

DISCUSSION PAPER SERIES

No. 10661

DETERMINANTS AND VALUATION EFFECTS OF THE HOME BIAS IN EUROPEAN BANKS' SOVEREIGN DEBT PORTFOLIOS

Bálint Horváth, Harry Huizinga
and Vasso Ioannidou

FINANCIAL ECONOMICS



Centre for Economic Policy Research

DETERMINANTS AND VALUATION EFFECTS OF THE HOME BIAS IN EUROPEAN BANKS' SOVEREIGN DEBT PORTFOLIOS

Bálint Horváth, Harry Huizinga and Vasso Ioannidou

Discussion Paper No. 10661

June 2015

Submitted 12 June 2015

Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK

Tel: (44 20) 7183 8801

www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programme in **FINANCIAL ECONOMICS**. Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as an educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

Copyright: Bálint Horváth, Harry Huizinga and Vasso Ioannidou

DETERMINANTS AND VALUATION EFFECTS OF THE HOME BIAS IN EUROPEAN BANKS' SOVEREIGN DEBT PORTFOLIOS

Abstract

We document that large European banks hold sovereign debt portfolios heavily biased toward domestic government debt. This bias is stronger if the sovereign is risky and shareholder rights are strong, as evidence of a risk-shifting explanation of the home bias. In addition, the bias is stronger if the sovereign is risky and the government has positive ownership in the bank, as evidence of a government pressure channel. The home bias is positively valued by the stock market, as reflected by a positive association between the home bias and Tobin's q . The home bias premium declines with domestic sovereign risk, but less so for highly leveraged banks, suggesting that both the risk-shifting and government pressure channels are operative. The European Central Bank's large injections of liquidity in December 2011 and February 2012 reduced the marginal value of the home bias by allowing banks to expand their exposure to domestic government debt.

JEL Classification: F3, G01, G14, G15, G21 and G28

Keywords: bank valuation, government ownership, home bias, LTRO, moral suasion, risk-shifting, shareholder rights and sovereign debt crisis

Bálint Horváth b.l.horvath@tilburguniversity.edu
Tilburg University

Harry Huizinga huizinga@uvt.nl
Tilburg University and CEPR

Vasso Ioannidou v.ioannidou@lancaster.ac.uk
Lancaster University and CEPR

1. Introduction

The recent European sovereign debt crisis revealed the interrelatedness of the financial sector and government finances to be a key issue. Specifically, large holdings of domestic sovereign debt by banks may have a detrimental effect on financial and macroeconomic stability by creating a vicious loop between sovereign and bank credit risk. Distressed banks may require costly bailouts, increasing sovereign credit risk and eroding the value of government debts. This further weakens the financial sector to the extent that it is exposed to sovereign debt, implying a loop between sovereign and bank risk (Acharya, Drechsler and Schnabl, 2014).

The strength of the potentially negative feedback loop between the financial and government sectors would be reduced, if banks were less exposed to domestic government debt.¹ This renders it important to understand the determinants of banks' tendency to hold relatively large amounts of domestic government debt. This paper provides empirical evidence on the determinants of the observed home bias towards domestic government debt, and of its implications for bank valuation. Importantly, this paper provides tests that can help discriminate among competing explanations that have been put forward in the extant literature.

As a first explanation, the home bias reflects banks' optimal portfolio choice and is entirely voluntary. In particular, banks may benefit from holding risky government debt, if this enables them to increase equity returns by shifting part of the additional risk to the banks' creditors ('risk shifting'). Domestic government debt may be especially attractive in this regard, as this brings additional portfolio risk in states of the world when banks are likely to fail anyway. This reflects that sovereign defaults are likely to induce bank runs leading to bank default (Diamond and Rajan, 2011). Additional domestic debt exposure benefits domestic shareholders

¹ Recognizing the dangers of banks' excessive exposures to (domestic) government debt a recent CEPR report by Corsetti et al. (2015) proposes a regulatory change that would require banks to hold sovereign debts in proportion to, say, the issuing country's GDP to benefit from zero risk weighting.

to the extent that a bank's cost of funds does not fully reflect the heightened losses in case of a sovereign default, for instance on account of deposit insurance or the availability of cheap central bank funding. Accordingly, risky banks located in countries with risky sovereigns may have a particularly strong incentive to invest in domestic government debt. A bias towards domestic government debt further provide banks in a European context with a ‘natural hedge’ against a Eurozone break-up by reducing redenomination risks (Battistini, Pagano, and Simonelli, 2014).

As an alternative explanation, a domestic government debt home bias is the outcome of some sort of ‘government action’. In this scenario, bank shareholders are forced to acquiesce in a suboptimal portfolio choice. Governments could use ‘moral suasion’ as well as bank regulation and supervision to induce domestic banks to purchase large amounts of domestic government debt. The zero-risk weights on government debt in the Basle capital adequacy framework, in particular, provides strong incentives for banks—especially undercapitalized banks—to increase their holdings of risky, high-yielding government debt (see Acharya, Engle, and Pierret, 2014, and Acharya and Steffen, 2014).² Governments could alternatively adopt regulations that explicitly favor the holding of domestic government bonds, or pressure banks through supervisory action to support their funding needs. Overall, this ‘government action’ channel is expected to be stronger for riskier governments and for riskier banks that may be more easily pressured by their governments.

In this paper, we examine the determinants of the home bias in European banks' sovereign debt portfolios between 2010 and 2013. We use the sample of European banks that

² Korte and Steffen (2014) show that the resulting ‘sovereign subsidy’ (i.e., capital shortfall resulting from the application of zero risk weights on all government bonds regardless of their risk) is an important channel of contagion among European sovereigns. Beltratti and Stulz (2015) show that the transmission of sovereign shocks goes beyond cross-border exposures to government bonds to a weakening of the financial system more broadly.

were subject to a series of stress tests conducted by the European Banking Authority (EBA), and its predecessor, the Committee of European Banking Supervisors (CEBS), leading to the release of detailed information on bank sovereign bond holdings. This includes the largest publicly traded banks in the European Union (EU).

We first examine the determinants of the home bias by estimating regressions of any bank's exposure to any EU government's debt relative to the bank's total assets. We find that a bank's home bias is stronger, if domestic country risk – as proxied by the domestic sovereign CDS spread – is higher and if bank risk is higher – as proxied by bank leverage. These results suggest that higher risk on the part of either the government or the bank serves to intensify the link between the financial sector and government finances, increasing the chance of joint bank and sovereign failure. While significant, these results by themselves do not enable us to discriminate between the two main potential rationales for the home bias, i.e. risk-shifting and government action, as both of these are consistent with a greater home bias in the case of higher country and/or bank risk.

Three additional results provide more pointed evidence on the relative merits of the two explanations. First, as evidence in support of the government repression explanation, we find that the home bias is greater in case of a risky sovereign especially for government-owned banks. Governments have greater sway over publicly owned banks, and hence can more easily induce these banks to increase their funding to a risky sovereign. Second, as evidence of the risk shifting explanation, we find that the home bias is greater for a risky sovereign, if the bank-level corporate governance regime is more shareholder-friendly. Risk-shifting through an increased exposure to a risky sovereign serves the interests of bank shareholders consistent with the risk shifting hypothesis, possibly at the expense of bank creditors, management and employees.

