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Domestic banks as lightning rods? Home bias during the Eurozone crisis

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Abstract

Governments and domestic banks in Europe have attracted criticism due to the heightening inclination of banks to hold more local sovereign debt in the midst of the crisis. This has traditionally been interpreted as an evidence of financial repression or moral suasion. By using a novel dataset on bank-level exposures to sovereign and private debt covering the entire Eurozone crisis, I confirm that sovereign debt has been reallocated from foreign to domestic banks at the peak of the crisis. Furthermore, this reallocation has been especially visible for banks as opposed to other domestic private agents and cannot be explained by the risk-shifting tendency of the banks located in troubled countries. However, in contrast to the previous literature focusing only on sovereign debt, I show that banks' private sector exposures have suffered (at least) equally from a rising home bias. Finally, I present a direct information channel and demonstrate that foreign banks – free from moral suasion – located in informationally closer territories have relatively increased their exposures to crisis-countries.

Keywords: Home bias, Information asymmetries, Eurozone crisis, Sovereign debt

JEL Classification: F21, F34, F36, G01, G11, G21

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Domestic banks as lightning rods? Home bias during the Eurozone crisis

> *'The same personal and professional ties that may allow sovereigns to apply moral suasion on domestic banks might also give domestic bankers better information about the likelihood of sovereign default or repayment.'*
>
> Ethan Ilzetzki, in Economic Policy Discussion Panel (2014)

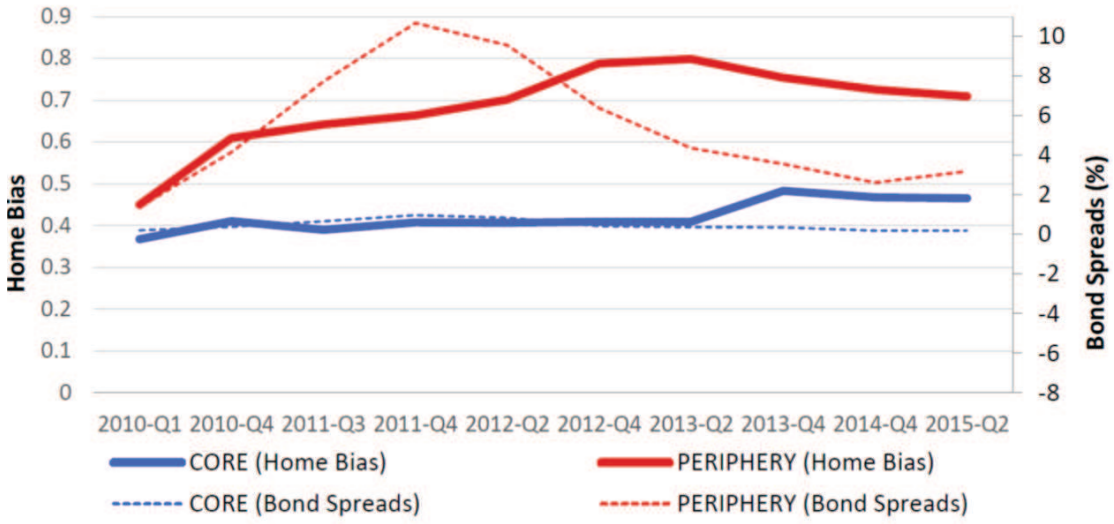
1. Introduction

Can domestic banks act as lightning rods in the midst of a stormy financial climate? On the contrary, by now the deathly loop between sovereign and bank credit risks has been well documented, especially in the context of the recent Eurozone crises. Increasing risk pressures in the banking sector put unnecessary burdens on public finances due to potential future bailout costs and negative spillovers to the lending in the real economy. In turn, a spike in the sovereign credit risk might trigger a deterioration in bank finances through losses on banks' government bond holdings and the loss of credibility for future government support (Acharya, Drechsler, and Schnabl, 2014). Many studies have already pointed out that European banks' relatively high exposure to sovereign debt has led them to decrease the loan supply in their respective territories, thus transferring the financial turmoil to the real economy (Acharya, Eisert, Eufinger, and Hirsch, 2016a; Altavilla, Pagano, and Simonelli, 2016; Popov and Van Horen, 2015).

One of the most interesting observations, however, was the banks' escalating home bias for sovereign debt, especially in crisis countries. That is, at the peak

of the government debt problems, banks started accumulating local government bonds. Figure 1 illustrates the initial rise and the gradual reversal

Figure 1
Home bias in core and periphery Euro countries during crisis.

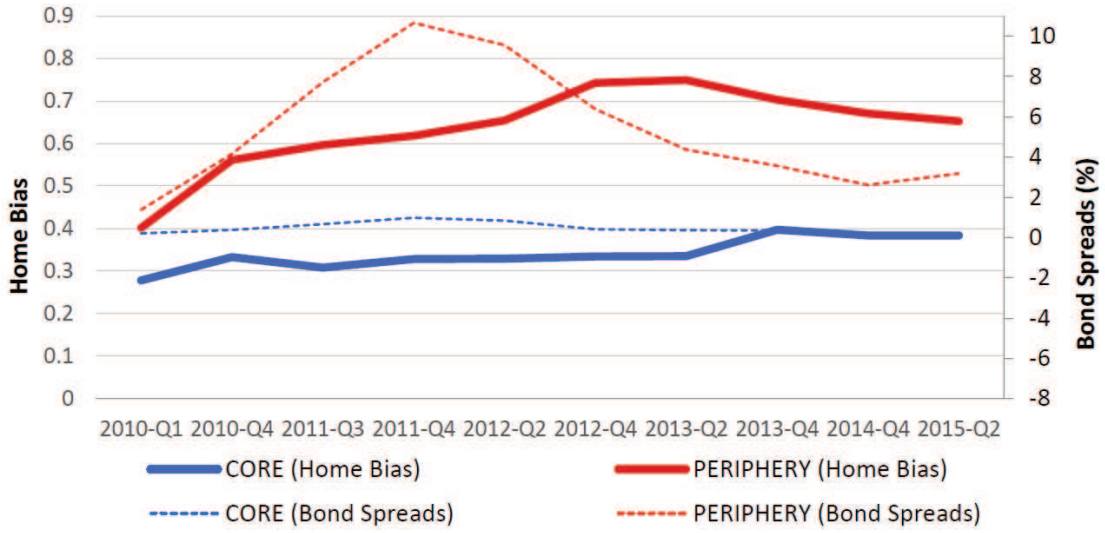


The graph shows simple country averages of home bias and bond spreads for each country group. Home Bias is defined as the portion of the total sovereign debt of a country held by its domestic banks. Bond Spreads are computed as the average daily bond spreads for a country (with respect to Germany) over the 3-month period before each observation date. Sovereign bond exposure data come from various stress-tests, transparency and recapitalization exercises undertaken by the European Banking Authority (EBA) and include 10 observation dates from 2010-Quarter1 to 2015-Quarter2 (see Table 1). Bond yields are obtained from Datastream. Core (non-crisis) countries: Austria, Belgium, Finland, France, Germany and Netherlands. Periphery (crisis) countries: Greece, Ireland, Italy, Portugal, Spain.

of this trend – alongside with the respective bond spreads – in the Eurozone periphery. In contrast, the corresponding bias in core Eurozone countries seems to have been more or less stable throughout the crisis. Intriguingly, the observation still stands in Figure 2 even after correcting for how much of the

domestic debt the banks should hold in a standard Capital Asset Pricing Model (CAPM).[1]

Figure 2
Home bias (CAPM-adjusted) in core and periphery
Eurozone countries during crisis



The graph shows simple country averages of home bias and bond spreads for each country group. Home Bias is defined as the portion of the total sovereign debt of a country held by its domestic banks, after taking into account the portfolio size of these domestic banks according to a standard portfolio (CAPM) model (see Data Description). Bond Spreads are computed as the average daily bond spreads for a country (with respect to Germany) over the 3-month period before each observation date. Sovereign bond exposure data come from various stress-tests, transparency and recapitalization exercises undertaken by the EBA and include 10 observation dates from 2010-Quarter1 to 2015-Quarter2 (see Table 1). Bond yields are obtained from Datastream. Core (non-crisis) countries: Austria, Belgium, Finland, France, Germany and Netherlands. Periphery (crisis) countries: Greece, Ireland, Italy, Portugal, Spain.

With the dismal interaction between sovereign and banking crises in the background, most of the recent literature attributed this observation to the argument of financial repression/moral suasion (Becker and Ivashina, 2014; De Marco and Macchiavelli, 2016; Ongena, Popov, and Van Horen, 2016). In other

[1] As discussed later in the Data section, a simple asset pricing model would predict that banks must hold sovereign debt in proportion to the relative weight of their sovereign portfolio in the universe of total sovereign bond holdings.

words, in order to gain relief from the crisis and to be able to rollover their debts, governments may have (implicitly) forced the banks in their jurisdiction to increase domestic sovereign exposures. Pointing to the highly positive correlations between government-relatedness[2] and public bond holdings of the banks, these papers argue that there has been a clear tendency of troubled governments to impose moral suasion on the banks that they can control. From this perspective, the resulting home bias has been mostly involuntary for domestic banks and created an unnecessary burden on the financial health of the banking sectors in crisis countries.

