—that domestic banks’ propensity to purchase domestic sovereign bonds will differ across high- and low-need months, their propensity to purchase other classes of securities will not. While column (1) confirms this in the case of foreign sovereign bonds, in column (2) we proceed to test this

¹⁵ Holdings of foreign sovereign bonds relative to assets are on average lower than holdings of domestic bonds (0.4 percent for domestic banks and 2.1 percent for foreign banks). For both types of banks there is significant variation both across banks and within banks over time. Importantly, the difference in variation in within-bank net purchases between the two groups of banks is insignificant.

¹⁶ The evidence further suggests that our results are not contaminated by 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).

hypothesis in the case of private securities.¹⁷ We document no statistical differences across the two types of banks, in high-need versus low-need months, suggesting that variation in governments' refinancing needs are only reflected in the extent to which banks purchase domestic sovereign bonds.

As a final falsification test, we estimate the model for 38 domestic and 7 foreign banks active in Germany during the period January 2009 – September 2012. We define *High risk* as the period after May 2010 (i.e., the month of the first Greek bailout). To make the sample of German banks as comparable as possible to the sample of GIIPS banks, we only include 45 of the available 56 German banks in our dataset. In particular, we drop 9 Landesbanken—government-owned head institutions at the State level which are very large compared to the rest—as well as two small regional banks which are—in terms of assets—smaller than the smallest bank in the GIIPS sample. 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 (3)).

We conclude that the phenomenon we document—domestic banks being significantly more likely than foreign banks to increase their holdings of domestic sovereign bonds during months in which the government has relatively larger refinancing needs—only occurs in fiscally stressed countries, and only affects domestically issued sovereign bonds. Therefore, this finding is fully consistent with the occurrence of moral suasion in sovereign debt markets.

5.3.2. Alternative channels

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 the amount of public debt that needed to be rolled over was relatively low. This strategy

¹⁷ Before the crisis, domestic banks held on average 6.3 percent of their assets in private securities and foreign banks 8.6 percent. Also in this case there is substantial variation over time both across banks and within banks. Once again, the difference between the two groups of banks—in terms of average securities holdings, of average changes over time in these holdings, and of the variation in such changes over time—is not statistically significant.

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 when banks are weak, 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 to their balance sheet that hit their net worth during the same months when the government’s refinancing needs are particularly high. 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, both on average and especially during the high-risk period. As can be seen in column (1), the point estimate on the interaction *High risk* \times *High need* \times *Domestic* hardly changes, confirming the intuition that ‘moral suasion’ is a mechanism independent of the impact of concurrent shocks to banks’ balance sheets.

Another possible confounding mechanism is that a bank’s incentive to shift risk might vary over time. 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 because of risk shifting and not because of moral suasion. And while our empirical model allows for domestic banks to have on average a higher propensity to engage in risk shifting, we have not yet formally controlled for the possibility that domestic banks’ own risk might be higher during high-need months. In column (2), we add an interaction of *Domestic* 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 1,753. 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 main interaction of interest is once again positive and significant at the 5 percent statistical level, suggesting that variation in own bank risk is not driving our results.¹⁸

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 in doing so when the government itself is closer to default. If 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 that is activated not only on average (i.e., after the start of the sovereign crisis), but also within the high-risk period itself. We note, however, that 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.¹⁹ Moreover, in column (3) we formally test whether the incentives of (some) domestic banks to risk shift is affecting our results by adding an interaction between the spread on a 10-year domestic sovereign bond and *High risk × Domestic*.²⁰ The estimates indicate that our baseline result is hardly affected. They also suggest that domestic banks are more likely to increase their domestic sovereign bond holdings during months of elevated sovereign stress; however, this is not the case during the high-risk period.

Another 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 *High risk × Domestic* with the

¹⁸ Note that the bank fixed effects already pick up the fact that some banks were perceived as riskier than others by the market. Therefore, it is not entirely surprising that a shift in the bank's CDS spread does not have a statistically significant independent effect.

¹⁹ In addition, Appendix Table 3 demonstrates that country risk (measured both in terms of CDS spreads and in terms of bond yields) is typically statistically similar in low-need and in high-need months. Only in Spain during the full period is country risk statistically higher during high-need months than it is during low-need months. However, this is not the case during the high-risk period, when country risk is uniformly similar across high-need and low-need months, both in the full sample and for individual countries. The only exception is Italy, where country risk is higher during *low-need* months, but this difference is only weakly significant.

²⁰ In unreported regressions, we control for the domestic sovereign CDS spread instead of bond yields. The main result is unchanged (available upon request).

change in the country-specific Business Sentiment Index published each month by the European Commission. The coefficient on that interaction implies that during the high-risk period, domestic banks tended to buy more domestic sovereign bonds when economic sentiment was 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 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 interactions of the variable *Primary dealer* with the variables *High need* and *High risk* and their interaction which we then include as controls in our main specification. The point estimates suggest that primary dealers (i.e., mainly large foreign banks) are less likely than the rest of the banks to increase their holdings of domestic sovereign bonds during the high-risk period, and that their propensity to load on sovereign bonds is independent of the government’s refinancing needs. Importantly, the main effect—that during the high-risk period, domestic banks were more likely than foreign banks to purchase domestic sovereign bonds during high-need months—is obtained 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 reducing their exposures during high-need months. This could be the case if foreign banks are explicitly asked by their regulators to decrease their

holdings of risky foreign debt especially during high-need months, or because foreign banks price the credit risk embedded in government bonds of stressed countries differently than their domestic peers, especially in months of high refinancing needs. As our identification strategy is based on the comparison of domestic and foreign banks across high- and low-need months, it is unlikely that this is driving the results. For example, while it is possible that the French regulator would ask the subsidiary of BNP Paribas in Italy to decrease its holdings of Italian government debt after CDS spreads became elevated, it is unlikely it would ask the bank to do this 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, we show that on average foreign banks are less likely to purchase domestic sovereign bond during the high-risk period (column (6)). Crucially, this behaviour does not vary across high-need and low-need months, suggesting that the ‘moral suasion’ channel we document is not driven by foreign banks’ pricing sovereign risk differently than domestic banks in high-need months.

5.3.3. Robust high risk

The empirical approach we employ throughout the paper rests on distinguishing the behaviour of domestic and foreign banks between months with high and months with low refinancing need, under the assumption that any portfolio adjustment will be driven by lack of sufficient investor demand during periods of elevated sovereign stress. This approach makes it necessary to make a clear distinction between periods of high risk and periods of low risk, for each country. Our measure of high risk so far is based on a market definition, whereby we have chosen as the start of the high-risk period in each country the month during which the CDS spread on a 10-year government bond permanently breached the 300-bps threshold. To make sure that our results are not driven by this particular choice, we now test for whether our results still obtain when we employ alternative definitions of elevated sovereign risk.

We employ five such alternative definitions. First, we assign the start of the high-risk period to the month in which the yield on a 10-year government bond permanently breached 500 bps, for each individual country. This is an alternative market-based measure whereby we make sure that our definition of elevated sovereign risk is not driven by one particular market. Relative to our main definition, the high-risk period now starts one month later in Greece and one month

earlier in Italy and in Spain. Second, we assign the start of the high-risk period to the month during which the CDS spread on a 10-year sovereign bond breaches the 300-bps threshold for the first time, regardless of whether it stays above this level or not. This moves the beginning of the high-risk period all the way to December 2010 in the case of Spain (see Figure 4). Third, we use the log of the CDS spread instead of a dummy variable to allow for sovereign risk to change continuously. Fourth, we date the high-risk period based on the activation of the ECB's Security Markets Program (SMP) for each individual country. Under this program, the ECB started purchasing sovereign bonds in secondary markets. The program was activated in May 2010 for Greece, Ireland, and Portugal, and in July 2011 for Italy and Spain. Finally, we assign the same high-risk period to each country, starting in September 2010, the month when the median country in our sample, Ireland, entered a period of elevated sovereign stress according to our main definition.