Third, we find that bank valuation, as proxied by a bank's Tobin's q, is positively related to a measure of the home bias, particularly when both the country and the bank are risky, consistent with the risk-shifting explanation. The home bias, however, is negatively valued for less risky banks in risky countries, which suggests that these banks are pressured into holding more domestic government debt than is consistent with maximum bank valuation.

We further find that prior to European Central Bank's (ECB's) massive injections of liquidity through its 3-year Long Term Refinancing in Operations (LTRO) in December 2011 and February 2012, the marginal value of the sovereign debt home bias was positive, suggesting that banks could have increased their values by further increasing their home bias. Insufficient liquidity and risk-sensitive funding sources may have prevented that. The LTRO injections changed all that by increasing bank's access to cheap and risk-insensitive funding, enabling banks, particularly in riskier countries, to significantly expand their holdings of domestic government debt. This, in turn, brought down the marginal value of home bias to about zero, as market pressures began to subside and spreads in risky government bonds began to drop.

There are several papers that have previously investigated banks' bias towards domestic sovereign debt. Battistini, Pagano, and Simonelli (2014) find that banks respond to higher country risk by increasing their domestic debt exposure (although only in the case of periphery countries —i.e., already risky – countries), consistent with the main competing explanations of home bias. Going beyond Battistini, Pagano and Simonelli (2014), this paper provides separate evidence for the main explanations of the home bias.

Acharya and Steffen (2015) present evidence that banks use European government bonds to reap 'carry trade' profits. They show that bank stock returns correlate positively with the returns on Greek, Italian, Irish, Portuguese and Spanish (GIIPS) long-term government bonds

and negatively with returns on northern (German) bonds. These patterns are consistent with banks holding large GIIPS government bond portfolios financed by selling German government bonds. The authors show that this behavior is related to GIIPS governments pressurizing banks to absorb domestic debt and regulatory capital arbitrage and/or risk-shifting by riskier banks. We extend their results by providing further tests to distinguish between these channels.

Drechsler et al. (2014) analyze the Lender of Last Resort (LOLR) interventions undertaken by the ECB between 2007 and 2011. They find that as the financial crisis turned into a sovereign debt crisis in mid-2010, weakly-capitalized banks began borrowing from the LOLR facilities of the ECB, using distressed sovereign bonds as collateral, to actively further increase their exposures to risky government bonds, particularly of their home country. Consistent with Drechsler et al. (2014), we find that the ECB's LTROs in December 2011 and February 2012 enabled banks in riskier countries to further increase their exposures to domestic government debt. This in turn has brought down the spreads in risky government bonds and removed incentives for further increases in home bias.

There are some theoretical results regarding banks' incentives to create a home bias in a monetary union. Uhlig (2013) shows that when banks can pledge government bonds to obtain financing from a common central bank, regulators in risky countries have incentives to allow their banks to hold more domestic government debt, whereas regulators in 'safe' countries will impose tighter regulation. This allows governments in risky countries to borrow more cheaply by effectively shifting the risk of some of the sovereign default losses onto the balance sheets of the common central bank, and eventually to other 'safe' countries. This leads to biased government bond portfolios in riskier countries. Our results confirm Uhlig's prediction that home bias is stronger in riskier countries and in riskier banks and highlight the risk-shifting role of LTRO.

The home bias literature is embedded in a broader discussion about the interrelatedness of sovereign and bank risk and as such our paper relates to papers investigating how government bailout programs may threaten financial stability by undermining the fiscal strengths of governments and thus their implicit or explicit guarantees to the financial sector (see, among others, Acharya, Drechsler and Schnabl, 2014; Attinasi et al., 2009; BIS, 2011; Demirguc-Kunt and Huizinga, 2013; Ejsing and Lemke, 2009).

We proceed in the next section by describing the hypotheses of the paper and introduce the methodology to test the hypotheses. In section 3 we describe the data used in the paper. In section 4 we present the results. Section 5 provides a discussion of the results and concludes.

2. Hypotheses regarding the home bias and empirical approach

In the literature, several explanations are offered for the tendency of banks to allocate a relatively large portfolio share to domestic government debt. First, banks that invest heavily in domestic government debt potentially face heavy losses in the event of a default of the domestic sovereign. Increased losses in this event do not further harm bank shareholders, if the bank is going to fail anyway in the event of a domestic sovereign default. Banks are able to shift risk of a joint bank and sovereign failure to tax payers and possibly to bank creditors to the extent that a bank's funding cost does not properly reflect the cost of joint failure, due to deposit insurance or because of the availability of cheap central bank funding. Since the end of 2011, Eurozone banks have been able to obtain ample and cheap credit from the ECB's 3-year LTRO. The cost of this financing, at 1% annually at the time of announcement, does not reflect any additional bank risks resulting from increased domestic government debt exposures financed by this funding.

Second, banks' sovereign debt portfolios may display a home bias, as banks are induced to invest heavily in domestic government debt by government action. An important inducement

is the zero risk weighting attached to government debt by Basle capital adequacy rules. Occasionally individual governments use other regulatory inducements to banks to invest in domestic government debts as well. On April 24, 2014, for instance, the Hungarian central bank announced various measures with the stated aim of “improving” Hungary’s debt structure. These measures, including a new interest rate swap facility, were explicitly designed to facilitate the purchase of Hungarian debt by Hungarian banks by increasing incentives for them to hold domestic as opposed to foreign government bonds.

A third motivation has to do with the fact that exposure to domestic government debt can provide domestic banks with a ‘natural hedge’ against the risk of Eurozone break-up. The idea is that after such a break-up, domestic government debt is likely to be denominated in the same currency as the banks’ main funding categories such as bank deposits, thereby reducing redenomination risk (see, for example, Battistini, Pagano, and Simonelli, 2014).

To examine the validity of these hypotheses, our empirical work consists of two parts: (i) portfolio share regressions where the dependent variable is the ratio of each bank’s sovereign debt exposure to any EU country relative to the bank’s total assets, and (ii) bank valuation regressions where the dependent variable is a bank’s Tobin’s q constructed as the approximated market value of the bank’s assets relative to their book value.

The ‘risk-shifting’ motive for the home bias predicts that it is larger in case of a risky sovereign as then bank risk can be increased materially by a higher share of domestic government debt in the sovereign debt portfolio. However, the ‘government action’ hypothesis is also consistent with a positive impact of country risk on a bank’s domestic debt holdings, as weak governments presumably have a greater need for using their domestic banks as a funding source. Finally, the ‘natural hedge’ hypothesis can also explain a greater home bias for banks

located in risky countries, as a country's sovereign default risk can be expected to correlate with redenomination risk. Overall, we thus expect a positive relationship between the sovereign debt home bias and country default risk, even if evidence to this effect does not enable us to establish the relative merits of the various competing hypotheses for home bias.