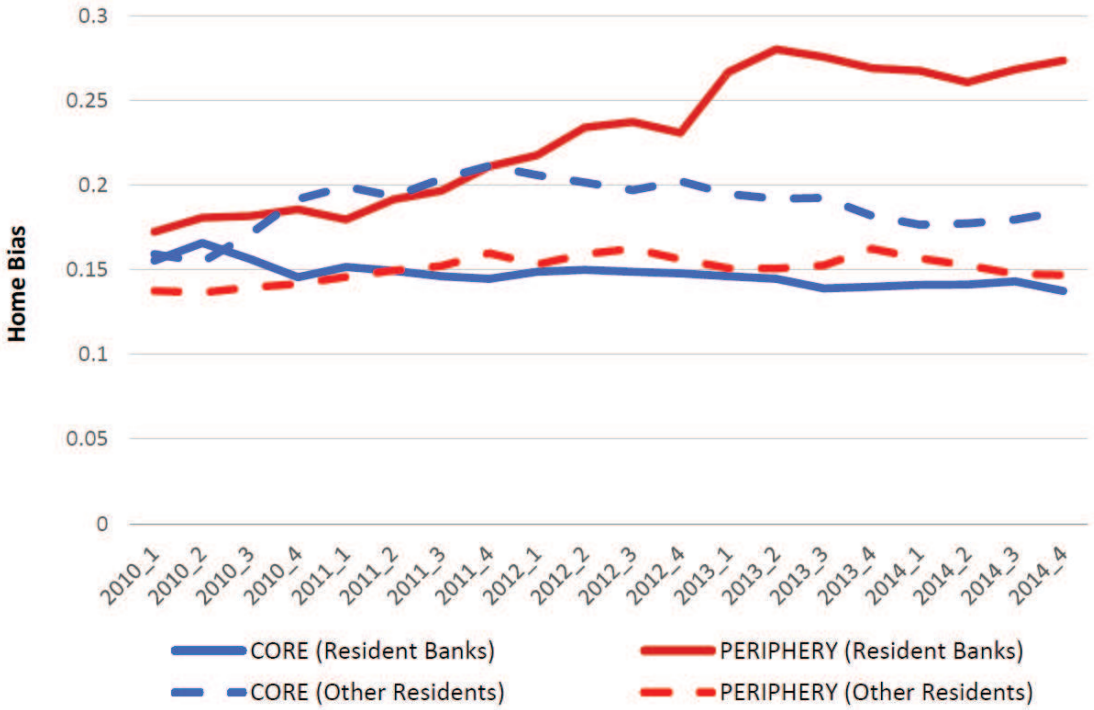
Another competing argument for the repatriation of public debt from non-crisis to crisis countries is based on the assumption that governments would be less willing to default if their debt was held by domestic rather than foreign agents due to the costs such a default would inflict on the domestic economy (Broner, Martin, and Ventura, 2010; Gennaioli, Martin, and Rossi, 2014b). Hence, in the existence of well-functioning secondary markets, sovereign debt should naturally be reallocated back to host countries as domestic agents will attach a higher value to these securities than their foreign counterparts. According to this view, the resulting home bias has been a dark side-effect of secondary bond markets and might even have benefited the creditors if it eventually decreased governments' willingness to default. With respect to this argument, Figure 3 illustrates the evolution of the home bias for different types of domestic agents in periphery and core Euro countries. Although it is clear that resident banks in the periphery accumulated a big portion of domestic debt, this is hardly true for other residents in the same countries, which goes

[2] Either through direct government ownership of the bank or political links in the board of directors.

against the intuition of Broner et al. (2010) and asks for a further link between resident banks and government debt.

In this paper, I propose an alternative channel and show that European banks' increasing sovereign home bias in crisis countries is not so surprising if one takes into account one of the most conventional (albeit lately forgotten) theories of the home bias in asset markets: informational frictions (Brennan and Cao, 1997; Van Nieuwerburgh and Veldkamp, 2009; Dziuda and Mondria, 2012). As is true for most asset classes, home bias usually exists when there is an informational advantage in favour of domestic agents. In tranquil periods and well-integrated markets such as in Europe, one would not expect to observe a high level of home bias. Nonetheless, in crisis episodes during which domestic agents are likely to gain an informational advantage over their foreign peers, one would expect the home bias to rise since foreign agents would be more likely to react negatively to bad news (Brennan, Cao, Strong, and Xu, 2005). This is especially true if the crisis episodes are associated with large scale market panic as illustrated by recent studies of the Eurozone (De Grauwe and Ji, 2013; Saka, Fuertes, and Kalotychou, 2015). If this view is correct, one would expect to see sovereign debt to be reallocated especially to local banks rather than other domestic agents due to the strong informational linkages between banks and governments. In fact, if the information channel was operational, it is expected that the reallocation would be concentrated on banks that were closely linked to the government. Hence, based on such empirical findings the conclusions of the above-mentioned studies arguing in favour of the moral suasion hypothesis might be biased in the absence of an explicit control for the information channel.

Figure 3
Home bias for resident banks and non-bank residents during crisis



The graph shows simple country averages of home bias separately for resident banks and nonbank residents of each country in the group (core vs. periphery). Home Bias is defined as the portion of the total sovereign debt of a country held by a particular resident group. Sovereign debt exposures come from the dataset compiled from various national sources by Merler and Pisani-Ferry (2012) and include quarterly observations from 2010-Quarter1 to 2014-Quarter4. Core (non-crisis) countries: Belgium, Finland, France, Germany and Netherlands. Periphery (crisis) countries: Greece, Ireland, Italy, Portugal, Spain. Data for Belgium and Finland can only be found annually; so these data are linearly interpolated in order to obtain quarterly values.

By taking a global portfolio approach and using a novel bank-level dataset compiled from various stress-tests, transparency and capital exercises of the European Banking Authority (EBA), I first show that European banks' home bias increased and sovereign debt was indeed reallocated from foreign to domestic banks at the peak of the crisis. Consistent with Acharya and Steffen (2015) and Crosignani (2015), I also find evidence of risk-shifting behaviour for banks located in crisis countries. However, it is also shown that home bias goes much beyond this behaviour. Interestingly, and in contrast with the secondary market theory of Broner et al. (2010), this reallocation does not seem to be visible at all for domestic agents other than banks. This is compatible with the

information asymmetry theory of home bias given the informational advantages that banks enjoy in comparison with other local agents in government debt markets. Additionally, I illustrate that, in response to the crisis, private forms of debt (retail and corporate) on bank balance sheets have experienced an equally large (if not larger) increase in home bias. This is in sharp contradiction to the moral suasion story unless one assumes that corporate/retail borrowers can somehow force the domestic banks to lend to them. On the other hand, this finding is exactly what one would expect from informationally more sensitive assets (such as private debt) if crisis episodes were associated with informational frictions. Finally, I present a direct information channel and demonstrate that foreign banks – free from moral suasion – headquartered in informationally closer territories have increased their relative exposures to troubled countries during the crisis.

Overall, the evidence presented in this paper is only compatible with the conventional theory of increasing informational asymmetries between domestic and foreign agents during crisis. Thus, answering the question in the beginning, it is possible that domestic banks may have acted as lightning rods collecting the sovereign debt while governments were suffering from informational frictions as foreign banks left the market in panic, triggering a financial storm.

The rest of the paper is organized as follows. The next section briefly outlines the relevant background literature. Section 3 describes the data. The empirical methodology and results are presented in section 4. The final section concludes.

2. The related literature

2.1 Recent home bias in the Eurozone

The main motivation of the paper comes from the recently aroused academic and policy interest in the causes of rising fragmentation – home bias – across Eurozone sovereign debt markets. One of the earlier contributions by Becker and Ivashina (2014) illustrates the positive association between country-level government ownership in the banking sector and domestic government bond holdings of the banks. They further extend this finding by showing the significance of the positive relationship between government-relatedness of the banks' board members and government bond holdings in crisis-country banks. De Marco and Macchiavelli (2016) follow a similar path to point out that, upon receiving liquidity injections, only politically-related European banks increased their exposure to domestic sovereign debt. Using a proprietary bank-level dataset from the European Central Bank (ECB), Ongena et al. (2016) demonstrate that, compared to foreign ones, domestic banks were more inclined to increase their exposures when governments had to rollover large chunks of outstanding public debt. Many other recent papers confirm these observations (Horváth, Huizinga, and Ioannidou, 2015; Altavilla et al., 2016) and conclude that a moral suasion channel was in operation during the Eurozone crisis.[3] Nonetheless, none of these studies take into account the possible information channel that might have been active between governments and related banks. I contribute to this literature first by presenting evidence on the equally rising home bias for asset classes other than sovereign

[3] These findings are not always consistent though. For example, using the same source of data as in Ongena et al. (2016), Altavilla et al. (2016) find evidence for moral suasion also in core Euro countries, which ex-post is hard to reconcile with the observation that these countries did not have any difficulty in rolling over their debts at the time.

debt and then by illustrating that the information channel was operational even in the sovereign exposures of foreign banks.

Another strand of the home bias literature specific to sovereign debt underlines the assumption that it is harder for governments to default on their promises when most of the debt is held domestically. In such a scenario, a government would rather choose not to default since the benefits could be offset by its harm to the domestic economy. Hence, in the local agents' expectation of this, government debt will flow back to the host country in times of crisis (Broner et al., 2010). Analysing a vast database covering 191 countries, Gennaioli, Martin, and Rossi (2014a) show empirical patterns consistent with this prediction although they cannot differentiate between domestic and foreign bonds at the bank-level. In a recent paper, Brutti and Sauré (2016) present confirming evidence in the context of the Eurozone crisis by demonstrating that reallocation was more intense for sovereign than private debt. Furthermore, the debt of the crisis governments tended toward those banks whose countries were politically more powerful in the Euro area, implying that debt reallocation was mainly driven to discourage the troubled governments from declaring bankruptcy. By using a dataset covering the entire Eurozone crisis episode for 30 European countries at the bank-level, I complement and challenge these findings: I find that the reallocation of sovereign debt did indeed occur during the Eurozone crisis. This, however, only holds for domestic banks, not other domestic agents, which goes against the earlier prediction of Broner et al. (2010). Furthermore, compared to government debt, retail and corporate debt on bank balance sheets suffered equally (if not more) from an increase in home bias in response to the crisis. This is hard to reconcile with the earlier finding

of Brutti and Sauré (2016) who only focus on the first part of the Eurozone crisis in their sample period with a limited coverage of European countries.[4]

A related literature focuses on the risk-shifting tendency of undercapitalized banks. According to this argument, banks with low capital ratios prefer high-risk instruments such as government bonds of crisis countries so that shareholders would benefit from a resurrection of the country while losses would be limited in case of a default. (Acharya and Steffen, 2015; Horváth et al., 2015). However, this argument does not necessarily explain why weak banks would especially risk-shift by accumulating domestic government bonds rather than the bonds of other governments struck by crisis. In line with Crosignani (2015), I find evidence that (potentially weak) banks located in crisis countries shift their sovereign portfolios more towards other countries in crisis, but this behaviour is found to be much more prominent when it is the domestic government that is in crisis. This indicates the need for a further investigation of the link between banks and domestic sovereign bond holdings.

2.2 Home bias in other markets

There is a massive literature on home bias in portfolio holdings of different asset classes. Most of this literature focuses on equity holdings (French and Poterba, 1991) whereas some recent studies look at the regional biases in international bond portfolios of various country groups (Lane, 2005). Previous studies mainly revolve around three broad categorical explanations for home bias: exchange rate risk, transaction costs in financial markets, and informational frictions (Coeurdacier and Rey, 2013). In the specific context of Europe, with the increasing financial integration and exchange rate stability

[4] Their sample period goes from 2007 to late 2011 and is mainly restricted to Eurozone countries with also some non-European countries such as Brazil and Mexico.

over the years, a more realistic culprit for the recently sky-rocketing home bias would be the informational asymmetries.

Brennan and Cao (1997), for example, model the sensitivity to asset-related news when there is a difference between the informational endowments of domestic and foreign agents. They illustrate that, in such a scenario, home bias would be positively associated with negative news as foreign investors would try to infer local information from past asset prices and react more to such news.[5] Along similar lines, Van Nieuwerburgh and Veldkamp (2009) show that, in the existence of (even initially small) informational differences between foreign and domestic agents, the costly information acquisition process may boost the agents' home bias. Lastly, Dziuda and Mondria (2012) demonstrate that, even in the existence of sophisticated investors such as investment funds, home bias may arise due to the fact that investors would be better at judging the performance of fund managers when they invest in local assets rather than foreign ones. Therefore, one might observe a home bias even in the portfolios of highly sophisticated institutions such as banks or mutual funds.