The estimates from these alternative tests are reported in Table 8. The evidence strongly suggests that neither the statistical significance nor the economic magnitude of the 'moral suasion' mechanism we documented so far is overly sensitive to how we define country-specific elevated sovereign stress. While in some cases the effect is only significant at the 10-percent statistical level, the evidence is uniformly consistent with the idea that domestic banks are more likely to support the domestic government during periods of sovereign stress, especially when the government is facing high refinancing needs.

5.3.4. Robust government need

Our identification strategy relies on splitting the sample period in high need versus low need months based on the total amount of debt maturing during that month. This raises four 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 potentially issued by the current government only recently, casting doubt on our identification strategy. To address this point, in column (1) of Table 9 we recalculate the *High need* variable based on only maturing long-term bonds (i.e.,

with a maturity higher than 5 years). 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 9, 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 one in months when the government's refinancing need is in the top country-specific quartile for the sample period, and equal to zero otherwise. In this way, we attempt to gauge the impact of severe refinancing needs. While the point estimate declines somewhat relative to the one in Table 4, column (3), it is still significant at the 10-percent statistical level.

Third, 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) 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. The main result of the paper still obtains, and the effect is significant at the 10-percent statistical level.

One final concern is that while employing a dummy variable for high versus low government refinancing needs makes interpretation easy, it may be unnecessarily throwing out information. To address this concern, we replace the *High need* dummy with a continuous treatment variable defined as the fraction of outstanding debt being rolled over in each month. The point estimates reported in column (4) strongly suggest that the 'moral suasion' mechanism we document is robust to defining government refinancing needs in this alternative way.

5.3.5. Sample robustness

Finally, we check how robust our results are to analysing different samples. In Table 10, 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. The same is true in column (2), where we drop Ireland which did not auction any sovereign bonds between October 2010 and June 2012, and in column (3), where we exclude all country-months in the sample during which no sovereign bond auctions took place.

In column (4), 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, by excluding these two months from the sample period. On these dates, 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, Fraise, 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, the evidence strongly suggests that the moral suasion effect is not driven by the LTRO, with domestic banks more likely than foreign banks to purchase domestic debt even outside of the months of the two ECB's LTROs.

Finally, as shown in Table 3, 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 deposit-to-asset ratio. 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 (see Section 5.2), 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, based on pre-crisis values of the bank-specific controls that exhibit statistically significant differences across the two groups. 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 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 (5), show that even within the matched sample, and compared to their foreign counterparts, domestic banks increase their holdings of domestic sovereign bonds relatively more during high-need months.

6. Implications for private lending

A number of recent papers have studied the extent to which 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 (2017) show that domestic banks in GIIPS countries more exposed to their sovereign reduced both their domestic as well as foreign lending to non-financial corporates. Furthermore, Acharya Eisert, Eufinger, and Hirsch (2018)—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 (2018) provide evidence indicating that financial repression in the European periphery led to crowding out of corporate lending.

In this section, we contribute 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 on 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 (2018), relationship lending tends to be more stable when a credit cycle turns. Furthermore, as banks tend to engage in long-term lending relationships 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 examine whether the moral suasion that we document results in crowding out of lending to the real economy, we study adjustments in both loan volumes and interest 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 one year, and loans to non-financial corporates with maturity of more than one 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 four additional new dependent variables, using a different dataset of the same banks: the Individual MFI Interest Rate Statistics (IMIR). These variables equal the average interest rate on consumption loans and on mortgage loans issued by the bank to households,²¹ as well as the average interest rate on loans to non-financial corporates with maturity of less than one year and with maturity of more than one 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

²¹ IBSI contains no disaggregation of loans to households in terms of volumes, while IMIR reports interest rates by categories.

country level. We also include in each regressions an interaction of *Domestic* and *High Need x Domestic* with the variable capturing monthly changes in business sentiment (see also Table 7, column (4)). This controls for the fact that clients of domestic banks might be more sensitive to the local business sentiment and therefore might face different demand shocks compared to clients of foreign banks.

The results in Panel A of Table 11 show that while the point estimate on the main variable of interest is negative in 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 in months directly following high-need months when they increased their holdings of domestic sovereign bonds, compared to foreign banks. We do not find statistically significant differences for lending to corporates. Furthermore, in Panel B we find that these same banks raised their interest rates on mortgage loans to households (column (2)) but not to firms (columns (3)–(4)). The combination of a decline in volumes and an increase in prices in the case of loans to households indicates a genuine supply shift following months when banks had to step in and support their government.

7. Aggregate effect and duration

Our results raise two broad questions regarding the aggregate economic effect and the duration of the effect. The first question asks how much additional balance sheet risk a domestic bank is taking on because of the moral suasion mechanism that we documented. The triple interaction parameter and the double interaction parameter in Table 4, column (3) allow us to perform a back-of-the-envelope calculation in order to determine the estimated increase in the stock of domestic sovereign debt due to moral suasion, relative to the increase in the stock of domestic sovereign debt due to risk shifting. As 49 percent of the months during the crisis period are high-need months, and as only the risk shifting channel is operational during both high- and low-need months, the coefficient on the triple interaction suggests that on average, the propensity to increase the holdings of domestic sovereign bonds relative to total assets due to moral suasion was higher by 0.035 (the parameter estimate 0.071 divided by two). The coefficient on the double interaction implies that on average, the propensity to increase the holdings of domestic sovereign bonds relative to total assets due to risk shifting was higher by 0.049. The two forces

combined give a propensity that domestic banks increase their holdings of domestic sovereign bonds relative to total assets during the high-risk period by 0.084 on a month-on-month basis.

The average (domestic) bank in the sample spends 18.6 months in a stress period, and so its holdings of domestic sovereign bonds relative to total assets increase by 156 percent, out of which 65 percent is due to moral suasion and 91 percent due to risk shifting. This corresponds to the holdings of domestic sovereign bonds, as a share of total assets, by the median GIIPS bank in the sample increasing from 3.8 percent to 6.3 percent due to moral suasion. Alternatively, at the beginning of the stress period, the average bank in our GIIPS sample held €3.9 billion (bn) worth of domestic sovereign bonds, and so the 46 domestic banks in our dataset held collectively €179.4 bn worth of domestic sovereign bonds. Our point estimates imply that their overall holdings of domestic sovereign bonds increased by €116.6 bn due to moral suasion. Clearly, these estimates understate the aggregate effects of moral suasion on domestic sovereign bond holdings because the banks in our sample account for about 70 percent of the overall domestic market.

The second question asks how persistent the moral suasion effect is. Ex ante one would expect the moral suasion effect to subside quickly after the sovereign stress disappears. After all, governments only need to pressure their banks when they face the risk of an undersubscribed government bond auction. One would therefore expect the effect to disappear quickly after the announcement of the OMT Program. In addition, testing the persistence of the moral suasion effect is also complicated by the fact that other factors came into play in the period after the speech and the OMT announcement that affected banks' incentives to buy domestic sovereign debt. For example, as shown by Fiordelisi, Ricci, Stentella, and Saverio (2016), the Asset Quality Review and the establishment of the SSM and the Banking Union incentivized European banks, including GIIPS banks, to buy more (domestic) sovereign debt in order to window-dress their balance sheet ahead of the review. As these programs were already announced at the end of 2012, it is hard to say what drives banks' holding of sovereign debt after the OMT announcement.