We further relate sovereign debt shares to bank leverage as a proxy for bank risk. Risky banks have a 'risk-shifting' motive for a government debt bias as they stand a real chance of bank failure. Riskier and weaker banks may similarly be easier to cajole into holding additional domestic government debt by a government intent on increasing its bank funding. Hence, a positive relationship between bank risk and the home bias does not enable us to discriminate between the 'risk-shifting' and 'government action' rationales for the home bias.

We use information on bank ownership and bank-level corporate governance regimes to test more specific hypotheses concerning the channels underlying the sovereign debt home bias. First, we hypothesize that banks hold more government debt of risky governments if the bank is government-owned. This would be evidence in support of the 'government action' channel, as governments are more capable of nudging banks towards a higher portfolio share of domestic government debt if they are government-owned. Second, we examine whether banks hold more domestic government debt of risky countries especially if the bank's corporate governance regime is rather shareholder-friendly. Evidence of this kind supports the 'risk-shifting' motive as risk-shifting benefits shareholders at the expense of other stakeholders such as the bank's creditors and possibly its management and employees.

In addition to the portfolio share analysis, we consider the implication of a bank's home bias in its government debt portfolio on bank valuation. To this end, we construct a home bias variable that reflects to what extent a bank's share of domestic government debt in its overall

government debt portfolio exceeds the average share of that country's government debt in EU banks' government debt portfolios. A positive valuation of a bank's home bias by bank shareholders is consistent with the 'risk-shifting' and 'natural hedge' motives, while a negative valuation suggests that banks are nudged or forced to hold more domestic debt than they wish consistent with a government action explanation. A valuation of the home bias that increases with country risk similarly is consistent with the risk-shifting and natural hedge hypotheses, while a valuation of the home bias that declines with sovereign risk suggests that banks are forced to hold too much domestic government debt in case of a risky sovereign consistent with a government-action explanation of the home bias.

3. Data and descriptive statistics

We obtain data on banks' exposures to government debts of EU member states from the EU-wide stress tests conducted first by the CEBS for the first quarter of 2010, and subsequently by the EBA for the fourth quarter of 2010, the fourth quarter of 2011, the second and fourth quarters of 2012, and the second quarter of 2013. The first stress test of 2010 included 91 banks, representing 65% of the European banking market in terms of assets. Subsequent stress tests involved mostly the same set of banks. Our sovereign debt exposure data are gross of impairment³ and cover debt in both the banking and trading books. Moreover, the exposure data are net of derivative positions. As a consequence, the exposure data are potentially negative. This is the case in about 1% of the observations in our sample.

Using the exposure data, we construct the sovereign exposure variable as each bank's exposure to any one EU sovereign divided by the bank's total assets (with bank balance sheet information taken from SNL Financials; Appendix A provides variable definitions and data

³ Except for the first wave, when the exposure data is net of impairment.

sources). As seen in Table 1, the sovereign exposure variable has a mean of 0.3%, meaning that a bank's average sovereign debt exposure to any EU country is about 0.3% of total assets. The maximum value of the sovereign exposure variable is 0.321 (for the case of a Greek bank's exposure to Greek sovereign debt).

In Figure 1 we plot banks' exposure to domestic government debt as a percentage of their total assets. We present the mean values for banks in three GIIPS countries (Italy, Portugal and Spain) and for non-GIIPS banks separately.⁴ Throughout the sample period banks in GIIPS countries have higher exposures to domestic government debt than banks in non-GIIPS countries. However, this difference becomes dramatically more pronounced after the second quarter of 2012, with banks in the three GIIPS countries increasing significantly their exposures to domestic government debt. Around the same time, banks in non-GIIPS countries increased their exposures to domestic government debt as well, but to a much lesser degree.

This increase in domestic government debt coincided with the ECB's LTRO injections of liquidity in December 2011 and February 2012. Prior to this, European banks, particularly in GIIPS countries, had more limited access to liquidity and their funding costs were sensitive to the risk of their portfolios, putting a limit to their exposures to risky government debt. With the large LTRO injections in late 2011 and early 2012, banks in the Eurozone were able to access ample liquidity at very low costs that were not sensitive to their risk or the risk of any additional investments. Figure 1 indicates that banks, particularly those in GIIPS countries, may have used

⁴ We exclude Greece from the graph, because exposure data for Greek banks are not available for the fourth quarter of 2011 and the second quarter of 2012. Ireland is excluded because of missing balance sheet data for Irish banks.

the liquidity from the LTRO to significantly increase their exposures to domestic government debt.⁵

The underlying bank exposure data are also used to construct a measure of the home bias of a bank's sovereign debt portfolio following Bracke and Schmitz (2008). Let E_{ijh} be the exposure of bank i to the sovereign debt of country j given that the bank is located in country h . The share, S_{ijh} , of bank i 's government debt portfolio allocated to country j can be written as follows

$$S_{ijh} = \frac{E_{ijh}}{\sum_j E_{ijh}}$$

Actual portfolios shares, S_{ijh} , allocated to the debt of country j can be compared to the portfolio share, $CAPM_j$, for country j that would arise if all banks were to invest in sovereign debts in proportion to debts outstanding as follows

$$CAPM_j = \frac{\sum_i E_{ijh}}{\sum_i \sum_j E_{ijh}}$$

where h takes on different values for banks located in different countries.

The home bias, HB_{ih} , for a bank i located in country h is defined as 1 minus the ratio of the bank's portfolio share allocated to non- h countries divided by the share of the available debts of non- h countries as follows

$$HB_{ih} = 1 - \frac{\sum_{j \neq h} S_{ijh}}{\sum_{j \neq h} CAPM_j},$$

or equivalently

$$HB_{ih} = 1 - \left[\frac{1 - S_{ijh}}{1 - CAPM_h} \right].$$

⁵ Distinguishing between the various GIIPS countries reveals that this increase is more pronounced for Italy and Portugal. Analyzing the available data for Greek bank reveals instead an overall declining exposure of Greek banks to domestic government debt due the assumption of Greek debt by European official bodies.

The home bias HB_{ih} for bank i is zero if the bank's actual portfolio share allocated to its home country h , S_{ijh} , equals the available debt share for that country, i.e. $CAPM_h$, while $HB_{ih} > 0$ if $S_{ijh} > CAPM_h$, and vice versa. The sample mean value of HB is positive at 0.613.

In Figure 2 we plot the sample averages of the home bias variable separately for banks located in three GIIPS countries (Italy, Portugal and Spain) and banks in non-GIIPS countries. The figure shows that throughout the sample period the sovereign debt portfolios of banks in GIIPS countries were significantly more biased towards their domestic governments than the portfolios of banks in non-GIIPS countries. Furthermore, the home bias in non-GIIPS countries increased materially over the 2010-2012 period and it began decreasing for both groups of banks after July 2012. This reduction in the home bias towards the end of the sample period together with the increase in domestic government debt documented in Figure 1 suggest that banks in GIIPS countries may have used the LTRO facilities to also expand their exposures to government bonds of other countries, possibly engaging in a carry trade. Banks in non-GIIPS countries, exhibit qualitatively a similar behavior, but to a lesser degree.

In the portfolio regressions, the sovereign exposure variable is first related to the domestic variable which is a dummy variable signaling domestic sovereign debt. To represent country risk, we use the sovereign CDS spread for 5-year senior sovereign debt available from Datastream. As an index of bank risk, leverage is total liabilities divided by total assets, with a mean of 0.942.