Following the intuition that informational frictions might lie behind the widely-observed home bias for various asset classes,[6] many researchers have empirically studied the effects of several forms of informational distance on portfolio holdings. For instance, Coval and Moskowitz (1999, 2001) find that geographical proximity is crucial for US investors' portfolio composition and the risk-adjusted returns, even within the same country. Grinblatt and Keloharju (2001) discover that investors might be biased towards firms that are

[5] Inspired by Brennan and Cao (1997), there is a stream of studies in the asset-pricing literature that detect the foreign investors' trend-following behaviour. See Choe, Kho and Stulz (1999; 2005); Grinblatt and Keloharju (2000); Froot, Oconnell, and Seasholes (2001); Kim and Wei (2002); Griffin, Nardari, and Stulz (2004); Richards (2005); Edison and Warnock (2008).
[6] For further evidence on the informational advantage that domestic investors may hold vis-à-vis foreign investors, see Kang and Stulz (1997) and Kaufmann, Mehrez, and Schmukler (2005).

close to them in terms of physical location, culture and language of communication. Hau (2001) exemplifies this with a case in which professional traders located in Germany or in German-speaking cities make more profit in German stocks. Finally, Portes and Rey (2005) conclude that geographical distance matters for cross-border capital flows. However, it mostly matters because it proxies the effects of other informational variables such as bank branches across countries or telephone call traffic. I contribute to this literature by demonstrating that informational proxies (such as geographical distance, bank branches and past merger announcements) have had a significant effect on European banks' sovereign portfolios during the Eurozone crisis.

3. Data description

The main body of data that I use in the paper comes from various stress-tests, transparency and recapitalization exercises that have been undertaken by the EBA over the course of 5 years for a large set of European banks covering 30 members of the European Economic Area (EEA). The first of these disclosures was undertaken by the Committee of European Banking Supervisors (CEBS), which was comprised of senior representatives of bank supervisory authorities and central banks of the European Union and later succeeded by the EBA. Its results were made public by national regulators at the time. However, the EBA does not provide the related data. Hence, this dataset was obtained from the Peterson Institute for International Economics while all other datasets were acquired from EBA.

Table 1 lists these exercises and the disclosure dates for each of them together with how many banks and which information dates were covered. The 10 data time-points start from the first quarter of 2010 and go all the way to the second

quarter of 2015, thus covering the start, the rise, and the fall of the Eurozone crisis. Sovereign bond holdings are reported for each data time-point while private credit exposures (corporate, retail, etc.) can be found for 6 of these. In each disclosure, the full country-breakdown of each bank's debt portfolio for up to 200 countries can be found.[7] However, to focus on the debt reallocation across Europe, only exposures to 30 EEA countries are included in the sample.

The main banks involved in the exercises mostly stay the same even though some smaller banks are added and subtracted from one exercise to another. All exposures are consolidated at the parent bank level and each exercise involves banks with at least 65% of the total banking assets in Europe and 50% of the banking sector of each EEA member. Some studies have already explored the sovereign bond holdings in the datasets of earlier EBA disclosures (De Marco and Macchiavelli, 2016; Horváth et al., 2015). However, to the best of my knowledge, this is the most comprehensive dataset compiled with all the sovereign and private debt exposures of European banks in all the tests undertaken and made public by the EBA until now. Compared to other studies using proprietary datasets from the ECB (Ongena et al., 2016; Altavilla et al., 2016), EBA data covers banks from a wider range of countries (including non-Eurozone) and documents finer granularity in terms of full country-breakdowns of sovereign exposures at bank-level.

[7] Except the first disclosure undertaken by CEBS in which only exposures to 30 European countries can be found.

Table 1
Data disclosure details from EBA.

Disclosure date	*Disclosure name*	*Information date*	*Number of banks covered*	*Type of credit disclosure*
23/07/2010	2010 EU-wide stress testing exercise (CEBS)	2010-Q1	91	Sovereign
15/07/2011	2011 EU-wide stress testing exercise (EBA)	2010-Q4	90	Sovereign & Private
08/12/2011	EU Capital exercise 2011 (EBA)	2011-Q3	65	Sovereign
03/10/2012	EU Capital exercise 2012 (EBA)	2011-Q4 & 2012-Q2	62	Sovereign
16/12/2013	2013 EU-wide transparency exercise (EBA)	2012-Q4 & 2013-Q2	64	Sovereign & Private
26/10/2014	2014 EU-wide stress testing exercise (EBA)	2013-Q4	123	Sovereign & Private
24/11/2015	2015 EU-wide transparency exercise (EBA)	2014-Q4 & 2015-Q2	105	Sovereign & Private

The table lists the disclosures of various exercise results as announced by the EBA. The 2010 EU-wide stress testing exercise was conducted by the CEBS and made public by national regulators. However, the EBA does not provide the related data. Hence, this dataset was obtained from the Peterson Institute for International Economics while all other datasets were acquired from EBA. Private credit refers to the corporate and retail credit exposure of the banks covered in the respective datasets. Information date refers to the data time-points in each disclosure for which the values of bank credit positions can be found.

I am mainly interested in what portion of a sovereign's total debt is held by a specific bank. Thus the main variable of interest ($SovereignPortion_{b,c,t}$) measures each bank's (b) nominal exposure to a certain country (c) at a certain time-point (t) divided by the total nominal exposure of all the banks for that country at that time. That is;

$$SovereignPortion_{b,c,t} = \frac{NominalExposure_{b,c,t}}{\sum_b NominalExposure_{b,c,t}}$$

It is important to note that this measure is independent of the valuation technique used for the bank-level sovereign exposures as long as all the banks apply the same methodology at a given point in time, which is the case in my sample as all disclosures are centrally directed and homogenized by the EBA. This helps me better quantify the relative distribution of sovereign debt across banks. Furthermore, by construction, $SovereignPortion_{b,c,t}$ does not depend on price changes as these are automatically reflected in all banks' nominal exposures and thus does not change the particular portion that a specific bank holds out of the total debt. Therefore, it constitutes an ideal measure to understand the reallocation of sovereign debt over time.

In line with the mainstream literature on home bias (Ahearne, Griever, and Warnock, 2004; Coeurdacier and Rey, 2013), I also create an alternative variable that takes into account an optimal portion of sovereign debt that should be held by a bank according to a standard Capital Asset Pricing Model (CAPM). This variable ($SovereignPortion\ Bias_{b,c,t}$) takes the difference between our main variable of interest ($SovereignPortion_{b,c,t}$) and the portion that is suggested by

the CAPM model ($SovereignPortionCAPM_{b,t}$).[8] As is conventional in the literature, this difference is standardized by the share of other banks' portfolios in the global portfolio ($1 - SovereignPortionCAPM_{b,t}$). That is;

$$SovereignPortionBias_{b,c,t} = \frac{SovereignPortion_{b,c,t} - SovereignPortionCAPM_{b,t}}{1 - SovereignPortionCAPM_{b,t}}$$

where

$$SovereignPortionCAPM_{b,t} = \frac{\sum_c NominalExposure_{b,c,t}}{\sum_{b,c} NominalExposure_{b,c,t}}$$

If bias variable $SovereignPortionBias_{b,c,t}$ takes the value of 1, it means all of the country's debt is held by the specific bank, thus perfect home bias. If it is zero, that means the bank holds exactly the portion of the debt suggested by the CAPM model, thus no home bias.

For the later section of the study, I create the corresponding variables for retail and corporate ($RetailPortion_{b,c,t}$ & $CorporatePortion_{b,c,t}$) exposures separately (but exactly in the same way as described above) and then merge it with the sovereign exposure variables under a single variable name ($DebtPortion_{d,b,c,t}$) where (d) denotes the type of debt in consideration.

To construct the dummy variable $Crisis_{c,t}$, the daily yields of 10-year maturity bonds of 30 European countries are obtained from Datastream.[9] In the next step, I follow a similar approach to Brutti and Sauré (2016) and categorize a country as "in crisis" ($Crisis_{c,t}$) if a country is a Euro member and its average

[8] Notice that CAPM concludes that the optimal portion that a bank would hold in an equilibrium setting should depend only on the size of the bank's sovereign portfolio and the size of the global sovereign portfolio. Hence, it does not depend on the specific country of exposure (c).
[9] Bond yields for two countries (Estonia and Liechtenstein) are not available on Datastream so these observations are dropped from the sample.

daily bond spreads (with respect to Germany) for the previous three months was above 400 basis points.[10]

To be able to differentiate between different types of creditors, a measure of sovereign holdings for non-bank agents is needed. Unfortunately, EBA datasets only contain information about banks. Hence, I resort to a country-level dataset compiled from various national sources by Merler and Pisani-Ferry (2012), which lists the portion of a country's total debt held by its resident banks and non-bank residents.[11] Observations cover 11 European countries[12] at quarterly intervals, starting from the 1990s. For consistency, I choose the same period covered by the EBA dataset, from 2010-Q1 to 2014-Q4. For the panel estimations with this dataset, I create a dependent variable called $DomesticPortion_{c,k,t}$, which measures the portion of a country's (c) debt held by a certain domestic creditor (k: $ResidentsBanks$ or $OtherResidents$) at a certain time-point (t).

To control for time-varying bank characteristics, I get the balance sheet items from Bankscope for the corresponding banks in the EBA datasets. In line with the recent literature (De Marco and Macchiavelli, 2016; Horváth et al., 2015; Ongena et al., 2016), I include $LogAssets$ which is the logarithm of the bank's total assets (originally in million Euros); $Tier1/RWA$ which is the Tier 1 capital of the bank as a percentage of its risk-weighted-assets; $Loans/Deposits$ which is the net loans divided by the bank's customer deposits. All bank-level

[10] Various robustness checks are conducted later by using different crisis definitions (see Section 4.6).
[11] Importantly for our purposes, the 'other residents' category does not include public agencies or central banks, so we can assume that these are private non-bank residents.
[12] These are Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain and United Kingdom. Data for Belgium and Finland can only be found annually so I linearly interpolated the data to get quarterly values for these two countries.

characteristics are end-of-the-year values and included with a year lag with respect to the observation date (t).

Finally, to proxy the informational linkages across countries, I construct 3 different variables in line with the previous home bias literature (Portes, Rey, and Oh, 2001; Portes and Rey, 2005). The first, $CrossCountryDistance_{l,c}$, measures the geographical distance (in thousand kilometers) between the capital city of the bank's home country (l) and the capital city of the exposure country (c). The second, $CrossCountryBranches_{l,c}$, represents the total number of bank branches (in thousands) in the exposure country of the bank which ultimately belong to a bank from its home country. [13] Finally, $CrossCountryMergers_{l,c}$ is the total number of bank mergers (in hundreds) that occurred between the home country and the exposure country in the years starting from 1985 all the way up to the pre-crisis period (2008) in Europe. Geographical distance information is derived via MapQuest. The snapshot of banks' branch networks as of February 2016 is acquired from SNL Financial[14] while the data on mergers comes from SDC Platinum.