However, to offer some indication as to whether the moral suasion effect persists, Table 12 reports the estimates from an additional test whereby we extend the sample period to June 2013, and include in our main model an additional triple interaction of *Domestic* with *High need* and a *Post – OMT* dummy which is equal to one after September 2012, and to zero otherwise. We

find that while the crisis period exhibits a strong moral suasion pattern, both relative to the pre-crisis and relative to the post-crisis period, there is no difference in the behaviour of domestic and of foreign banks, in high- versus low-need months, after the announcement of the OMT program. Our results thus suggest that as expected, the effects we record are not permanent and that this type of behaviour ceases once sovereign risk declines.

8. 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, banks that received government support during the financial crisis and banks that pine (but are not assured) to receive it in the future—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-on-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 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. In addition, the bail-in mechanism introduced by the EU “Bank Resolution and Recovery Directive” of May 15, 2014, and made legally binding since January 1, 2016, in principle shifts (some of) the onus to bank bond holders.²² Bondholders may be expected to provide more forceful resistance to suasion practices, especially when bondholding is concentrated, institutional and/or foreign, and if bank bonds are mainly short-term and need to be rolled over.

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.²³ 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

²² “Persuaded” bank shareholders are of course also exposed to higher bank default risk and in the case of bail-out domestic tax payers are “on the hook”. However, neither shareholders nor taxpayers may be fully informed about the moral suasion activities that take place and taxpayers partially benefit from it given the uninterrupted continuation of government funding. Neither group is therefore expected to “push back” as strongly as the exposed bank bond holders.

²³ 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.

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.

As moral suasion becomes more documentable in time and place also the Basel committee, the IMF, or other multilateral organizations could play a role by establishing permanent monitoring mechanisms. More concrete measures could include the shaming of governments that excessively burden domestic banks with their domestic debt and the imposition of temporary bank capital surcharges on domestic sovereign bonds when individual domestic banks' holdings are growing too quickly. While all of these proposals may “dissuade governments to persuade”, it does not solve their short-term funding needs during crises. On this account ESBies as envisioned by Brunnermeier et al (2017) could play a role to the extent that their issuance would correspond adequately enough in time and volume with high funding needs in crisis-hit countries. We leave the further exploration of this role to future research.

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

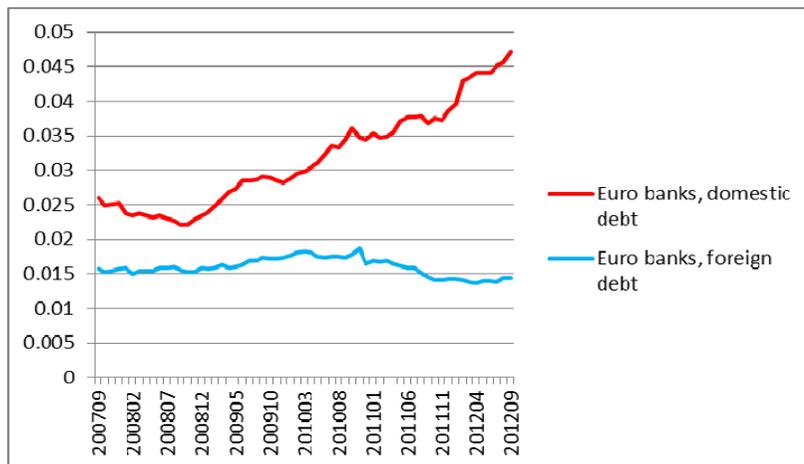


Figure 2. Domestic sovereign bond holdings: Stressed versus non-stressed countries

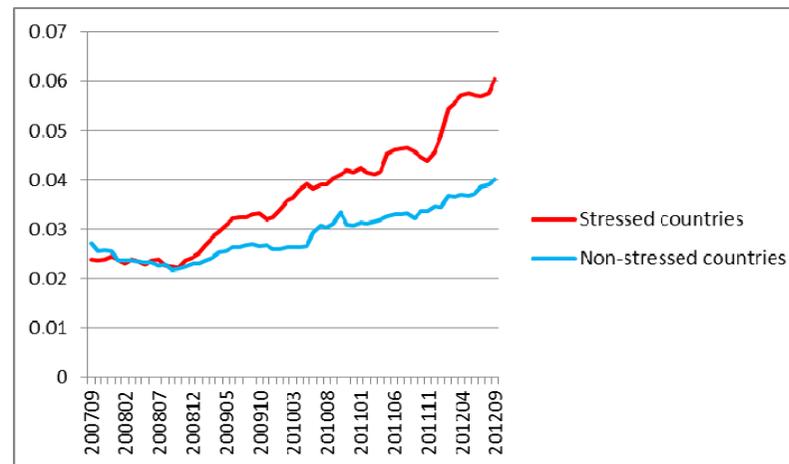
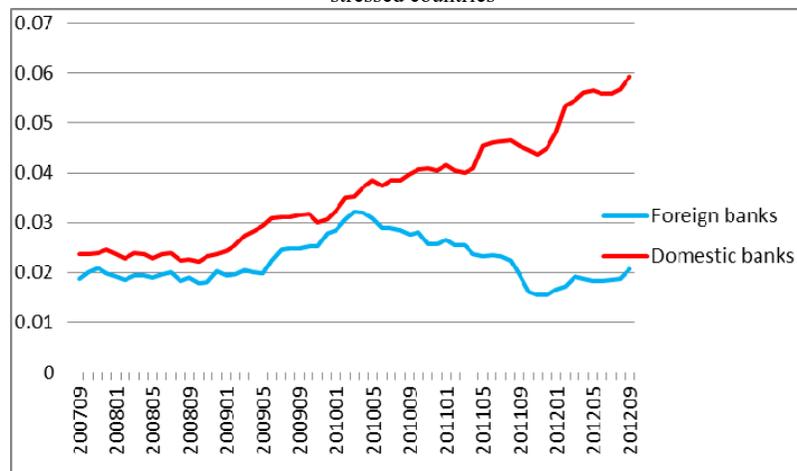
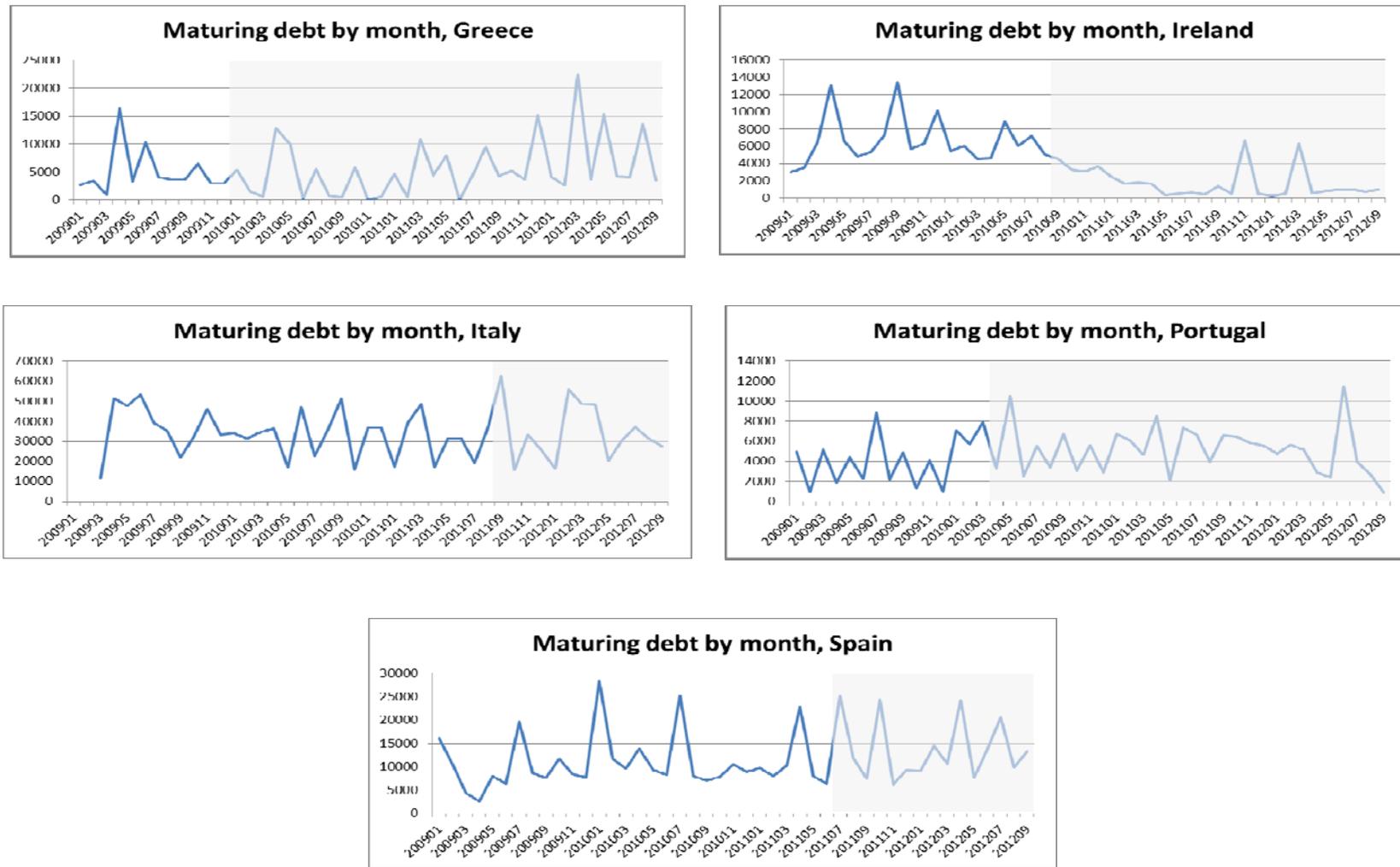