In some specifications, we consider how a bank's sovereign debt portfolio decision depends on the share of government ownership taken from SNL Financials. On average, the share of government ownership is 5.4%.

In addition, we consider the impact of bank-level corporate governance. We use indices of corporate governance as formulated by Aggarwal, Erel, Stulz, and Williamson (2009). The indices increase with the power of minority shareholders, and are based on individual governance attributes assembled by Institutional Shareholder Services. The individual characteristics are dummy variables that take on a value of 1 if the attribute is relatively shareholder-friendly, and zero otherwise. The corporate governance variable is an overall index that summarizes information on the full set of 44 attributes. Furthermore, there are four sub-indices, called board, compensation and ownership, auditing and takeover that summarize information on 25, 10, 3 and 6 attributes related to the pertinent aspects of corporate governance. The takeover sub-index, for instance, reflects the extent to which there are corporate governance-related barriers to takeovers.

In the valuation regressions, Tobin's q is computed as the market value of equity plus the book value of total liabilities divided by the book value of total assets. The average Tobin's q is 0.984. This bank valuation measure is first related to the assets variable which is the logarithm of total assets. Larger banks may attain higher market valuation as a reflection of their too-big-to-fail status. Deposits to liabilities is the ratio of total deposits to total liabilities with a mean of 0.5. Deposits funding may increase bank valuation as it is relatively cheap and stable. The return on equity is the ratio of operating income to equity, with a mean of 0.11. A higher return on equity may be mirrored in a higher Tobin's q.

The income diversity variable measures to what extent a bank's income is diversified between net interest income and non-interest income. Specifically, this variable takes on a value of 1 if net interest income and non-interest income are equal (in this case the bank's income is taken to be well-diversified), while it declines with the absolute value of the difference between

these the two types of income. Similarly, the asset diversity variable equals 1 if its loans and securities portfolios are of equal size, while it decreases with the divergence in the size of these two bank asset categories. Banks with highly diverse income streams or asset portfolios may possibly be valued less, as they are more difficult to manage effectively (Laeven and Levine, 2007).

Finally, the asset growth variable is the rate of change of a bank's assets, while the operating income growth variable is the growth rate of a bank's operating income. Banks with growing assets or operating income may be valued more highly as a reflection of growth opportunities as perceived by bank stock investors. Table 2 provides information on correlations among the bank-level variables. The table shows that Tobin's q and the home bias have a positive correlation of 0.0508, but this correlation is not statistically significant.

4. Empirical results

4.1. Portfolio share regressions

The portfolio share regressions explain a bank's sovereign exposure to any of the EU governments as a share of the bank's total assets. In regression 1 of Table 3, the sovereign exposure variable is related only to the domestic dummy variable. The regression includes bank and time fixed effects, and errors allow for clustering at the bank level. The domestic variable obtains a coefficient of 0.059 that is significant at the 1% level. This confirms a positive home bias towards bank investments in domestic government debt as displayed in Figure 1. The coefficient of 0.059 implies that a bank's exposure to domestic government debt is on average almost 6% of assets higher than for any foreign government. This home bias is economically significant as the sovereign exposure variable has a mean of only 0.3% with a standard deviation

1.5% as seen in Table 1. In subsequent specifications we use more conservative fixed effects. In regression 2, we include country-time fixed effects instead of time fixed effects, again yielding a coefficient of 0.059 for the domestic variable that is significant at the 1% level. In regression 3, we use bank-time fixed effects, exploiting variation in government debt exposures of the same bank in the same year. Results are virtually unchanged.

Next, we examine how the home bias is affected by country risk as represented by the sovereign CDS spread, and by bank risk as represented by bank leverage. Starting with country risk only, regression 1 in Table 4 includes an interaction term of domestic with the sovereign CDS spread in addition to bank and country-time effects; the inclusion of the latter fixed effects precludes an estimation of the effect of the sovereign CDS spread per se on the portfolio share. The interaction term obtains a positive coefficient of 0.016, but it is statistically insignificant. Regression 2 instead includes bank-time fixed effects yielding almost identical results.

Next, regressions 3 and 4 additionally include the leverage variable, interactions of this variable with domestic and sovereign CDS, and a triple interaction of this variable with domestic and the sovereign CDS spread, starting from regressions 1 and 2. In regression 3, the interaction of domestic and sovereign CDS obtains a negative coefficient of -0.301 that is significant at the 10% level, while the triple interaction of domestic, sovereign CDS and leverage has a positive coefficient of 0.332 that is significant at the 10% level. These two estimated coefficients together imply that the home bias declines with the sovereign CDS spread for lowly leveraged banks, and vice versa. Specifically, the home bias declines with the sovereign CDS spread if leverage is below 0.907, and vice versa. A bank with average leverage of 0.942 is estimated to increase its home bias with the sovereign CDS spread.

The tendency for the home bias to decline with the sovereign CDS spread for lowly leveraged banks suggests that such less risky banks try to diversify away part of the risk associated with highly risky domestic government debt. Highly leveraged banks instead increase their domestic exposure with the riskiness of domestic government debt consistent with the risk-shifting as well as the government action hypotheses.

In regressions 3 and 4, the domestic variable and its interaction with leverage are highly correlated leading to collinearity. Hence, in regressions 5 and 6 we re-estimate these specifications after dropping the interaction of the domestic and leverage variables. In these regressions, the coefficient of domestic is positive and statistically significant at the 1% level. The interaction of domestic with sovereign CDS spread has a negative and statistically significant coefficient at the 5% level suggesting that home bias decreases as the country's risk increases. The coefficient of the triple interaction between domestic, sovereign CDS spread, and leverage is instead positive and statistically significant at the 5% level indicating that the home bias increases when both the country and the bank are risky. The estimated coefficients in regressions 5 and 6 imply that the home bias increases with the sovereign CDS spread if bank leverage is greater than 0.828 ($=0.0993/0.120$). This applies to almost all banks in the sample, as the minimum leverage is 0.848 from Table 1.

Next we consider how the home bias depends on the government ownership share in a bank. Governments have greater control over government-owned banks than over privately owned banks, and hence a greater home bias for government-owned banks in case of a risky sovereign suggests that governments force these banks under their control to hold more government debt. Regressions 1 and 2 of Table 5 includes an interaction between domestic and the government ownership share in regressions 1 and 2 of Table 4, yielding positive coefficients

that are statistically insignificant. The government ownership share is nearly time-invariant, and hence mostly subsumed by the bank fixed effects in these regressions. Regressions 3 and 4 additionally include a triple interaction term of domestic, the sovereign CDS spread, and the government ownership share. In these regressions, the domestic variable, its interaction with the sovereign CDS spread, and the triple interaction term obtain positive coefficients that are statistically significant at 1%, 10%, and 1%, respectively. Hence, the home bias increases with country risk as proxied by the sovereign CDS spread, and it is especially strong in case of both high country risk and a high government ownership share of the bank. The latter result could imply that governments force their government owned banks to purchase domestic government debt especially if country risk is high, and hence is consistent with a government action explanation of the home bias.