Table 2 gives summary statistics for these variables. It is important to note that for the $SovereignPortion$ variable, more than half of the observations contain zero values. However, these are meaningful zeros, implying that the bank does not have any exposure to that sovereign at that point in time. When the mean

[13] This variable is created by taking all of the ultimate-parent banks located in 30 EEA countries available in the SNL database, independent of whether the bank is included in the EBA dataset or not. The purpose here is to capture the non-time-varying banking linkages across countries. Hence, it is important to consider the full sample available rather than only the restricted EBA sample. This data covers 137,284 bank branches in total, which is 92% of all bank branches (149,242) in these countries, estimated using World Bank data for 2014 (see http://data.worldbank.org/indicator/FB.CBK.BRCH.P5).

[14] Unfortunately, the branch information is not available historically and SNL Financial only provides the most current data available. However, to the extent that the current data is representative of the non-time-varying cross-country banking linkages, it is reasonable to assume that estimates would not be biased in any particular direction. Additionally, the $CrossCountryMergers_{l,c}$ variable overcomes this timing problem by providing a pre-crisis picture of cross-country information linkages.

levels across general and domestic samples are compared, one can clearly see the inclination of the banks to hold a higher fraction of the government debt of their own countries. The same can also be said for retail debt ($RetailPortion$). When we compare different debt categories for domestic bank samples, we see that a bank on average holds a higher fraction of its country's retail debt (0.164) than it holds its country's sovereign debt (0.126). This is consistent with the information asymmetry theory of home bias, predicting that – in general – informationally more sensitive assets (private debt) should suffer more from home bias than other more standardized assets (public debt) would do.

Table 2
Summary statistics for main variables

Variables	*Mean*	*Median*	*Std. Deviation*	*Min*	*Max*	*Observations*	*Source*
SovereignPortion	0.012	0	0.047	0	0.973	23,268	EBA
SovereignPortionBias	0	-0.004	0.047	-0.076	0.972	23,268	EBA
RetailPortion	0.012	0	0.070	0	1	13,665	EBA
SovereignPortion (Domestic)	0.126	0.092	0.128	0	0.841	831	EBA
SovereignPortionBias (Domestic)	0.115	0.072	0.128	-0.014	0.841	831	EBA
RetailPortion (Domestic)	0.164	0.075	0.208	0	1	497	EBA
DomesticPortion (ResidentBanks)	0.179	0.164	0.098	0.008	0.451	207	Bruegel
DomesticPortion (OtherResidents)	0.194	0.212	0.121	0.002	0.415	207	Bruegel
BondSpreads (in basis points)	2.54	1.44	3.35	-0.96	28.70	280	Datastream
Crisis (Spread > 400bps)	0.12	0	0.33	0	1	280	Datastream
CrossCountryDistance (in thousand km)	1.45	1.36	0.83	0	4.88	616	MapQuest
CrossCountryBranches (in thousand branches)	0.22	0	1.86	0	28.72	616	SNL Financial
CrossCountryMergers (in hundred announcements)	0.05	0	0.34	0	6.10	616	SDC Platinum
LogAssets	11.83	11.79	1.41	8.33	14.59	480	Bankscope
Tier1/RWA (percentage)	12.27	11.60	4.42	-6.10	44.02	480	Bankscope
Loans/Deposits (percentage)	92.91	89.10	34.38	21.13	269.84	480	Bankscope

The table lists the variables used in the main regressions. $SovereignPortion$ is the portion of the total sovereign debt of a country held by a specific bank. $SovereignPortionBias$ is the portion of total sovereign debt of a country held by a specific bank, after adjusting for a standard CAPM model (see Data Description). $RetailPortion$ is the portion of the total retail debt in a country held by a specific bank. *Domestic* in parentheses denotes the observations where the country of exposure is the same as the home country of the bank. $DomesticPortion$ is the portion of the overall sovereign debt of a country held by domestic agents, separately for $ResidentBanks$ and $OtherResidents$. $BondSpreads$ are the spreads (in basis points) on 10-year maturity bond for each country in the sample (with respect to 10-year German bond) averaged over three-months daily values before each observation date. $Crisis$ is a dummy variable which is equal to 1 if a Euro country's bond spread (with respect to Germany) is above 400 basis points at an observation date. $CrossCountryDistance$ is the geographical distance (in thousand kilometers) between the capital city of the bank's home country and the capital city of the bank's exposure country. $CrossCountryBranches$ is the total number of bank branches (in thousands) in the exposure country of the bank which ultimately belong to a bank from its home country. $CrossCountryMergers$ is the total number of completed bank merger announcements (in hundreds) over the years 1985-2008 in which the acquirer is from the bank's home country and the target is from the bank's exposure country. $LogAssets$ is the logarithm of the bank's total assets (originally in million Euros). $Tier1/RWA$ is the Tier 1 capital of the bank as a percentage of its risk-weighted-assets. $Loans/Deposits$ is the net loans divided by bank's customer deposits. All bank-level characteristics from Bankscope are reported with a year lag with respect to the observation date. The last column shows the source of the related data used for computations of each variable.

4. Methodology and results

4.1 Sovereign home bias during crisis

The first thing to capture is the effect of the crisis on the sovereign home bias of European banks. Hence, the first specification is:

$$SovereignPortion_{l,b,c,t} = \beta_1\left(Crisis_{c,t} \times Domestic_{l,c}\right) + \beta_0 Domestic_{l,c} + \delta BankFin_{b,t} + \theta_b + \gamma_{c,t} + \lambda_{l,t} + \varepsilon_{l,b,c,t} \quad (1)$$

where (l) denotes the home country of the bank, (b) identifies the specific bank, (c) is for the country of exposure and (t) specifies the time dimension. All variables are constructed as previously explained in the Data Description. Controls include time-varying bank financials as well as various fixed effects at the levels of $Bank$, $HomeCountry^{*}Time$ and $ExposureCountry^{*}Time$. Thus, the model controls for the overall effects of the crisis both at the home country and exposure country levels and the $Crisis$ dummy can only enter the regression as an interaction term. Additionally, $Domestic_{l,c}$ is a dummy variable which is equal to 1 if the bank's headquarters are located in the country of exposure (i.e. l=c). In this model, β_0 should give us an idea about the general level and significance of the sovereign home bias in European banks and β_1 measures the additional effect of the crisis on this home bias. The same model is also estimated with the alternative dependent variable with the CAPM adjustment ($SovereignPortionBias_{l,b,c,t}$).

The results are presented in Table 3. Columns I-II confirm the previous literature in that banks do have home bias in their sovereign debt holdings. It is economically meaningful as well at a level around 0.126, clearly illustrating that a bank holds a much bigger portion of a country's debt when it comes to its own country. Columns III-IV of the same table confirm another observation that is compatible with the previous literature: crisis increases the sovereign home bias of domestic banks (Gennaioli et al., 2014a; Brutti and Sauré, 2016).

The effect is economically huge: the portion of a country's debt held by a representative domestic bank almost doubles in response to a crisis.[15] Bank-level controls are mostly significant in the expected directions: larger banks ($LogAssets$) hold more sovereign debt; well-capitalised banks ($Tier1/RWA$) hold less; bank loans ($Loan/Deposits$) and sovereign debt act as substitutes. More interestingly, even though bank-level controls are no longer significant, the main results hold even when we take into account the relative portfolio size of the banks according to a standard CAPM model (see columns V-VIII).

[15] This result is also compatible with the recent bank lending literature showing that, during a financial crisis, international banks demonstrate a stronger home bias in terms of syndicated loan issuance (Giannetti and Laeven, 2012) or cut credit less in markets that are geographically close (De Haas and Van Horen, 2013).

Table 3
Sovereign debt reallocation across European banks during crisis

Dependent Variable:	*SovereignPortion*				*SovereignPortionBias*			
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
*Domestic*Crisis*			0.110***	0.108***			0.110***	0.108***
			[3.72]	[3.56]			[3.71]	[3.55]
Domestic	0.126***	0.126***	0.113***	0.112***	0.127***	0.128***	0.114***	0.114***
	[10.39]	[10.06]	[9.31]	[8.84]	[10.47]	[10.14]	[9.39]	[8.91]
LogAssets		0.011***		0.011***		-0.000		-0.000
		[2.98]		[2.98]		[-0.03]		[-0.03]
Tier1/RWA		-0.001**		-0.001**		-0.000**		-0.000**
		[-2.26]		[-2.26]		[-1.99]		[-1.99]
Loans/Deposits		-0.000**		-0.000**		-0.000		-0.000
		[-2.13]		[-2.13]		[-0.10]		[-0.10]
Fixed Effects								
Bank	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Clustering	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj-R-sq	0.26	0.25	0.28	0.27	0.26	0.25	0.27	0.27
N	23268	20552	23268	20552	2368	20552	23268	20552

*$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$.

The table summarizes the results of equation (1) with dependent variables $SovereignPortion$ (I-IV) and $SovereignPortionBias$ (V-VIII) estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. $SovereignPortion$ is the portion of the total bank-debt of a sovereign held by a specific bank. $SovereignPortionBias$ is the portion of total bank-debt of a sovereign held by a specific bank, after adjusting for a standard CAPM model (see Data Description). $Domestic$ is a dummy variable equal to 1 only if the country of exposure is the same as the home country of the bank. $Crisis$ is a dummy variable which is equal to 1 only if a Euro country's bond spread (with respect to Germany) is above 400 basis points calculated as the average of daily bond spreads over the 3-month period preceding the observation date. Bank-level Controls include $LogAssets$ which is the logarithm of the bank's total assets (originally in million Euros); $Tier1/RWA$ which is the Tier 1 capital of the bank as a percentage of its risk-weighted-assets; $Loans/Deposits$ which is the net loans divided by bank's customer deposits. All Bank-level Controls come from Bankscope and are used with a year lag. Sovereign bond holding data comes from various exercises of the EBA and country exposures are included for 30 members of the EEA. Bond yields for the $Crisis$ dummy are obtained from Datastream. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

4.2 Risk-shifting in crisis-country banks

The findings in Table 3 are compatible with information asymmetry, secondary markets or moral suasion stories of the home bias. One may also argue that banks in crisis countries are especially weakly-capitalised, which drives them to invest more in their home country bonds to benefit from shifting the risk onto their creditors (Crosignani, 2015). However, if this is the case, one would expect these banks to also invest in other high-risk countries.