Figure 3. Domestic sovereign bond holdings: Domestic versus foreign banks in stressed countries



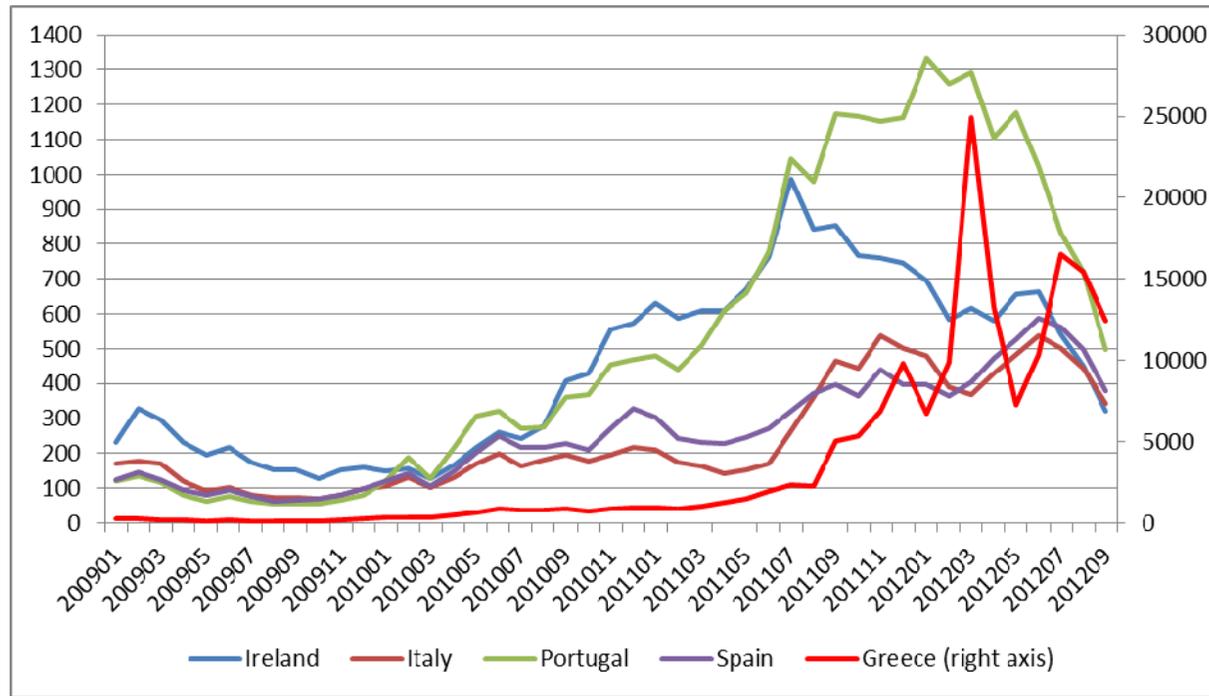
Notes: Average holdings of domestic and foreign sovereign bonds, divided by total assets, for 207 banks in eleven euro area countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain), for the period September 2007 – September 2012 (Figures 1 and 2). Average holdings of domestic sovereign bonds, divided by total assets, for 46 domestic banks in 14 foreign banks in five stressed euro area countries (Greece, Ireland, Italy, Portugal, and Spain), for the period September 2007 – September 2012 (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 2009 and September 2012. Shaded areas represent the high-risk period (starting in January 2010 in the case of Greece, in September 2010 in the case of Ireland, in September 2011 in the case of Italy, in April 2010 in the case of Portugal, and in July 2011 in the case of Spain). Source: Bloomberg.

Figure 5. Monthly average CDS spread on a 10-year sovereign bond, by country



Notes: The figure plots the average monthly CDS spread on a 10-year sovereign bond from January 2009 to September 2012, for Greece, Ireland, Italy, Portugal, and Spain. Source: Bloomberg.

Table 1. Total amount of monthly maturing sovereign bonds, by country: Summary statistics

Country	Mean	Median	St. dev	Min	Max
Greece	6,183.55	4,521.43	5,306.98	68.00	22,406.12
Ireland	1,715.63	900.24	1,814.21	280.00	6,739.31
Italy	34,853.80	32,244.10	14,396.50	15,631.24	62,721.70
Portugal	4,628.71	4,690.72	2,435.82	595.40	11,483.70
Spain	13,561.00	11,834.60	6,675.31	5,570.59	29,629.57

Notes: This table presents summary statistics for monthly maturing sovereign bonds in Greece, Ireland, Italy, Portugal, and Spain, in mln. euro. The sample period is January 2009 – September 2012.