A home bias with a risk-shifting motive serves the interests of shareholders. Thus we may expect a greater home bias towards a risky sovereign if the corporate governance of the bank is relatively shareholder-friendly. To examine the impact of corporate governance, we first include interactions of domestic and corporate governance in regressions 1 and 2 of Table 4, with the results reported as regressions 1 and 2 of Table 6. Estimated coefficients for this interaction term are negative but statistically insignificant. Regressions 3 and 4 in addition include triple interactions of domestic, and sovereign CDS spread, and corporate governance. In both regressions, this triple interaction term is estimated with a positive coefficient that is significant at the 1% level. The home bias towards the debts of risky domestic sovereigns thus appears to be strong especially if corporate governance is shareholder-friendly. This is evidence in favor of a risk-shifting motive for the sovereign debt home bias.

The overall corporate governance index can be broken down into four subindices that represent corporate governance attributes related to the board, auditing, takeover matters, and compensation and ownership. To examine the separate roles of these aspects of corporate governance, we include these one at a time in regressions 1-4 of Table 7, analogously to regression 4 of Table 6. The triple interactions of the board, audit and takeover subindices with domestic and sovereign CDS obtain positive and significant coefficients in columns 1-3, while the triple interaction of compensation and ownership with domestic and sovereign CDS spread obtains a negative but insignificant coefficient in regression 4. Regression 5 in turn includes the triple interactions involving the four subindices jointly. In this instance, the triple interaction involving the board subindex is estimated with a positive and significant coefficient, while the other three triple interactions are estimated with insignificant coefficients. This suggests that board attributes that are shareholder-friendly particularly contribute towards a home bias towards risky sovereigns, consistent with a risk-shifting motive.

4.2 . Bank valuation regressions

This subsection examines the implications of the observed home bias in banks' sovereign debt portfolios on bank valuation, as proxied by Tobin's q. The relationship between bank valuation and the home bias potentially provides us with additional information on the underlying determinants of the home bias. A positive valuation of the home bias should arise if banks invest in domestic government bonds with a view to shifting risks. A home bias which is valued negatively by bank stock investors, on the other hand, is consistent with banks being forced in one way or another by their governments to invest in domestic government debt.

To start, we relate Tobin's q to the home bias variable in a regression that includes bank and country-time fixed effects. The estimated coefficient for the home bias variable, as reported

in regression 1 of Table 8, is positive at 0.00687 and significant at the 5% level. A bank with average home bias of 0.613 thus is estimated to have a Tobin's q that is 0.4% (= 0.613*0.00687) higher, consistent with a risk-shifting explanation. In regression 2, we include a set of control variables in regression 1 to control for time-varying bank characteristics. The home bias variable obtains a positive coefficient of 0.0057 that is significant at the 1% level. Among the controls, Tobin's q is positively and significantly related to leverage, while it is negatively related to bank size consistent with results in Demirguc-Kunt and Huizinga (2013).

Regressions 3 and 4 include an interaction term of the home bias and sovereign CDS variables in regressions 1 and 2. The coefficients on these interaction terms are negative and statistically significant at the 1% level in regression 4. The home bias thus is relatively negatively valued if the home country is more risky. This suggests that banks in risky countries are forced to increase their home bias beyond the level consistent with maximum bank valuation.

Regressions 5 and 6 additionally include interaction terms with leverage. The interactions of home bias with sovereign CDS continue to have negative and significant coefficients, while the triple interaction terms between home bias, sovereign CDS, and leverage have positive coefficients. Banks thus stand to benefit more from a home bias, if the country and the bank are both risky. This is consistent with the notion that risk-shifting by risky banks through a higher home bias increases bank valuation. The coefficient of leverage is positive and statistically significant, while its interaction term with sovereign CDS spread is negative and statistically significant indicating that banks with higher leverage are positively valued unless they are located in riskier countries.

Regressions 7 and 8 exclude the home bias and leverage interaction variable from regressions 5 and 6 on the ground that this variable is highly correlated with home bias. Results

with respect to the interaction terms remain almost unchanged, while the coefficient of the home bias variable gains statistical significance. Finally, regressions 9 to 12 present augmented specifications of the previous four regressions including the sovereign debt exposures to each country as a percentage of the bank's total sovereign debt portfolio. This allows to additionally control for differences in the pricing of different government bonds on Tobin's q. A similar approach was used, for example, in Huizinga and Laeven (2012). Results are unaffected.

Overall, our findings in Table 8 indicate that the home bias is positively valued, particularly if both the country and the bank are risky. Home bias in risky countries, however, is negatively valued for less risky banks, which suggest that less risky banks in risky countries may be forced to hold more domestic government debt than what is consistent with maximum bank valuation.

Next, we examine how the value of home bias varies over time. In Table 9 we estimate separate valuation regressions for each of the six stress test dates in our sample. Using the estimates from these specifications we compute the marginal value of home bias on each of these dates as the first derivative of Tobin's q with respect to the home bias variable.

Figure 3 displays the resulting marginal values. We report the estimated mean values and their 95% confidence intervals. As can be observed in Figure 3, prior to the ECB's LTRO injections in December 2011 and February 2012, the home bias had on average a positive marginal valuation (i.e., an increase in banks' home bias would on average be associated with an increase in bank value). After the LTRO injections, the average marginal value of home bias declined significantly as the crisis became less severe over time.

In combination with results in Figures 1 and 2, these results suggest that despite the positive marginal value of home bias during the first part of the sample, banks could not act on

that by increasing their home bias. The LTRO injections changed all that. By increasing banks' access to cheap liquidity, it allowed banks, and in particular banks in riskier countries, to expand their holdings of domestic government debt, which in turn brought down the marginal value of home bias as the crisis began to subside and spreads in risky government bonds began to drop.

5. Policy implications and conclusions

In this paper we analyzed banks' sovereign debt portfolios and found that there is a significant bias towards domestic government debt. This poses threats to financial stability in countries where sovereign default is perceived as a real possibility and can have implications for macroeconomic stability through its impact on credit supply (see, among others, Becker and Ivashina, 2014; van Horen and Popov, 2014). This is all the more troubling since the bias is largest in countries where the risk of sovereign and bank default are the highest.

When we look deeper at the composition of banks' sovereign debt portfolios we find support for two hypotheses to explain the home bias: more government ownership is associated with larger home bias in weak countries, supporting the government action hypothesis; and more shareholder-friendly corporate governance is positively correlated with the home bias in weak countries, in line with the risk-shifting explanation.

In bank valuation regressions, we find a premium associated with a government bond portfolio tilted towards the domestic sovereign. This premium declines with sovereign CDS spreads, but less so for highly leveraged banks, suggesting that the risk-shifting and government suasion channels are both operative.

These results provide a rationale for mitigating the risk of interconnected government finances and bank stability by way of encouraging less biased sovereign debt portfolios. Applying positive risk weights for sovereign debt is one such avenue. Furthermore, risk weights

that increase with the likelihood of default should reduce banks' incentives to shift risk to creditors and tax payers by increasing the cost of loading up on risky domestic government bonds. Risk-adjusted weights may also limit governments' willingness to force banks to absorb their debt as such an action would weaken banks' regulatory capital position and would risk a credit crunch exactly at a time when banks already face difficulties in meeting capital requirements.