To check for the risk-shifting tendency of banks located in troubled countries, I estimate the following model to separate the home bias phenomenon from the risk-shifting story:

$$SovereignPortion_{l,b,c,t} = \beta_2\left(Domestic_{l,c} \times Crisis_{c,t} \times StressedBank_{l,t}\right) + \beta_1\left(Crisis_{c,t} \times StressedBank_{l,t}\right) + \beta_0 Domestic_{l,c} + \delta BankFin_{b,t} + \theta_b + \gamma_{c,t} + \lambda_{l,t} + \varepsilon_{l,b,c,t} \quad (2)$$

where $StressedBank_{l,t}$ is a dummy variable representing those observations in which the home country of the bank (l) is considered to be in crisis at a certain time (t). All other variables are constructed as previously explained. Due to time-varying fixed effects at the home country and exposure country levels, $Crisis$ and $StressedBank$ dummies can only enter the regression in interaction with other variables.[16]

Model 2 checks for risk-shifting behaviour of (potentially weak) banks located in crisis countries, in line with Crosignani (2015). If the rising home bias in crisis countries is mainly due to risk-shifting, one should observe a similar tendency of crisis-country banks to shift their portfolios towards all crisis countries no matter if it is domestic or foreign. This is captured by β_1. On the other hand, β_2

[16] For conciseness, additional two-way interactions of $Domestic^{*}Crisis$ and $Domestic^{*}StressedBank$ are dropped from the estimation since the coefficients are both insignificant and their inclusion does not change the results in any meaningful way.

measures the additional effect of the crisis on domestic exposures that cannot be explained by the general level of risk-shifting in these crisis-country banks.

Columns I-II-V-VI in Table 4 confirm the earlier predictions by showing that crisis-country banks actually expand their relative exposure to all other crisis countries, thus potentially risk-shifting. However, as illustrated in columns III-IV-VII-VIII, this behaviour is much heavier for the home exposures of these banks, thus indicating that risk-shifting contributes to the rising home bias in crisis countries but is not a sufficient explanation. The magnitude of the response to a crisis in the home country is more than tenfold higher than that to a crisis in a foreign country (0.101 vs 0.009). Indeed, banks located in troubled countries have a special preference for their own government's bonds which goes much beyond their risk-shifting incentives.

4.3 Secondary markets and redenomination risk

As discussed previously, the secondary markets hypothesis states that the increase in banks' sovereign home bias might be related to the presumption that government bonds would be more valuable (due to governments being less willing to default) when they are held domestically. Thus, in the existence of well-functioning secondary markets, debt would naturally flow from foreign to domestic agents. In addition, if redenomination (Eurozone break-up) risk was particularly high for crisis countries, this may have pushed up the selling pressure especially for the foreign investors since they may risk ending up with a currency mismatch between their assets and liabilities in case of a crisis country declaring its exit from the Eurosystem (Battistini, Pagano, and Simonelli, 2014).

Table 4

Sovereign debt reallocation across European banks during crisis: Stressed Banks

Dependent Variable:	*SovereignPortion*				*SovereignPortionBias*			
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
Domestic	0.123***	0.123***	0.113***	0.112***	0.124***	0.125***	0.114***	0.114***
	[10.30]	[9.95]	[9.31]	[8.83]	[10.38]	[10.03]	[9.38]	[8.90]
*StressedBank*Crisis*	0.029***	0.029***	0.009***	0.009***	0.029***	0.029***	0.009***	0.009***
	[4.13]	[4.12]	[3.20]	[3.37]	[4.12]	[4.11]	[3.12]	[3.29]
*StressedBank*Crisis*Domestic*			0.104***	0.101***			0.104***	0.101***
			[3.58]	[3.40]			[3.57]	[3.38]
Bank-level Controls		*Yes*		*Yes*		*Yes*		*Yes*
Fixed Effects								
Bank	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Clustering	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj-R-sq	0.26	0.26	0.28	0.27	0.26	0.25	0.27	0.27
N	23268	20552	23268	20552	23268	20552	23268	20552

$^{*}p \leq 0.1$, $^{**}p \leq 0.05$, $^{***}p \leq 0.01$.

The table summarizes the results of equation (2) estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. Dependent variables are $SovereignPortion$ (I-IV), which is the portion of the total sovereign debt of a country held by a specific bank, and $SovereignPortionBias$ (V-VIII), which is the portion of total sovereign debt of a country held by a specific bank after adjusting for a standard CAPM model (see Data Description). $Domestic$ is a dummy variable equal to 1 only if the country of exposure is the same as the home country of the bank. $Crisis$ is a dummy variable which is equal to 1 only if a Euro country's bond spread (with respect to Germany) is above 400 basis points calculated as the average of daily bond spreads over the 3-month period preceding the observation date. $StressedBank$ is a dummy variable indicating those observations in which the home country of the bank is considered to be "in crisis" ($400bps \leq spread$). Bank-level Controls include $LogAssets$ which is the logarithm of the bank's total assets (originally in million Euros); $Tier1/RWA$ which is the Tier 1 capital of the bank as a percentage of its risk-weighted-assets; $Loans/Deposits$ which is the net loans divided by bank's customer deposits. All Bank-level Controls come from Bankscope and are used with a year lag. Sovereign bond holding data come from various exercises of the EBA and country exposures are included for 30 members of the EEA. Bond yields for the *Crisis* dummy are obtained from Datastream. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

However, neither of these channels is specific to banks and, if they were prominent, one would expect to see a rising home bias not only for domestic banks but also for other types of agents in crisis countries. Hence, I differentiate the effect of the crisis on the home bias of different domestic agents operating in the same economy. For this purpose, I use the Bruegel dataset at the country-level and estimate the following model:

$$DomesticPortion_{c,k,t} = \beta_1\left(ResidentBanks_k \times Crisis_{c,t}\right) + \lambda_k + \gamma_{c,t} + \varepsilon_{c,k,t} \qquad (3)$$

where (c) is for the country, (k) is for the creditor type and (t) is for different quarters of the year. $ResidentBanks_k$ is a dummy variable that is equal to 1 if the creditor (k) of the country is its resident banks and zero if it is other private non-bank residents. All other variables are constructed as previously explained. Controls also include $Country^{*}Time$ fixed effects, which should absorb all the time-varying country characteristics.[17] The coefficient of interest is β_1, which signals whether or not domestic banks behaved somewhat differently compared to other domestic agents.

Table 5 compares the responses of two types of domestic agents during crisis. Although statistically insignificant, Columns I-II indicate that the crisis leads domestic agents to decrease their home bias on average, which is counter-intuitive with respect our earlier findings. However, when I separate the additional effect of being a resident bank, columns III-IV confirm that resident banks in crisis countries are more likely to increase their home bias whereas other non-bank residents seem to have moved in the opposite direction. The conclusion holds even when overall shocks at the $Country^{*}Time$ level are controlled for (column V). Hence, this finding goes against the secondary

[17] Notice that with the creditor and country-time fixed effects, the $ResidentBanks$ and $Crisis$ dummies can only enter the regression in interaction form.

markets hypothesis arguing that, during crisis times, government debt should flow back to the home country irrespective of the resident type, since the government would then prefer keeping its promise not to harm the domestic economy. Although it could be argued that governments "care" more about the banking sector and hence it should be more reasonable that sovereign debt flows to resident banks, one would still expect to see a somewhat positive response for other non-bank residents as well, which does not seem to be visible in our findings.

Furthermore, even though the Eurozone could be said to have come to the verge of a break-up in the midst of the crisis, it is not easy to conclude that redenomination risk was instrumental in banks' sovereign exposure behaviour since it does not seem to have affected other types of investors resident in the same troubled countries. On the other hand, it is noteworthy that, since different investors may tend towards different kinds of domestic assets to hedge for the currency risk, the ideal setting to test for the redenomination risk would be the case in which we could see the creditor decomposition (bank vs non-bank) of all asset classes rather than only that of sovereign debt. However, in the absence of a more comprehensive dataset and a legitimate counter-argument for why non-bank residents should especially avoid hedging via government bonds, it is safe to say that redenomination risk was not substantial.

Table 5
Sovereign debt reallocation during crisis: Resident banks vs non-bank residents

Dependent Variable: *DomesticPortion*	*I*	*II*	*III*	*IV*	*V*
Crisis	-0.030	-0.025	-0.099***	-0.094***	
	[-1.24]	[-1.32]	[-3.05]	[-3.15]	
*Crisis*ResidentBanks*			0.139***	0.139***	0.139**
			[2.89]	[2.88]	[2.14]
Country-level Controls		*Yes*		*Yes*	
Fixed Effects					
Country	*Yes*	*Yes*	*Yes*	*Yes*	
Time	*Yes*	*Yes*	*Yes*	*Yes*	
Creditor Type	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country x Time					*Yes*
Clustering	Country	Country	Country	Country	Country
Adj-R-sq	0.03	0.04	0.13	0.14	0.20
N	414	414	414	414	414

$^{*}p \leq 0.1$, $^{**}p \leq 0.05$, $^{***}p \leq 0.01$.

The table summarizes the results of equation (3) with dependent variable $DomesticPortion$ (I-V), which is the portion of the overall sovereign debt of a country held by a particular domestic agent (either by resident banks or other private residents), estimated over a time period fully spanning the Eurozone crisis on a quarterly basis from early 2010 to the end-of-2014. $ResidentBanks$ is a dummy variable equal to one only if the creditor is the resident banks of the country. $Crisis$ is a dummy variable which is equal to 1 only if a Euro country's bond spread (with respect to Germany) is above 400 basis points calculated as the average of daily bond spreads over the 3-month period preceding the observation date. Country-level Controls are the average values for each country's banks computed over the sample period and include $LogAssets$ which is the logarithm of the bank's total assets (originally in million Euros); $Tier1/RWA$ which is the Tier 1 capital of the bank as a percentage of its risk-weighted-assets; $Loans/Deposits$ which is the net loans divided by bank's customer deposits. All Country-level Controls come from Bankscope and are used with a year lag. Domestic sovereign holding data come from the dataset compiled from various national sources by Merler and Pisani-Ferry (2012). Countries include Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain and United Kingdom. Bond yields for $Crisis$ dummy are obtained from Datastream. Robust standard errors are clustered at the country-level and t-statistics are reported in brackets.

4.4 Sovereign vs. private debt home bias

Most of the recent literature has focused on European banks' sovereign home bias although this behaviour might have been just a sub-observation of a more general phenomenon. Thus, I would also like to compare the effect of the crisis on home bias across various asset classes held by European banks. For this

purpose, I use a more generalized model in order to be able to differentiate the home bias across asset classes in both normal and crisis times:

$$DebtPortion_{d,l,b,c,t} = \beta_3\left(Sovereign_d \times Crisis_{c,t} \times Domestic_{l,t}\right) + \beta_2\left(Crisis_{c,t} \times Domestic_{l,c}\right) + \beta_1\left(Sovereign_d \times Domestic_{l,c}\right) + \beta_0\left(Retail_d \times Domestic_{l,c}\right) + \delta BankFin_{b,t} + \zeta_d + \theta_b + \gamma_{c,t} + \lambda_{l,t} + \varepsilon_{d,l,b,c,t} \quad (4)$$

where $Sovereign_d$ and $Retail_d$ are dummy variables indicating the respective asset classes. All other variables are constructed as previously explained.[18] The coefficients β_1 and β_0 should give us an idea about the home bias in these different asset classes in general. β_2 reflects the overall effect of the crisis on the home bias for both asset classes and β_3 should tell us if the increase in home bias was stronger for sovereign debt, as would be suggested by the competing theories of home bias (moral suasion and secondary market theory).