Table 2. Summary statistics

Variable	Mean	Median	St. dev	Min	Max
<i>Bank-level variables, all banks</i>					
Domestic bank	0.68	1.00	0.47	0.00	1.00
Δ Domestic sovereign bonds	0.03	0.00	0.15	-0.83	0.99
Δ Foreign sovereign bonds	-0.02	0.00	0.18	-0.99	0.88
Δ Private securities	-0.01	-0.01	0.12	-0.98	0.99
Δ Loans to households	0.01	0.00	0.03	-0.50	0.86
Δ Loans to NFCs ≤ 1y	-0.01	-0.01	0.11	-0.87	0.96
Δ Loans to NFCs > 1y	0.01	0.00	0.04	-0.33	0.92
Average rate on consumption loans to households	5.00	4.77	4.08	0.00	20.77
Average rate on mortgage loans to households	2.47	2.75	1.57	0.00	13.68
Average rate on loans to NFCs ≤ 1y	2.48	2.60	1.83	0.00	11.57
Average rate on loans to NFCs >1y & ≤5y	1.25	0.00	1.99	0.00	13.08
Average rate on loans to NFCs >5y	1.09	0.00	1.97	0.00	10.14
Assets (mln.)	77,810.73	45,531.00	93,508.70	933.00	533,849.00
Deposit/Assets	0.54	0.52	0.20	0.00	1.08
Loans/Deposits	1.50	1.35	1.13	0.25	10.00
Capital/Assets	0.10	0.09	0.07	0.00	0.60
Domestic sovereign bonds/Assets	0.04	0.03	0.05	0.00	0.27
Bank CDS	372.41	224.47	400.54	22.12	3,884.53
<i>Bank-level variables, domestic banks</i>					
State-owned	0.48	0.00	0.50	0.00	1.00
Supported	0.42	0.00	0.49	0.00	1.00
State-owned or supported	0.67	1.00	0.47	0.00	1.00
Share affiliated executive board	0.12	0.00	0.24	0.00	0.86
Share affiliated supervisory board	0.19	0.16	0.13	0.00	0.41
Primary dealer	0.23	0.00	0.42	0.00	1.00
Log Assets (2009)	18.54	18.42	1.09	17.16	21.19
Tier 1/Assets (2009)	0.09	0.09	0.01	0.07	0.12
Tier 1+2/Assets (2009)	0.11	0.11	0.01	0.09	0.15
Liquid assets/Assets (2009)	0.16	0.12	0.10	0.04	0.57
Loans/Deposits (2009)	1.67	1.61	0.46	0.83	3.02
NPLs/Assets (2009)	0.04	0.04	0.03	0.01	0.11
Domestic sovereign bonds/Assets (2009)	0.03	0.03	0.03	0.00	0.14
<i>Country-level variables</i>					
Sovereign CDS spread	661.33	271.59	2,197.63	58.01	25,960.76
Δ Business sentiment index	0.02	0.02	0.18	-1.07	0.62
Maturing debt (mln.)	16,283.67	9,839.02	14,961.30	0.00	62,721.70
Auctioned debt (mln.)	16,172.99	14,347.10	13,324.04	0.00	46,620.11
10-year bond yield spread	6.43	5.46	4.41	3.83	48.60

Notes: This table presents summary statistics for the variables used in the empirical tests. The sample includes 46 domestic and 14 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is January 2009 – September 2012. All variable definitions and their source can be found in Appendix Table 1.

Table 3. Domestic vs. foreign banks, pre-sovereign debt crisis

Variable	Foreign	Domestic	Difference
<i>Bank-level controls</i>			
Log (Assets)	10.335	11.033	-0.698***
Deposit/Assets	0.606	0.496	0.110**
Loans/Deposits	1.156	1.611	-0.456
Capital/Assets	0.108	0.100	0.008
<i>Propensity to purchase domestic sovereign bonds</i>			
Domestic sovereign bonds/Assets	0.026	0.038	-0.012
Δ Domestic sovereign bonds	0.018	0.024	-0.006
Δ Domestic sovereign bonds, low-need months	0.022	0.032	-0.010
Δ Domestic sovereign bonds, high-need months	0.014	0.015	-0.001
St. dev. (Δ Domestic sovereign bonds)	0.137	0.133	0.004
St. dev. (Δ Domestic sovereign bonds), low-need months	0.128	0.131	-0.003
St. dev. (Δ Domestic sovereign bonds), high-need months	0.136	0.125	0.011

Notes: This table presents difference-in-differences estimate from a Mann-Whitney two-sided *t*-test, for domestic vs. foreign banks. The sample includes 46 domestic and 14 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. Mean values are calculated over a sample period which starts in January 2009 for all countries and ends in December 2009 for Greece, April 2010 for Portugal, August 2010 for Ireland, July 2011 for Spain, and August 2011 for Italy. All variables are observed with monthly frequency. ‘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/Assets’ denotes the ratio of the bank’s equity to total assets. ‘Domestic sovereign bonds/Assets’ denotes the ratio of the bank’s stock of sovereign bonds issued by the domestic government to the bank’s total assets. ‘ Δ Domestic sovereign bonds’ denotes the ratio of the bank’s net flow of sovereign bonds issued by the domestic government at time *t* to the bank’s total holdings of sovereign bonds issued by the domestic government at time *t*-1, for the pre-crisis period. ‘St. dev. (Δ Domestic sovereign bonds)’ is the standard deviation of ‘ Δ Domestic sovereign bonds’ for each bank over the respective sample period. *** indicates significance at the 1% level, and ** at the 5% level.

Table 4. Moral suasion: Main results

	Δ Domestic sovereign bonds		
	(1)	(2)	(3)
High risk \times High need \times Domestic bank		0.070** (0.031)	0.071** (0.031)
High risk \times Domestic bank	0.079*** (0.020)	0.044* (0.027)	0.049** (0.026)
High need \times Domestic bank	0.008 (0.013)	-0.024 (0.021)	-0.027 (0.021)
Log (Assets)			-0.006 (0.025)
Deposits/Assets			-0.122* (0.083)
Loans/Deposits			-0.002 (0.007)
Capital/Assets			0.109 (0.150)
Bank fixed effects	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes
R-squared	0.18	0.18	0.18
No. banks	60	60	60
No. observations	2,484	2,484	2,484

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold sovereign bonds issued by the domestic government. The sample includes 46 domestic and 14 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is January 2009 – September 2012. The dependent variable is the ratio of the bank's net flow of sovereign bonds issued by the domestic government at time t to the bank's total holdings of sovereign bonds issued by the domestic sovereign at time $t-1$. 'High risk' is a dummy variable equal to 1 in all the months after the country's average CDS spread breaches permanently 300 basis points (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for Italy). 'High need' is a dummy variable equal to 1 if the amount of maturing domestic sovereign bonds 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. '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. Moral suasion: Mechanisms across domestic banks

Panel A. Distinguishing across political connections

<i>Bank type</i>	Δ Domestic sovereign bonds				
	<i>State-owned (dummy)</i>	<i>State-owned (continuous)</i>	<i>Supported</i>	<i>Affiliation of executive board</i>	<i>Affiliation of supervisory board</i>
	(1)	(2)	(3)	(4)	(5)
High risk \times High need \times <i>Bank type</i>	-0.035 (0.027)	-0.079 (0.053)	0.065* (0.037)	-0.146 (0.086)	-0.063 (0.042)
High risk \times <i>Bank type</i>	0.034 (0.022)	0.059 (0.041)	-0.057** (0.026)	0.095** (0.042)	0.062 (0.109)
High need \times <i>Bank type</i>	0.040** (0.018)	0.082** (0.031)	-0.017 (0.024)	0.071 (0.073)	-0.013 (0.111)
Bank controls	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.22	0.22	0.22	0.14	0.13
No. banks	46	46	46	18	18
No. observations	1,961	1,961	1,961	715	715

Panel B. Distinguishing across bank health

<i>Bank characteristic</i>	Δ Domestic sovereign bonds						
	<i>Low Log Assets</i>	<i>Low Tier 1/Assets</i>	<i>Low Tier 1+2/Assets</i>	<i>Low Liquid assets/Assets</i>	<i>High Loans/Deposits</i>	<i>High NPLs/Assets</i>	<i>High Domestic sovereign bonds/Assets</i>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
High risk \times High need \times <i>Bank char.</i>	0.066** (0.026)	0.072** (0.034)	0.049* (0.034)	0.055* (0.034)	-0.027 (0.038)	-0.016 (0.032)	0.042 (0.036)
High risk \times <i>Bank characteristic</i>	-0.014 (0.023)	-0.058** (0.027)	-0.045* (0.024)	-0.034 (0.024)	0.026 (0.027)	0.037 (0.027)	-0.075** (0.030)
High need \times <i>Bank characteristic</i>	-0.048*** (0.017)	-0.055** (0.021)	-0.025 (0.023)	-0.039* (0.023)	0.032 (0.024)	0.003 (0.020)	-0.009 (0.023)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.22	0.22	0.22	0.22	0.22	0.22	0.22
No. banks	46	46	46	46	46	46	46
No. observations	1,916	1,916	1,916	1,916	1,916	1,916	1,916