Further integration of bank supervision at the European level is potentially also beneficial, as this limits governments' ability to induce banks to absorb sovereign debt by applying regulatory forbearance to risky banks exposed to substantial domestic sovereign risk and under domestic oversight. Since November 2014, the European Central Bank is the direct supervisor of about 120 large banks in the Eurozone as part of the Single Supervisory Mechanism, which should serve to eliminate any prior supervisory bias in favor of investments in domestic sovereign debt for these banks.

References

- Acharya, V., I. Drechsler, and P. Schnabl, 2014, A Pyrrhic victory? Bank bailouts and sovereign credit risk, *Journal of Finance* 69, 2689-2739.
- Acharya, V., R. Engle, and D. Pierret, 2014. Testing macroprudential stress tests: the risk of regulatory risk weights. *Journal of Monetary Economics*, forthcoming.
- Acharya, V. and S. Steffen, 2015, The greatest carry trade ever? Understanding Eurozone bank risks, *Journal of Financial Economics* 115, 215-236.
- Aggarwal, R., I. Erel, R. Stulz, and R. Williamson, 2009, Differences in governance practices between U.S. and foreign firms: Measurement, causes, and consequences, *Review of Financial Studies* 22, 3131–3169.
- Attinasi, M., C. Checherita and C. Nickel, 2009, What explains the surge in euro area sovereign spreads during the financial crisis of 2007–09?, *ECB Working Paper Series No. 1131*.
- Bank for International Settlement (BIS), 2011, The impact of sovereign credit risk on bank funding conditions, *CGFS Papers No. 43*.
- Battistini, N., M. Pagano and S. Simonelli, 2014, Systemic risk, sovereign yields and bank exposures in the euro crisis, *Economic Policy* 78, 205-241.
- Becker, B. and V. Ivashina, 2014, Financial repression in the European sovereign debt crisis, *SSRN working paper No. 2429767*.
- Beltratti, A. and R. Stulz, 2015, Bank sovereign bond holdings, sovereign shock spillovers, and moral hazard during the European crisis, *NBER working paper No. 21150*.
- Corsetti, G., L. P. Feld, P. R. Lane, L. Reichlin, H. Rey, D. Vayanos, and B. Weder di Mauro, 2015, A new start for the Eurozone: dealing with debt. *CEPR Monitoring the Eurozone Report*.
- Diamond, D. and R. G. Rajan, 2011. Fear of fire sales and the credit freeze. *Quarterly Journal of Economics* 126, 557–591.
- Demirgüç-Kunt, A. and H. Huizinga, 2013, Are banks too big to fail or too big to save? International evidence from equity prices and CDS spreads, *Journal of Banking and Finance* 37, 875-894.
- Drechsler, I., T. Drechsel, D. Martinez-Ibanez, and P. Schnabl, 2014, Who borrows from the Lender of Last Resort, *Journal of Finance*, forthcoming.
- Ejsing J. and W. Lemke, 2011, The Janus-headed salvation: Sovereign and bank credit risk premia during 2008-2009, *Economics Letters* 110, 28–31.

Huizinga H. and L. Laeven, 2012, Bank valuation and accounting discretion during a financial crisis, *Journal of Financial Economics* 106, 614-634.

Korte, J. and S. Steffen, 2014, Zero risk contagion-banks' sovereign exposure and sovereign risk spillovers, *SSRN working paper No. 2395097*.

Laeven, L. and R. Levine, 2007, Is there a diversification discount in financial conglomerates?, *Journal of Financial Economics* 85, 331-367.

Uhlig, H., 2013, Sovereign default risk and banks in a monetary union, *NBER WP 19343*.

van Horen, N. and A. Popov, 2014, Exporting sovereign stress: Evidence from syndicated bank lending during the Euro a sovereign debt crisis, *Review of Finance* 1-42.

Appendix

Table A1. Variable definitions and data sources

Variable	Definition	Source
Sovereign exposure	Bank's holdings of EU government debt to total assets	EBA, CEBS, SNL Financial
Home bias	1 minus the ratio of a bank's sovereign debt portfolio share allocated to foreign EU countries divided by the share of foreign EU country sovereign debt in all EU sovereign debt held by banks in the sample	EBA, CEBS
Domestic	Dummy variable indicating domestic sovereign debt exposure	EBA, CEBS
Sovereign CDS	CDS spread for five-year senior sovereign debt (in basis points/10,000)	Datastream
Leverage	Total liabilities divided by total assets	SNL Financial
Government ownership	Share of domestic government ownership of a bank	SNL Financial
Corporate governance	Overall corporate governance index	ISS
Board	Corporate governance index based on board attributes	ISS
Audit	Corporate governance index based on auditing attributes	ISS
Takeover	Corporate governance index based on antitakeover attributes	ISS
Competition and ownership	Corporate governance index based on compensation and ownership attributes	ISS
Tobin's q	Tobin's Q computed as market value of equity plus book value of liabilities divided by book value of assets	Datastream, SNL Financial
Assets	Logarithm of total assets	SNL Financial
Deposit to liabilities	Total deposits divided by total liabilities	SNL Financial
Return on equity	Operating income divided by total equity	SNL Financial
Income diversity	1-Abs((Net interest income - (Net noninterest income))/Total operating income)	SNL Financial
Asset diversity	1-Abs((Net loans - Total securities)/(Net loans +Total securities))	SNL Financial
Asset growth	Quarterly rate of change of total assets	SNL Financial
Operating income growth	Growth rate of operating income	SNL Financial

Table A2. Corporate governance attributes

Board attributes
1. All directors attended 75% of board meetings or had a valid excuse
2. CEO serves on the boards of two or fewer public companies
3. Board is controlled by more than 50% independent outside directors
4. Board size is greater than 5 but less than 16
5. CEO is not listed as having a related-party transaction
6. No former CEO on the board
7. Compensation committee composed solely of independent outsiders
8. Chairman and CEO are separated or there is a lead director
9. Nominating committee composed solely of independent outsiders
10. Governance committee exists and met in the past year
11. Shareholders vote on directors selected to fill vacancies
12. Governance guidelines are publicly disclosed
13. Annually elected board (no staggered board)
14. Policy exists on outside directorships (four or fewer boards is the limit)
15. Shareholders have cumulative voting rights
16. Shareholder approval is required to increase/decrease board size
17. Majority vote requirement to amend charter/bylaws
18. Board has the express authority to hire its own advisors
19. Performance of the board is reviewed regularly
20. Board-approved succession plan in place for the CEO
21. Outside directors meet without CEO and disclose number of times met
22. Directors are required to submit resignation upon a change in job
23. Board cannot amend bylaws without shareholder approval or can do so only under limited circumstances
24. Does not ignore shareholder proposal
25. Qualifies for proxy contest defenses combination points
Auditing attributes
26. Board independence: Audit committee
27. Consulting fees paid to auditors are less than audit fees paid to auditors
28. Auditors ratified at most recent annual meeting
Antitakeover attributes
29. Single class, common
30. Majority vote requirement to approve mergers (not supermajority)
31. Shareholders may call special meetings
32. Shareholder may act by written consent
33. Company either has no poison pill or a pill that was shareholder approved
34. Company is not authorized to issue blank check preferred
Compensation and ownership attributes
35. Directors are subject to stock ownership requirements
36. Executives are subject to stock ownership guidelines
37. No interlocks among compensation committee members
38. Directors receive all or a portion of their fees in stock
39. All stock-incentive plans adopted with shareholder approval
40. Options grants align with company performance and reasonable burn rate
41. Company expenses stock options
42. All directors with more than one year of service own stock
43. Officers' and directors' stock ownership is at least 1% but not over 30% of total shares outstanding
44. Repricing is prohibited

Source: Aggarwal, Erel, Stulz, and Williamson (2009)

Figure 1. Banks' exposure to domestic government debt in GIIPS and non-GIIPS countries

The graph displays the average domestic government debt to total assets ratios for banks in three GIIPS countries (Italy, Portugal and Spain) and non-GIIPS countries.