To get a better sense of whether sovereign debt was the only asset that suffered from home bias during the crisis, Table 6 draws the following comparison: Columns I-II confirm that there is a significant home bias across both asset classes together. When I separate the home bias for different assets, columns III-IV show that the magnitude of the general home bias for retail debt (0.171) is more than 30 percent higher than the one for sovereign debt (0.127) and the difference between these two coefficients is statistically significant, which is perfectly in line with the information asymmetry theory of home bias. Compared to standard products such as government securities, informationally more sensitive assets such as retail debt should be held more by the domestic agents who have an advantage in reaching the relevant information for such assets (Portes et al., 2001; Portes and Rey, 2005).

[18] To focus on the main coefficients of interest, the two-way interaction of $Sovereign^*Crisis$ is dropped from the estimation since the coefficient is statistically insignificant and its inclusion does not change the results in any meaningful way.

The remaining columns in Table 6 provide even more interesting results. Columns V-VI show that the crisis has a positively significant effect on home bias for both asset classes. Columns VII-VIII shed light on the additional response of sovereign debt to the crisis, but there seems to be none. At best, this additional effect is negative (-0.032, though not statistically significant), meaning that it was retail debt that suffered more intensely from home bias in times of crisis. This finding is again consistent with the expectation that, during crisis episodes that are usually associated with rising informational frictions, informationally sensitive assets should experience a much deeper reallocation from foreign to domestic agents. For robustness, the same analysis is repeated with corporate debt in Table R.6. Not surprisingly, the results are very much in line: in general, European banks have a greater home bias in their corporate exposures and, compared to sovereign debt, this bias rises at least equally in response to a crisis in a country. Overall, it seems that the recent sovereign debt reallocation in Europe could be a part of a more general phenomenon (such as informational frictions) that may have influenced all asset classes simultaneously.

Table 6

Debt reallocation across European banks during crisis: Sovereign vs retail debt

Dependent Variable: *DebtPortion*	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
Domestic	0.141***	0.143***						
	[10.12]	[9.74]						
*Domestic*Retail*			0.167***	0.171***	0.154***	0.156***	0.152***	0.154***
			[8.37]	[8.13]	[7.80]	[7.42]	[7.63]	[7.24]
*Domestic*Sovereign*			0.126***	0.127***	0.112***	0.112***	0.113***	0.113***
			[10.42]	[10.09]	[9.14]	[8.56]	[9.36]	[8.85]
*Domestic*Crisis*					0.118***	0.118***	0.135***	0.139***
					[3.67]	[3.55]	[2.66]	[2.68]
*Domestic*Crisis*Sovereign*							-0.026	-0.032
							[-0.59]	[-0.74]
Bank-level Controls		*Yes*		*Yes*		*Yes*		*Yes*
Fixed Effects								
Bank	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Debt Type	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Clustering	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj-R-sq	0.22	0.22	0.22	0.22	0.24	0.24	0.24	0.24
N	36933	32530	36933	32530	36933	32530	36933	32530

$^{*}p \leq 0.1$, $^{**}p \leq 0.05$, $^{***}p \leq 0.01$.

The table summarizes the results of the equation (4) with dependent variable $DebtPortion$ (I-VIII), which measures the portion of a specific type of total debt (sovereign or retail) of a country held by a specific bank, estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. $Sovereign$ and $Retail$ are dummy variables indicating the respective debt types held by the banks. $Domestic$ is a dummy variable equal to 1 only if the country of exposure is the same as the home country of the bank. $Crisis$ is a dummy variable which is equal to 1 only if a Euro country's bond spread (with respect to Germany) is above 400 basis points calculated as the average of daily bond spreads over the 3-month period preceding the observation date. Bank-level Controls include $LogAssets$ which is the logarithm of the bank's total assets (originally in million Euros); $Tier1/RWA$ which is the Tier 1 capital of the bank as a percentage of its risk-weighted-assets; $Loans/Deposits$ which is the net loans divided by bank's customer deposits. All Bank-level Controls come from Bankscope and are used with a year lag. Sovereign and retail debt data come from various exercises of the EBA and country exposures are included for 30 members of the EEA. Bond yields for the $Crisis$ dummy are obtained from Datastream. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

Table R.6

Debt reallocation across European banks during crisis: Sovereign vs corporate debt

Dependent Variable: *DebtPortion*	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*
Domestic	0.140***	0.143***						
	[10.09]	[9.70]						
*Domestic*Corporate*			0.164***	0.171***	0.152***	0.158***	0.152***	0.157***
			[8.50]	[8.38]	[7.99]	[7.69]	[7.93]	[7.64]
*Domestic*Sovereign*			0.126***	0.127***	0.113***	0.113***	0.113***	0.113***
			[10.40]	[10.06]	[9.16]	[8.61]	[9.36]	[8.86]
*Domestic*Crisis*					0.110***	0.108***	0.114**	0.112***
					[3.34]	[3.13]	[2.12]	[2.01]
*Domestic*Crisis*Sovereign*							-0.006	-0.006
							[-0.12]	[-0.13]
Bank-level Controls		*Yes*		*Yes*		*Yes*		*Yes*
Fixed Effects								
Bank	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Debt Type	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Clustering	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj-R-sq	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.25
N	36933	32530	36933	32530	36933	32530	36933	32530

$^{*}p \leq 0.1$, $^{**}p \leq 0.05$, $^{***}p \leq 0.01$.

The table summarizes the results of the equation (4) with dependent variable $DebtPortion$ (I-VIII), which measures the portion of a specific type of total debt (sovereign or corporate) of a country held by a specific bank, estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. $Sovereign$ and $Corporate$ are dummy variables indicating the respective debt types held by the banks. $Domestic$ is a dummy variable equal to 1 only if the country of exposure is the same as the home country of the bank. $Crisis$ is a dummy variable which is equal to 1 only if a Euro country's bond spread (with respect to Germany) is above 400 basis points calculated as the average of daily bond spreads over the 3-month period preceding the observation date. Bank-level Controls include $LogAssets$ which is the logarithm of the bank's total assets (originally in million Euros); $Tier1/RWA$ which is the Tier 1 capital of the bank as a percentage of its risk-weighted-assets; $Loans/Deposits$ which is the net loans divided by bank's customer deposits. All Bank-level Controls come from Bankscope and are used with a year lag. Sovereign and retail debt data come from various exercises of the EBA and country exposures are included for 30 members of the EEA. Bond yields for the $Crisis$ dummy are obtained from Datastream. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

4.5 Effect of informational distance on banks' sovereign exposure

It is already well established in the literature that proximity to the borrower matters for banks' lending behaviour and it usually determines the amount of soft information that the bank can gather to serve its customers.[19] Of course, one could think that government bond markets are not necessarily of the kind where soft information would matter the most. Indicators (such as tax revenue or fiscal balance) showing the strength of a government's ability to pay back its debts are publicly available and easily accessible by market participants. Nevertheless, an interesting feature of government debt markets is that while corporate bankruptcy is always about the (in)ability of a company to repay, a sovereign default is – in most cases – a political decision and directly related to the degree of the governing party's willingness to cut back government spending or increase tax rates. This crucial difference between corporate and sovereign debt arises due to the lack of a legal mechanism to enforce repayment on sovereign bonds (Panizza, Sturzenegger, and Zettelmeyer, 2009) and makes it especially important in times of stress to have insider information on the government's willingness to honour its promises or the country's political capacity to endure further budget cuts. Such soft information could be obtained via domestic banks' local/political connections or simply by being more familiar with the country, its daily news and local economic and political climate.[20] In that respect, Butler (2008) illustrates a case in which local investment banks underwriting municipal bonds have a comparative

[19] See, among many others, Mian (2006), Alessandrini, Presbitero, and Zazzaro (2009) and Agarwal and Hauswald (2010).

[20] Here, I interpret familiarity as an accumulated informational advantage rather than a behavioural bias although the previous literature is somewhat ambiguous on this (see Huberman, 2001).

advantage in accessing and assessing soft information, especially when the bond is risky.

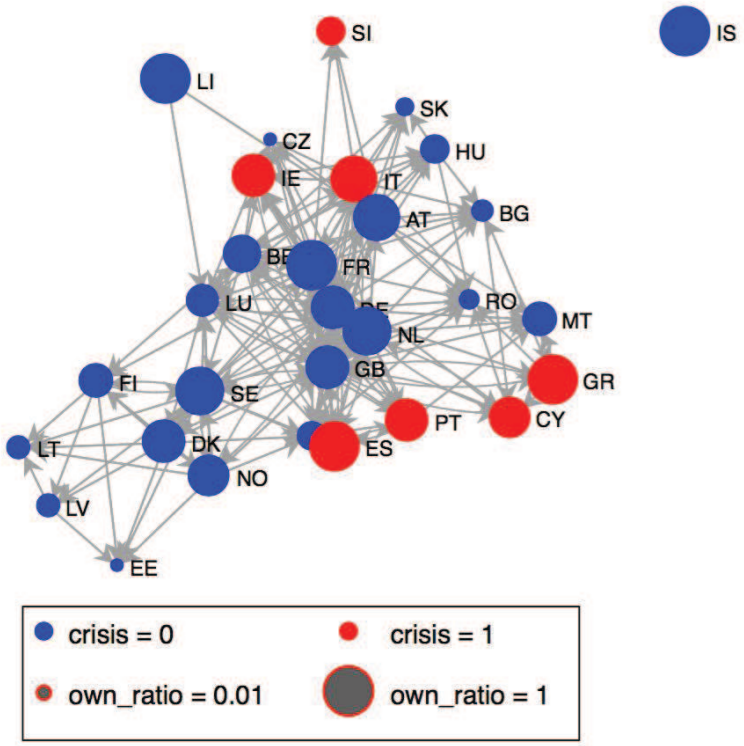
What is then so special about domestic banks compared to other types of domestic agents? First, domestic banks are the main players in the government debt markets. Figure 3 clearly illustrates that even before the crisis in the Euro periphery, domestic banks held a higher share of sovereign debt than all other domestic agents combined. This could give the banks a comparative edge in the pricing of government securities.[21] Second, banks are natural information-gatherers for their economies. They transact with almost every sector of domestic business and gain in-advance information on how well the overall economy may perform over the coming months/quarters, which would have a tremendous effect on the government's ability to raise tax revenues and pay back its debts. Lastly, banks are the agents with the greatest access to liquidity (via central banks) in times of financial crises. Hence, in a liquidity crunch, governments may find it easier to signal their intentions/plans to local banks than to any other local agent.