Panel C. Horse race

	Δ Domestic sovereign bonds				
	(1)	(2)	(3)	(4)	(5)
High risk \times High need \times Supported	0.075** (0.034)	0.047 (0.037)	0.055* (0.037)	0.065* (0.035)	0.062* (0.038)
High risk \times High need \times Low Log Assets	0.077*** (0.027)				0.054* (0.032)
High risk \times High need \times Low Tier 1/Assets		0.063* (0.036)			0.043 (0.033)
High risk \times High need \times Low Tier 1+2/Assets			0.039 (0.035)		0.007 (0.037)
High risk \times High need \times Low Liquid assets/Assets				0.057* (0.033)	0.028 (0.036)
Bank controls	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.22	0.22	0.22	0.22	0.22
No. banks	46	46	46	46	46
No. observations	1,916	1,916	1,916	1,916	1,916

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold sovereign bonds issued by the domestic government. The sample includes 46 domestic banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is January 2009 – September 2012. 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 risk’ is a dummy variable equal to 1 in all the months after the country’s average CDS spread breaches permanently 300 basis points (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for Italy). ‘High need’ is a dummy variable equal to 1 if the amount of maturing domestic sovereign bonds in a particular month is above the country-specific median for the sample period. In Panel A, ‘Bank type’ is a dummy variable equal to 1 if the bank is state-owned (Column (1)); the share of bank equity held by the government or by public entities (Column (2)); a dummy equal to 1 if the bank received government support during the financial crisis of 2008–09 (Column (3)); the share of the bank’s executive board that is politically affiliated with the federal government (Column (4)); and the share of the bank’s supervisory board that is politically affiliated with the federal government (Column (5)). In Panel B, ‘Bank type’ is a dummy variable equal to 1 if in 2009, the bank had below-sample-median assets (Column (1)); a below-sample-median ratio of Tier 1 capital to total assets (Column (2)); a below-sample-median ratio of Tier 1+Tier 2 capital to total assets (Column (3)); a below-sample-median ratio of liquid assets to total assets (Column (4)); an above-sample-median ratio of loans to deposits (Column (5)); an above-sample-median ratio of non-performing loans to total assets (Column (6)); and an above-sample-median ratio of domestic sovereign securities to total assets (Column (7)). All regressions include the rest of the 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. Moral suasion: Falsification tests

	Δ Foreign sovereign	Δ Private securities	Δ Domestic sovereign
	bonds		bonds, Germany
	(1)	(2)	(3)
High risk \times High need \times Domestic bank	0.004 (0.030)	-0.020 (0.033)	0.003 (0.032)
High risk \times Domestic bank	0.012 (0.030)	-0.014 (0.013)	-0.021* (0.011)
High need \times Domestic bank	-0.001 (0.021)	0.017 (0.020)	-0.004 (0.033)
Bank controls	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes
R-squared	0.22	0.20	0.08
No. banks	47	60	45
No. observations	1,662	2,462	1,894

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 38 domestic and 9 foreign banks (column (1)) and 46 domestic and 14 foreign banks (column (2)) in Greece, Ireland, Italy, Portugal, and Spain, and 38 domestic and 7 foreign banks in Germany (column (3)). The sample period is January 2009 – September 2012. The dependent variable is the ratio of the bank's net flow of sovereign bonds issued by foreign governments at time t to the bank's total holdings of sovereign bonds issued by foreign governments at time $t-1$ (column (1)), the ratio of the bank's net flow of securities issued by the private sector at time t to the bank's total stock of securities issued by the private sector at time $t-1$ (column (2)), and the bank's net flow of sovereign bonds issued by the domestic government at time t to the bank's total holdings of sovereign bonds issued by the domestic government at time $t-1$ (column (3)). 'High risk' is a dummy variable equal to 1 in all the months after the country's average CDS spread breaches permanently 300 basis points (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for Italy), or after May 2010 for Germany. 'High need' is a dummy variable equal to 1 if the amount of maturing domestic sovereign bonds 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. All regressions include the rest of the 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. Moral suasion: Alternative channels

	Δ Domestic sovereign bonds					
	Balance sheet shocks	Bank risk	Sovereign risk	Business sentiment	Primary dealers	Foreign banks' suasion
	(1)	(2)	(3)	(4)	(5)	(6)
High risk \times High need \times Domestic bank	0.070** (0.031)	0.062** (0.032)	0.070** (0.031)	0.065** (0.033)	0.073** (0.032)	
High risk \times Domestic bank	0.128 (0.117)	0.067** (0.032)	0.424*** (0.142)	0.063*** (0.024)	0.041* (0.025)	
High need \times Domestic bank	-0.031 (0.022)	-0.034* (0.018)	-0.031 (0.021)	-0.027 (0.022)	-0.029 (0.023)	
High risk \times Log (Assets) \times Domestic bank	-0.015* (0.008)					
High risk \times Deposits/Assets \times Domestic bank	0.069 (0.055)					
High risk \times Loans/Deposits \times Domestic bank	0.022*** (0.005)					
High risk \times Capital/Assets \times Domestic bank	0.381* (0.236)					
Log (Assets) \times Domestic bank	0.036 (0.077)					
Deposits/Assets \times Domestic bank	-0.043 (0.165)					
Loans/Deposits \times Domestic bank	0.007 (0.014)					
Capital/Assets \times Domestic bank	-0.584** (0.261)					
Bank CDS \times Domestic bank		-0.001 (0.001)				
Bank CDS		0.001 (0.001)				
High risk \times 10-year bond yield spread \times Domestic bank			-0.077*** (0.029)			
10-year bond yield spread \times Domestic bank			0.075*** (0.029)			
High risk \times Δ Business sentiment index \times Domestic bank				0.289*** (0.083)		

Δ Business sentiment index \times Domestic bank						-0.198*** (0.053)	
High risk \times High need \times Primary dealer						0.018 (0.027)	
High need \times Primary dealer						-0.010 (0.021)	
High risk \times Primary dealer						-0.055** (0.021)	
High risk \times High need							-0.017 (0.026)
High risk							-0.073*** (0.022)
High need							-0.008 (0.017)
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.19	0.23	0.19	0.18	0.19	0.09	
No. banks	60	60	60	60	60	14	
No. observations	2,484	1,753	2,484	2,155	2,484	567	

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold sovereign bonds issued by the domestic government. The sample includes 46 domestic and 14 foreign banks (columns (1)–(5)) and 14 foreign banks (column (6)) in Greece, Ireland, Italy, Portugal, and Spain. The sample period is January 2009 – September 2012. 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 risk’ is a dummy variable equal to 1 in all the months after the country’s average CDS spread breaches permanently 300 basis points (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for Italy). ‘High need’ is a dummy variable equal to 1 if the amount of maturing domestic sovereign bonds 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. ‘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. ‘Bank CDS’ is the bank’s own CDS spread. All bank controls are 1-year lagged. ‘10-year bond yield spread’ is the spread on a 10-year domestic sovereign bond. ‘ Δ Business sentiment index’ denotes the month-on-month change in the country’s indicator of business sentiment reported by the European Commission. ‘Primary dealer’ is a dummy variable equal to 1 if the bank is certified by the government to participate in government bond auctions. 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. Moral suasion: Robust high risk

	Δ Domestic sovereign bonds				
	Bond yield ≥ 500 bp	First time CDS ≥ 300 bp	Log (Average monthly CDS)	SMP dates	High risk after September 2010
	(1)	(2)	(3)	(4)	(5)
High risk \times High need \times Domestic bank	0.070* (0.041)	0.086** (0.040)	0.028** (0.015)	0.058* (0.035)	0.067* (0.045)
High risk \times Domestic bank	0.034 (0.031)	0.031 (0.031)	0.021* (0.013)	0.051** (0.026)	0.020 (0.034)
High need \times Domestic bank	-0.031 (0.027)	-0.037 (0.026)	-0.033 (0.033)	-0.024 (0.022)	-0.031 (0.031)
Bank controls	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.18	0.18	0.19	0.18	0.18
No. banks	60	60	60	60	60
No. observations	2,484	2,484	2,484	2,484	2,484