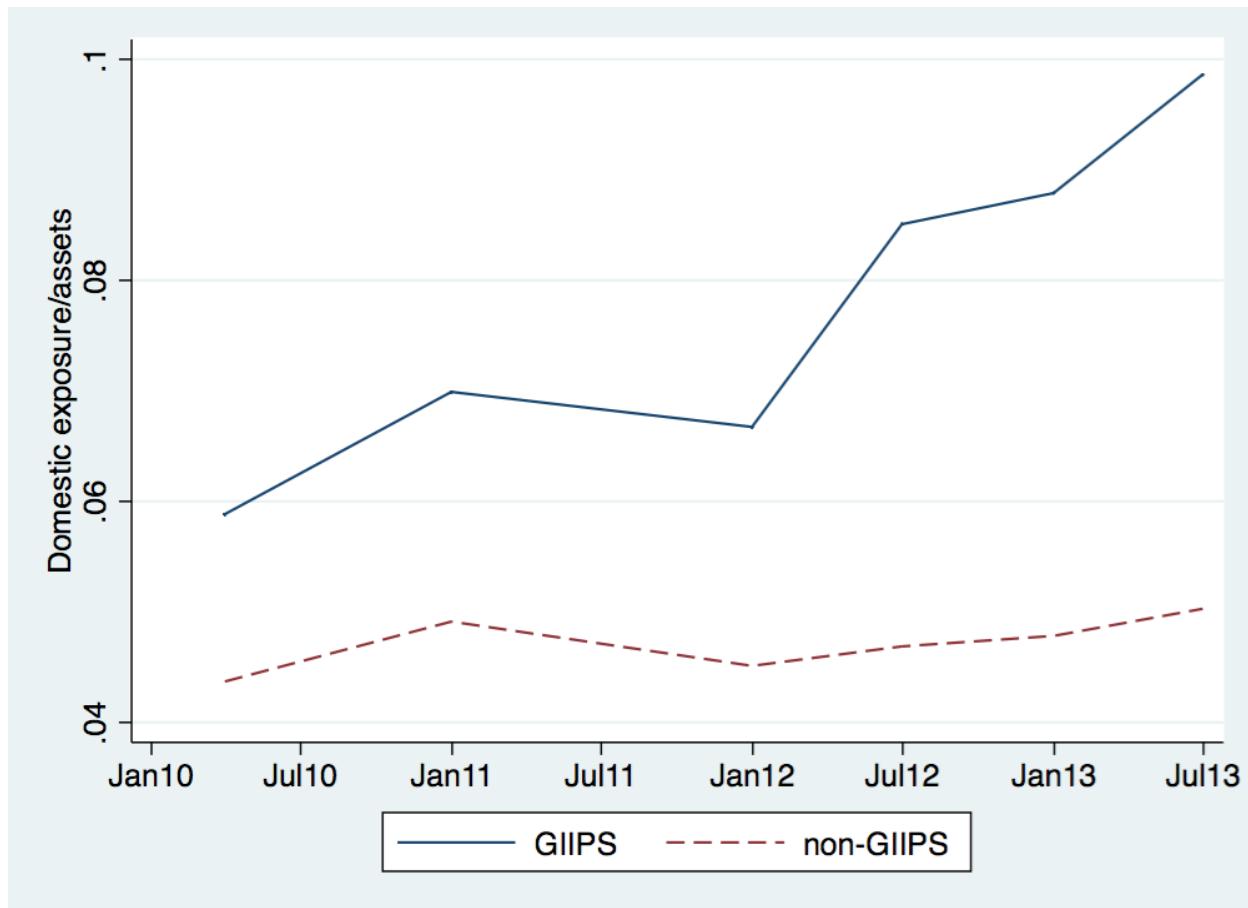


Figure 2. Average home bias for banks in GIIPS and non-GIIPS countries

The home bias is calculated as 1 minus the ratio of a bank's sovereign debt portfolio share allocated to foreign EU countries divided by the share of foreign EU country sovereign debt in all EU sovereign debt held by banks in the sample. The included GIIPS countries are Italy, Portugal and Spain.