In light of the above discussion, I expect cross-country informational linkages to be important for European banks' sovereign exposures both at home and abroad. Figure 4 depicts the bank branch network in 30 EEA countries and it appears that the Eurozone crisis particularly struck the countries located in the outer sphere of this network, which may have caused these sovereigns to be especially susceptible to informational frictions. Additionally, larger nodes in crisis countries imply that their banking sector is dominated by domestic

[21] Home bias might also arise simply due to domestic banks' responsibility to act as primary dealers or market makers in the sovereign debt markets. Ongena et al. (2016) provide the contrary evidence that most of the market makers in periphery countries during the crisis were foreign banks and this did not have any effect on domestic banks' home bias.

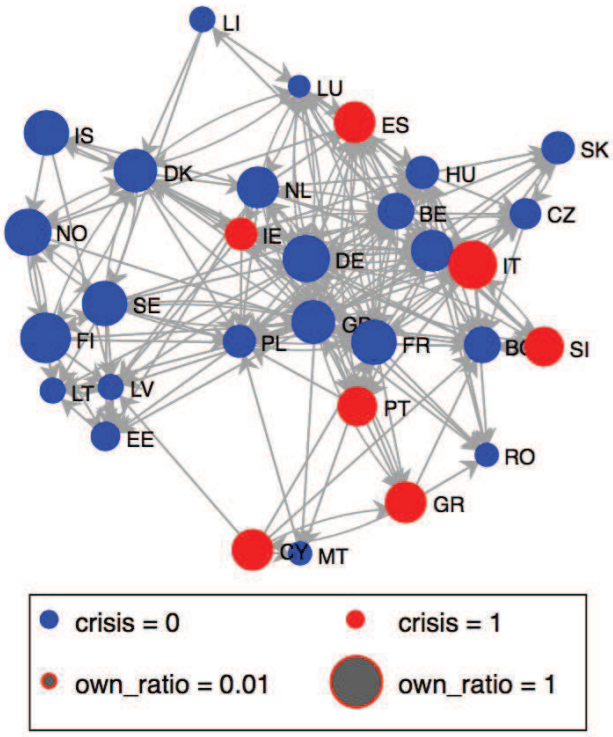
banks, which might be the reason why debt flew back to these countries in large quantities.

Figure 4
Bank branch network across European countries



The graph shows a simple network map for all the bank branch connections across 30 EEA countries. *Crisis* countries (Greece, Cyprus, Ireland, Portugal, Italy, Slovenia and Spain) are in red and others are in blue. Each arrow represents a connection between two countries with the direction of the arrow pointing from home country towards the host. Nodes are placed via multidimensional scaling procedure with a random component and the size of the nodes (own_ratio) represents the percentage of the total branches in a country that belongs to domestic banks. Bank branch data come from SNL Financial as of February, 2016.

Figure 5
Bank merger network across European countries



The graph shows a simple network map for all the bank merger connections across 30 EEA countries. *Crisis* countries (Greece, Cyprus, Ireland, Portugal, Italy, Slovenia and Spain) are in red and others are in blue. Each arrow represents a connection between two countries with the direction of the arrow pointing from home country towards the host. Nodes are placed via multidimensional scaling procedure with a random component and the size of the nodes (own_ratio) represents the percentage of the total mergers in a country that belongs to domestic banks. Bank merger data come from SDC Platinum and cover the years between 1985 and 2008.

Figure 5, which depicts bank merger networks, tells more or less the same story. Hence, I go on to formally estimate the effect of informational distance on European banks' behaviour towards crisis countries:

$$SovereignPortion_{l,b,c,t} = \beta_1\left(CrossCountryDistance_{l,c} \times Crisis_{c,t}\right) + \delta BankFin_{b,t} + \theta_b + \gamma_{c,t} + \lambda_{l,t} + \mu_{l,c} + \varepsilon_{l,b,c,t} \quad (5)$$

where, in addition to the previous ones, I also include fixed effects at the level of interaction between home country and exposure country ($\mu_{l,c}$) so that all non-time-varying structural cross-country linkages can be implicitly controlled. Hence, $CrossCountryDistance_{l,c}$ only enters the regression in interaction. Alternatively, I use $CrossCountryBranches_{l,c}$ and

$CrossCountryMergers_{l,c}$ as proxies that would capture the informational channel during crisis.

Table 7 presents the effects of informational distance on banks' exposures to crisis countries. The first thing to notice is that the explanatory power (adjusted-r-square) of the model increases significantly due to the fixed effects at $HomeCountry^{*}ExposureCountry$ level, implying that cross-country linkages matter substantially for the European banks' sovereign portfolios. Although geography could be thought of as a noisy proxy for informational linkages across countries,[22] especially in Europe given the fully open borders and easy transportation, columns I-II illustrate that physical distance has a significant negative effect on bank exposures in times of crisis. One standard deviation increase in distance (0.83) lowers a bank's sovereign portion holding of a crisis country by almost one percent. Given that the sample mean of $SovereignPortion$ is 0.012 in the full sample, the effect is quite sizable and economically meaningful. Similarly, branch and merger connections, which are better proxies for information, are also significant and positively associated with the banks' exposures to crisis countries (see columns III-VI).

[22] One could also think that distance should be positively associated with asset holdings since more distant countries would offer better diversification benefits due to the lower correlation in business cycles across countries (Portes and Rey, 2005).

Table 7

Sovereign debt reallocation across European banks during the crisis: Effect of informational distance

Dependent Variable: *SovereignPortion*	*Full Sample*						*Only Foreign Exposures*					
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*	*XI*	*XII*
*CrossCountryDistance*Crisis*	-0.012***	-0.012***					-0.001	-0.001				
	[-4.47]	[-5.75]					[-1.06]	[-0.72]				
*CrossCountryBranches*Crisis*			0.004***	0.004***					0.006**	0.005**		
			[4.86]	[4.79]					[2.24]	[1.84]		
*CrossCountryMergers*Crisis*					0.014***	0.014***					0.025**	0.018*
					[3.09]	[3.12]					[2.00]	[1.68]
Bank-level Controls		*Yes*		*Yes*		*Yes*		*Yes*		*Yes*		*Yes*
Fixed Effects												
Bank	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
HomeCountry x ExpCountry	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Clustering	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj-R-sq	0.53	0.53	0.54	0.54	0.53	0.53	0.26	0.27	0.26	0.27	0.26	0.27
N	23268	20552	23268	20552	23268	20552	22437	19818	22437	19818	22437	19818

$^{*}p \leq 0.1$, $^{**}p \leq 0.05$, $^{***}p \leq 0.01$.

The table summarizes the results of equation (5) with dependent variables $SovereignPortion$ in full sample (I-VI) and in foreign sample (VII-XII) estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. $SovereignPortion$ is the portion of the total sovereign debt of a country held by a specific bank. $Crisis$ is a dummy variable which is equal to 1 only if a Euro country's bond spread (with respect to Germany) is above 400 basis points calculated as the average of daily bond spreads over the 3-month period preceding the observation date. $CrossCountryDistance$ is the geographical distance (in thousand kilometers) between the capital city of the bank's home country and the capital city of the bank's exposure country. $CrossCountryBranches$ is the total number of bank branches (in thousands) located in the bank's exposure country which ultimately belong to a bank from its home country. $CrossCountryMergers$ is the total number of completed bank merger announcements (in hundreds) over the years 1985-2008 in which the acquirer is from the bank's home country and the target is from the bank's exposure country. Bank-level Controls include $LogAssets$ which is the logarithm of the bank's total assets (originally in million Euros); $Tier1/RWA$ which is the Tier 1 capital of the bank as a percentage of its risk-weighted-assets; $Loans/Deposits$ which is the net loans divided by bank's customer deposits. All Bank-level Controls come from Bankscope and are used with a year lag. Sovereign bond holding data come from various exercises of the EBA and country exposures are included for 30 members of the EEA. Bond yields for the $Crisis$ dummy are obtained from Datastream. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

However, the full sample in these estimations also contains domestic observations, which are highly correlated with information variables; and may thus bias the results if there is a moral suasion or secondary market effect in these domestic observations. Thus, I take a much more conservative approach and drop all the domestic observations from the sample. All remaining observations denote the foreign exposures of the banks, hence – in theory – they must be independent of moral suasion or secondary market effects. Notice that this is a very conservative approach in the sense that the informational linkages that this paper argued for so far have mostly emphasized the link between governments and their domestic banks. Furthermore, there is the possibility of "reverse moral suasion" on foreign banks, in which the national regulators may have forced their banks to specifically drop their exposures to the troubled countries (Ongena et al., 2016). In that case, such pressure would be most pronounced for better-connected banks which, even before the crisis, may have had higher exposures to crisis countries. Thus, focusing only on foreign bank observations would severely underestimate the importance of the information channel during a crisis.

With these concerns in mind, columns VII-VIII in Table 7 show that the effect of geographical distance becomes statistically indistinguishable from zero when we only consider the exposures of foreign banks, which is not surprising given the noisy nature of this proxy. On the other hand, columns IX-XII confirm that branch and merger variables are still influential in the behaviour of foreign banks towards crisis countries. Although statistical significance goes down in the subsample, the magnitude of the coefficients goes up. One standard deviation increase in $CrossCountryBranches$ (1.86) shoots up the sovereign portion by more than 0.9 percent, which is sizable given the sample average of 1.2 percent for $SovereignPortion$. Independent of alternative explanations of

home bias, this finding constitutes direct and strong evidence for the role of informational frictions on debt reallocation in times of crisis.

4.6 Further analysis and policy implications

The first thing that comes to mind is whether the estimations are robust to reasonable changes in the crisis definition. Table 8 and Table 9 present all the main results with crisis thresholds of 300 and 500 basis points for bond spreads instead of my main definition of 400bps. All the main results still hold although, expectedly, they get weaker with a higher threshold and stronger with a lower threshold.

Secondly, it might be the case that a country could get into a crisis faster than a three-month period, which is the rolling window that I use to compute the average spreads for each time period (t). However, Table 10 shows that results are also robust to the choice of a shorter rolling period for the average bond spreads.

Thirdly, by choosing a threshold, the assumption was that sovereign risk must have a non-linear effect on debt reallocation. That is, debt reallocation should occur only at the very peak levels of sovereign stress. However, this condition could be relaxed as well. Therefore, instead of using a crisis definition, Table 11 presents the main results with a continuous $Spreads$ variable. It seems that all of the interpretations stay the same except the evidence of risk-shifting disappearing in column 4.