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold sovereign bonds issued by the domestic government. The sample includes 46 domestic and 14 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is January 2009 – September 2012. 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 risk' is a dummy variable equal to 1 in all the months after the average monthly yield on a 10-year sovereign bond breaches permanently 500 basis points (i.e., February 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, July 2011 for Spain, and August 2011 for Italy) in column (1); a dummy variable equal to 1 in each month after the monthly CDS spread on a 10-year sovereign bond breaches 300 basis points for the first time (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, December 2010 for Spain, and August 2011 for Italy) in column (2); the average monthly CDS spread in column (3); a dummy variable equal to 1 after the activation of the ECB's Securities Markets Program (i.e., May 2010 for Greece, Ireland, and Portugal, and July 2011 for Italy and Spain) in column (4); and a dummy equal to 1 after September 2010 in column (5). 'High need' is a dummy variable equal to 1 if the amount of maturing domestic sovereign bonds 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. All regressions include the rest of the 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. Moral suasion: Robust high government need

	Δ Domestic sovereign bonds			
	Long-term maturing debt	75% cut-off	Auctioned debt	Share maturing debt
	(1)	(2)	(3)	(4)
High risk \times High need \times Domestic bank	0.062** (0.031)	0.048* (0.028)	0.051* (0.031)	0.810*** (0.308)
High risk \times Domestic bank	0.061*** (0.023)	0.070*** (0.025)	0.074** (0.029)	0.015 (0.038)
High need \times Domestic bank	-0.031 (0.033)	-0.006 (0.022)	0.021 (0.026)	-0.707** (0.300)
Bank controls	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes	Yes
R-squared	0.18	0.18	0.18	0.19
No. banks	60	60	60	60
No. observations	2,484	2,484	2,484	2,484

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold sovereign bonds issued by the domestic government. The sample includes 46 domestic and 14 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is January 2009 – September 2012. 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 risk' is a dummy variable equal to 1 in all the months after the country's average CDS spread breaches permanently 300 basis points (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for Italy). 'High need' is a dummy variable equal to 1 if the amount of maturing sovereign bonds issued by the domestic government with maturity of more than 5 years in a particular month is above the country-specific median for the sample period in 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 in column (2); 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 in column (3); and the share of maturing debt out of all debt maturing during the current calendar year in column (4). 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned. All regressions include the rest of the 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. Moral suasion: Robust sample

	Δ Domestic sovereign bonds				
	Excluding	Excluding	Excluding	Excluding	Matched
	Greece	Ireland	no-auction months	LTRO months	sample
	(1)	(2)	(3)	(4)	(5)
High risk \times High need \times Domestic bank	0.060* (0.034)	0.062** (0.032)	0.070** (0.032)	0.094** (0.040)	0.071** (0.031)
High risk \times Domestic bank	0.062** (0.029)	0.077 (0.026)	0.061** (0.027)	0.032 (0.029)	0.062** (0.026)
High need \times Domestic bank	-0.021 (0.023)	-0.028 (0.022)	-0.025 (0.022)	-0.030 (0.022)	-0.031 (0.022)
Bank controls	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.18	0.18	0.18	0.18	0.21
No. banks	55	52	60	60	47
No. observations	2,260	2,155	2,338	2,373	1,831

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold sovereign bonds issued by the domestic government. The sample includes 46 domestic and 14 foreign banks in Greece, Ireland, Italy, Portugal, and Spain, unless otherwise specified. The sample period is January 2009 – September 2012. 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 risk' is a dummy variable equal to 1 in all the months after the country's average CDS spread breaches permanently 300 basis points (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for Italy). 'High need' is a dummy variable equal to 1 if the amount of maturing domestic sovereign bonds 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. In column (1), all banks from Greece are excluded. In column (2), all banks from Ireland are excluded. In column (3), all country-months with no sovereign bond auctions are excluded. In column (4), the month of the ECB's first 3-year LTRO (December 2011) and the month of the ECB's second 3-year LTRO (March 2012) are excluded. In column (5), the sample is chosen based on a Propensity Score Matching procedure using pre-crisis values of 'Log (Assets)' and 'Deposits/Assets'. All regressions include the rest of the 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 11. Moral suasion: Crowding out of lending to the real sector

Panel A. Loans to households and to NFCs: Quantities				
	Δ Loans to households	Δ Loans to NFCs, $\leq 1y$	Δ Loans to NFCs, $> 1y$	
	(1)	(2)	(3)	
High risk \times High need \times Domestic bank	-0.014* (0.009)	-0.000 (0.015)	-0.064 (0.064)	
High risk \times Domestic bank	0.005 (0.006)	-0.001 (0.010)	0.061 (0.057)	
High need \times Domestic bank	0.002 (0.003)	0.023 (0.023)	0.089 (0.091)	
Bank controls	Yes	Yes	Yes	
Bank fixed effects	Yes	Yes	Yes	
Country \times Month fixed effects	Yes	Yes	Yes	
R-squared	0.14	0.13	0.14	
No. banks	59	59	59	
No. observations	2,111	2,083	2,141	
Panel B. Loans to households and to NFCs: Rates				
	Household loans: Consumption	Household loans: Mortgages	NFC loans: $\leq 1y$	NFC loans: $> 1y$
	(1)	(2)	(3)	(4)
High risk \times High need \times Domestic bank	0.433 (0.319)	0.308* (0.201)	-0.522** (0.228)	0.361 (0.420)
High risk \times Domestic bank	0.119 (0.639)	-0.152 (0.277)	0.795*** (0.278)	1.236*** (0.285)
High need \times Domestic bank	-0.351 (0.385)	0.013 (0.056)	0.057 (0.147)	0.018 (0.139)
Bank controls	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Country \times Month fixed effects	Yes	Yes	Yes	Yes
R-squared	0.78	0.84	0.83	0.75
No. banks	59	59	59	59
No. observations	1,947	1,947	1,947	1,947

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 46 domestic and 14 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is January 2009 – September 2012. The dependent

variable is the ratio of the loans issued by the bank to households at time $t+1$ to the stock of the bank's total loans to households at time t (column (1) of Panel A); the ratio of the loans with maturity of less than 1 year issued by the bank to non-financial corporations at time $t+1$ to the stock of the bank's total loans with maturity of less than 1 year to non-financial corporations at time t (column (2) of Panel A); the ratio of the loans with maturity of more than 1 year issued by the bank to non-financial corporations at time $t+1$ to the stock of the bank's total loans with maturity of more than 1 year to non-financial corporations at time t (column (3) of Panel A); the average rate on consumption loans issued by the bank to households at time $t+1$ (column (1) of Panel B); the average rate on mortgage loans issued by the bank to households at time $t+1$ (column (2) of Panel B); the average rate on the loans with maturity of less than one year issued by the bank to NFCs at time $t+1$ (column (3) of Panel B); and the average rate on the loans with maturity of more than one year issued by the bank to NFCs at time $t+1$ (column (4) of Panel B). 'High risk' is a dummy variable equal to 1 in all the months after the country's average CDS spread breaches permanently 300 basis points (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for Italy). 'High need' is a dummy variable equal to 1 if the amount of maturing domestic sovereign bonds 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. All regressions include the rest of the bank-specific variables from Table 4, as well as fixed effects as specified. In addition they include $\text{High risk} \times \Delta \text{ Business sentiment index} \times \text{Domestic bank}$ and $\Delta \text{ Business sentiment index} \times \text{Domestic bank}$ where ' $\Delta \text{ Business sentiment index}$ ' denotes the month-on-month change in the country's indicator of business sentiment reported by the European Commission. 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 12. Moral suasion: Duration analysis