Table 8
Main results with crisis threshold of 300 basis points

Dependent Variable:	*SovereignPortion*					
Table	*3*	*4*	*5*	*6*	*7 (Full)*	*7 (Foreign)*
Domestic	0.109***	0.109***				
	[8.26]	[8.25]				
*Domestic*Crisis*	0.096***					
	[3.64]					
*StressedBank*Crisis*		0.009***				
		[2.85]				
*StressedBank*Crisis*Domestic*		0.091***				
		[3.46]				
*Crisis*ResidentBanks*			0.133*			
			[1.87]			
*Domestic*Retail*				0.153***		
				[6.92]		
*Domestic*Sovereign*				0.110***		
				[8.28]		
*Domestic*Crisis*				0.109**		
				[2.46]		
*Domestic*Crisis*Sovereign*				-0.015		
				[-0.41]		
*CrossCountryBranches*Crisis*					0.004***	0.005**
					[4.61]	[2.36]
Bank-level Controls	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
Fixed Effects						
Bank	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
HomeCountry x ExpCountry					*Yes*	*Yes*
Debt Type				*Yes*		
Country			*Yes*			
Creditor Type			*Yes*			
Country x Time			*Yes*			
Clustering	Bank	Bank	Country	Bank	Bank	Bank
Adj-R-sq	0.27	0.27	0.21	0.23	0.54	0.27
N	20552	20552	414	32530	20552	19818

*$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$.

The table summarizes the results of the equations (1), (2), (3), (4) and (5) with the dependent variable *SovereignPortion* estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. For the definitions of variables, see Tables 3, 4, 5, 6 and 7. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

Table 9
Main results with crisis threshold of 500 basis points

Dependent Variable:	*SovereignPortion*					
Table	*3*	*4*	*5*	*6*	*7 (Full)*	*7 (Foreign)*
Domestic	0.117***	0.117***				
	[9.53]	[9.52]				
*Domestic*Crisis*	0.122***					
	[2.90]					
*StressedBank*Crisis*		0.017***				
		[4.03]				
*StressedBank*Crisis*Domestic*		0.107***				
		[2.64]				
*Crisis*ResidentBanks*			0.157**			
			[2.34]			
*Domestic*Retail*				0.164***		
				[7.64]		
*Domestic*Sovereign*				0.118***		
				[9.55]		
*Domestic*Crisis*				0.104*		
				[1.68]		
*Domestic*Crisis*Sovereign*				0.015		
				[0.29]		
*CrossCountryBranches*Crisis*					0.011**	0.016*
					[2.16]	[1.67]
Bank-level Controls	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
Fixed Effects						
Bank	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
HomeCountry x ExpCountry					*Yes*	*Yes*
Debt Type				*Yes*		
Country			*Yes*			
Creditor Type			*Yes*			
Country x Time			*Yes*			
Clustering	Bank	Bank	Country	Bank	Bank	Bank
Adj-R-sq	0.27	0.27	0.20	0.23	0.53	0.27
N	20552	20552	414	32530	20552	19818

*$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$.

The table summarizes the results of the equations (1), (2), (3), (4) and (5) with the dependent variable *SovereignPortion* estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. For the definitions of variables, see Tables 3, 4, 5, 6 and 7. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

Table 10
Main results with crisis dummy defined with one-month-rolling bond spreads

Dependent Variable:	*SovereignPortion*					
Table	*3*	*4*	*5*	*6*	*7 (Full)*	*7 (Foreign)*
Domestic	0.113***	0.113***				
	[8.96]	[8.95]				
*Domestic*Crisis*	0.106***					
	[3.31]					
*StressedBank*Crisis*		0.010***				
		[3.38]				
*StressedBank*Crisis*Domestic*		0.099***				
		[3.15]				
*Crisis*ResidentBanks*			0.141**			
			[2.16]			
*Domestic*Retail*				0.158***		
				[7.40]		
*Domestic*Sovereign*				0.114***		
				[8.98]		
*Domestic*Crisis*				0.125**		
				[2.22]		
*Domestic*Crisis*Sovereign*				-0.020		
				[-0.44]		
*CrossCountryBranches*Crisis*					0.004***	0.004*
					[4.41]	[1.78]
Bank-level Controls	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
Fixed Effects						
Bank	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
HomeCountry x ExpCountry					*Yes*	*Yes*
Debt Type				*Yes*		
Country			*Yes*			
Creditor Type			*Yes*			
Country x Time			*Yes*			
Clustering	Bank	Bank	Country	Bank	Bank	Bank
Adj-R-sq	0.27	0.27	0.20	0.23	0.53	0.27
N	20552	20552	414	32530	20552	19818

*$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$.

The table summarizes the results of the equations (1), (2), (3), (4) and (5) with the dependent variable $SovereignPortion$ estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. For the definitions of variables, see Tables 3, 4, 5, 6 and 7. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

Table 11
Main results with crisis dummy replaced with bond spreads

Dependent Variable:	*SovereignPortion*					
Table	*3*	*4*	*5*	*6*	*7 (Full)*	*7 (Foreign)*
Domestic	0.097***	0.114***				
	[7.54]	[9.19]				
*Domestic*Spread*	0.017***					
	[3.72]					
*HomeSpread*ExpSpread*		0.000				
		[1.46]				
*HomeSpread*ExpSpread*Domestic*		0.001***				
		[2.80]				
*Spread*ResidentBanks*			0.012**			
			[2.04]			
*Domestic*Retail*				0.134***		
				[6.79]		
*Domestic*Sovereign*				0.099***		
				[7.59]		
*Domestic*Spread*				0.023***		
				[3.01]		
*Domestic*Spread*Sovereign*				-0.006		
				[-0.92]		
*CrossCountryBranches*Spread*					0.002***	0.006***
					[5.34]	[2.71]
Bank-level Controls	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
Fixed Effects						
Bank	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
HomeCountry x Time	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
ExpCountry x Time	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
HomeCountry x ExpCountry					*Yes*	*Yes*
Debt Type				*Yes*		
Country			*Yes*			
Creditor Type			*Yes*			
Country x Time			*Yes*			
Clustering	Bank	Bank	Country	Bank	Bank	Bank
Adj-R-sq	0.28	0.27	0.20	0.24	0.54	0.27
N	20552	20552	414	32530	20552	19818

*$p \leq 0.1$, **$p \leq 0.05$, ***$p \leq 0.01$.

The table summarizes the results of the equations (1), (2), (3), (4) and (5) with the dependent variable *SovereignPortion* estimated over a time period fully spanning the Eurozone crisis on a biannual basis from early 2010 to mid-2015. For the definitions of variables, see Tables 3, 4, 5, 6 and 7. Robust standard errors are clustered at the bank-level and t-statistics are reported in brackets.

These findings clearly challenge the recent literature in Eurozone studies focusing solely on the home bias in sovereign debt. One might argue that, in the age of technology and well-integrated markets such as in Europe, information must be cheap to attain so huge asymmetries in the markets should not arise. However, the theoretical literature illustrates that even initially small differences in informational standings of domestic and foreign agents may lead them to focus on these differences rather than spending effort to seek information related to foreign assets (Van Nieuwerburgh and Veldkamp, 2009). Furthermore, recent studies on sovereign credit risk prices in the Eurozone provide evidence that, at the peak of the crisis, there were great discrepancies between the bond yields (or CDS spreads) and the macro fundamentals of the countries in the Euro periphery, which is interpreted as a sign of market panic (De Grauwe and Ji, 2013; Saka et al., 2015). In such circumstances, it is not unreasonable to expect domestic or government-related banks to benefit from their superior informational position and collect sovereign bonds while foreign banks were leaving the debt market in a rush. In fact, some studies already show that banks that loaded up periphery country bonds during the crisis benefited from this as the crisis pressures eased (Acharya, Eisert, Eufinger, and Hirsch, 2016b).

Another counter-argument might be that there is a growing literature on how increasing sovereign exposures had negative spillovers on the private lending of European banks, which may signal that the sovereign exposure behaviour was partly involuntary for these banks (Acharya et al., 2016a; Altavilla et al., 2016; Popov and Van Horen, 2015). Still, Broner, Erce, Martin, and Ventura (2014) clearly illustrate that, in the existence of frictions in financial markets, sovereign exposures may crowd out private lending without necessarily implying involuntary or forced behaviour on the part of banks. Additionally,

some recent studies that argue in favor of moral suasion do not even find any negative effect of sovereign exposures on private lending (Ongena et al., 2016).

A key policy conclusion of this paper is that if the information channel gets active between governments and their domestic banks in the midst of a crisis, this may be considered a stabilizing force compared to a situation where even domestic banks would rush out of the market and governments would find it impossible to rollover their debt. Further policy discussions may also focus on increasing transparency in the sovereign debt market, especially in times of crisis, rather than merely shifting the regulatory power from national to supranational institutions or coming up with various innovations of debt issuance in order to cut off the diabolic loop between sovereigns and their banks (see Brunnermeier, Garicano, Lane, Pagano,Reis, Santos, Thesmar, Van Nieuwerburgh, and Vayanos, 2016).

5. Conclusion

In contrast to the recent literature on rising sovereign debt home bias across European banks, this paper argues that this phenomenon is not surprising if one takes into account one of the most conventional (albeit lately forgotten) theories of the home bias in asset markets: informational frictions.

By taking a global portfolio approach and using a novel bank-level dataset compiled from various stress-tests, transparency and capital exercises of the EBA, I show that home bias increased and sovereign debt was indeed reallocated from foreign to domestic banks at the peak of the crisis. Although it cannot fully explain the rising home bias in response to the crisis, the risk-shifting tendency of crisis-country banks seems to make a contribution. In contrast to what the secondary market theory of sovereign home bias predicts,

this reallocation was not visible at all for domestic agents other than banks; a finding that is compatible with the information asymmetry theory of home bias given the informational advantages that banks enjoy in comparison to other local agents concerning the sovereign debt of their local governments. Additionally, I demonstrate that, in response to a crisis, private forms of debt (retail and corporate) in bank balance sheets have experienced an equally large (if not larger) jump in home bias than the one observed for public debt. This is in sharp contradiction to the moral suasion story unless one assumes retail/corporate borrowers can somehow force the domestic banks to lend to them. On the other hand, this finding is exactly what one would expect from informationally more sensitive assets (such as private debt) if crisis episodes were associated with informational frictions. Finally, I present a clear information channel and demonstrate that foreign banks informationally better-linked to crisis countries have relatively increased their exposures during the crisis.

If the information channel was operational, as argued in this paper, it is expected that the reallocation would be concentrated on banks that were closely linked to the government. Hence, the conclusions of recent studies arguing in favour of moral suasion based on positive correlations between the government-relatedness of the banks and their domestic bond holdings might be biased unless they could control for the apparent informational linkages between the two. More research is needed to differentiate these two channels. On the other hand, future policy discussions may benefit from focusing on increasing transparency in the sovereign debt market rather than merely trying to shift the regulatory mechanisms from national to supranational institutions or coming up with various innovations of debt issuance in order to overcome the so-called doom loop between sovereigns and banks.

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