	Δ Domestic sovereign bonds
High risk \times High need \times Domestic bank	0.056** (0.031)
High risk \times Domestic bank	0.052** (0.024)
High need \times Domestic bank	-0.009 (0.022)
Post-OMT \times High need \times Domestic bank	-0.010 (0.026)
Post-OMT \times Domestic banks	0.032 (0.030)
Bank controls	Yes
Bank fixed effects	Yes
Country \times Month fixed effects	Yes
R-squared	0.18
No. banks	60
No. observations	2,999

Notes: This table presents difference-in-differences estimates of the propensity of banks to hold sovereign bonds issued by the domestic government. The sample includes 46 domestic and 14 foreign banks in Greece, Ireland, Italy, Portugal, and Spain. The sample period is January 2009 – June 2013. 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 risk' is a dummy variable equal to 1 in all the months after the country's average CDS spread breaches permanently 300 basis points (i.e., January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for in Italy). 'High need' is a dummy variable equal to 1 if the amount of maturing domestic sovereign bonds in a particular month is above the country-specific median for the sample period. 'Post-OMT' is a dummy variable equal to 1 after September 2012. 'Domestic bank' is a dummy variable equal to 1 if the bank is domestically-owned. All regressions include the rest of the 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.

Appendix Table 1. Number of banks, per country

	# banks	# domestic banks	# foreign banks
Greece	5	3	2
Ireland	8	4	4
Italy	21	18	3
Portugal	5	3	2
Spain	21	18	3
Total	60	46	14

Notes: This table lists the number of banks in the dataset, by country.

Appendix Table 2. Variables: Definitions and sources

Variable	Definition	Source
<i>Bank-level variables, all banks</i>		
Domestic bank	Dummy variable equal to 1 if the bank is domestically-owned, and to 0 otherwise.	CvH
Δ Domestic sovereign bonds	The ratio of the bank's net flow of sovereign bonds issued by the domestic government at time t to the bank's total holdings of sovereign bonds issued by the domestic government at time t-1.	IBSI
Δ Foreign sovereign bonds	The ratio of the bank's net flow of sovereign bonds issued by foreign governments at time t to the bank's total holdings of sovereign bonds issued by foreign governments at time t-1.	IBSI
Δ Private securities	The ratio of the bank's net flow of securities issued by the private sector at time t to the bank's total holdings of securities issued by the private sector at time t-1.	IBSI
Δ Loans to households	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.	IBSI
Δ Loans to NFCs \leq 1y	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.	IBSI
Δ Loans to NFCs $>$ 1y	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.	IBSI
Average rate on consumption loans to households	The average rate on consumption loans issued by the bank to households.	IMIR
Average rate on mortgage loans to households	The average rate on mortgage loans issued by the bank to households.	IMIR
Average rate on loans to NFCs \leq 1y	The average rate on the loans with maturity of less than one year issued by the bank to NFCs.	IMIR
Average rate on loans to NFCs $>$ 1y	The average rate on the loans with maturity of more than one year issued by the bank to NFCs.	IMIR
Assets (mln.)	The bank's total assets, in mln. euro.	IBSI
Deposit/Assets	The ratio of the bank's total deposits to total assets.	IBSI
Loans/Deposits	The ratio of the bank's total loans issued to total assets.	IBSI
Capital/Assets	The ratio of the bank's equity to total assets.	IBSI
Domestic sovereign bonds/Assets	The ratio of the bank's holdings of sovereign bonds issued by the domestic government to total assets.	IBSI
Bank CDS	The bank's CDS spread	Bloomberg
<i>Bank-level variables, domestic banks</i>		
State-owned	Dummy variable equal to 1 if a domestic bank is state-owned, and to 0 otherwise.	CvH
Supported	Dummy variable equal to 1 if a domestic bank received government support during the financial crisis, and to 0 otherwise.	CvH
State-owned or supported	Dummy variable equal to 1 if a domestic bank is state-owned or received government support during the financial crisis, and to 0 otherwise.	CvH

Share affiliated executive board	The share of the executive board of a domestic bank that is politically affiliated with the federal government.	Boardex
Share affiliated supervisory board	The share of the supervisory board of a domestic bank that is politically affiliated with the federal government.	Boardex
Primary dealer	Dummy variable equal to 1 if a bank is a designated primary dealer in government bond auctions, and to 0 otherwise.	MFs, EPDH
Log Assets (2009)	Logarithm of the bank's total assets in 2009.	Bankscope
Tier 1/Assets (2009)	The ratio of the bank's Tier 1 capital to total assets in 2009.	Bankscope
Tier 1+2/Assets (2009)	The ratio of the bank's Tier 1 and Tier 2 capital to total assets in 2009.	Bankscope
Liquid assets/Assets (2009)	The ratio of the bank's liquid assets to total assets in 2009.	Bankscope
Loans/Deposits (2009)	The ratio of the bank's loans to deposits in 2009.	Bankscope
NPLs/Assets (2009)	The ratio of the bank's non-performing loans to assets in 2009.	Bankscope
Domestic sovereign bonds/Assets (2009)	The ratio of the bank's holdings of sovereign bonds issued by the domestic government to total assets in 2009.	IBSI

Country-level variables

Sovereign CDS spread	The CDS spread on the country's 10-year sovereign bonds in a month.	Bloomberg
Δ Business sentiment index	The month-on-month change in the country's indicator of business sentiment reported by the European Commission.	EC
Maturing debt (mln.)	The amount of existing government debt that is maturing in a month.	CSDB
Auctioned debt (mln.)	The amount of newly issued government debt in a month.	CSDB
10-year bond yield spread	The difference between the yield on a 10-year spread in a particular country and the yield on a German Bund in a month.	Bloomberg

Notes: 'CvH' is Claessens and van Horen (2015). 'IBSI' is the ECB's Individual Balance Sheet Statistics Dataset. 'MFs' is Ministries of Finance. 'EPDH' is the European Primary Dealers Handbook. 'EC' is the European Commission. 'CSDB' is the ECB's Centralized Securities Database.

Appendix Table 3. Sovereign risk: High- versus low-need months

Variable	Full sample period			High-risk sample period		
	Low-need months	High-need months	Difference	Low-need months	High-need months	Difference
Panel A. Average CDS spread	953.704	1,113.680	-159.995	1,659.596	2,063.407	-403.811
Greece	3,294.839	4,079.131	-784.293	5,450.361	4,668.544	781.817
Ireland	613.527	264.199	349.328***	645.189	589.312	55.887
Italy	266.974	216.244	50.731	470.822	418.873	51.950*
Portugal	440.616	623.407	-182.791	711.496	811.161	-99.665
Spain	224.494	291.412	-66.917*	431.216	433.090	-1.874
Panel B. Average bond yield	7.466	7.800	-0.334	10.123	11.026	-0.903
Greece	13.095	15.586	-2.490	18.594	17.155	1.439
Ireland	7.928	5.450	2.478***	8.194	7.450	0.744
Italy	4.924	4.567	0.357*	6.015	5.483	0.532*
Portugal	6.894	8.121	-1.227	8.987	9.565	-0.578
Spain	4.626	5.070	-0.445*	5.726	5.865	-0.139

Notes: This table presents difference-in-differences estimate from a Mann-Whitney two-sided *t*-test, high- versus low-need months. Mean values are calculated over a sample period which starts in January 2009 for all countries and ends in September 2012 (columns 91)–(3)), and over a sample period that starts in January 2010 for Greece, May 2010 for Portugal, September 2010 for Ireland, August 2011 for Spain, and September 2011 for Italy, and ends in September 2012 for all countries (columns (4)–(6)). *** indicates significance at the 1% level, and ** at the 5% level.