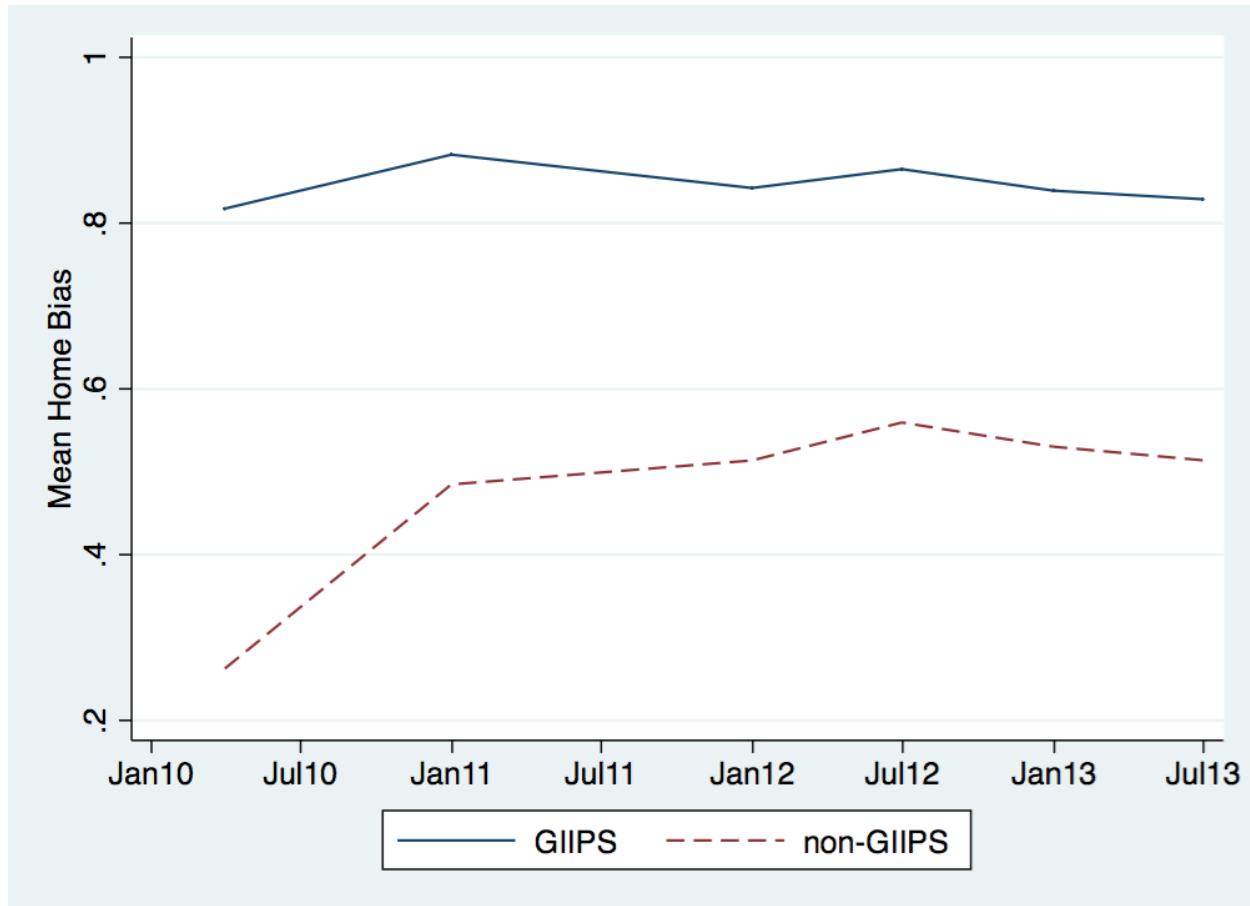


Figure 3. Marginal value of home bias during the sample period

The graph displays the average marginal value of the home bias during the sample period and the 95% confidence intervals around the estimated mean values. The estimates are obtained using the estimated coefficients of the Tobin's q regressions in Table 9, calculated using the first derivative of these regressions with respect to the home bias variable.

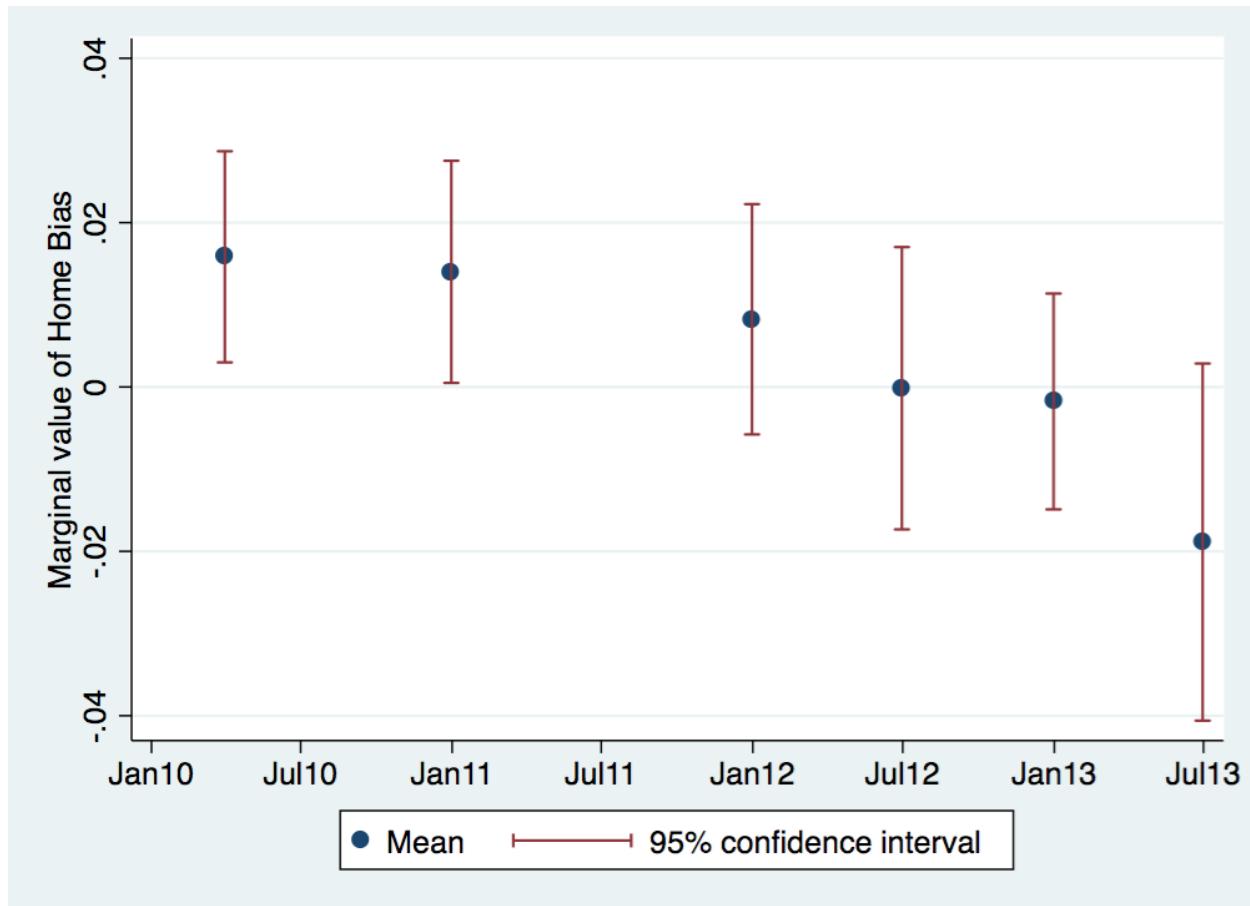


Table 1. Summary statistics

Sovereign exposure is a bank's holdings of EU government debt to total assets. Home bias is 1 minus the ratio of a bank's sovereign debt portfolio share allocated to foreign EU countries divided by the share of foreign EU country sovereign debt in all EU sovereign debt held by banks in the sample.

Domestic is a dummy variable indicating domestic sovereign debt exposure. Sovereign CDS is the CDS spread for five-year senior sovereign debt (in basis points/10,000). Leverage is total liabilities divided by total assets. Government ownership is the share of domestic government ownership of a bank. Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board attributes. Audit is a corporate governance index based on auditing attributes. Takeover is a corporate governance index based on antitakeover attributes. Competition and ownership is a corporate governance index based on compensation and ownership attributes. Tobin's q is computed as market value of equity plus book value of liabilities divided by book value of assets. Assets is the logarithm of total assets. Deposits to liabilities is total deposits divided by total liabilities. Return on equity is operating income divided by total equity. Income diversity is $1 - \text{Abs}(\text{Net interest income} - (\text{Net noninterest income})/\text{Total operating income})$. Asset diversity is $1 - \text{Abs}((\text{Net loans} - \text{Total securities})/(\text{Net loans} + \text{Total securities}))$. Asset growth is the quarterly rate of change of total assets. Operating income growth is the growth rate of operating income.

	Observations	Mean	Std. Dev.	Min	Max
Sovereign exposure	9044	0.003	0.015	-0.034	0.321
Home bias	253	0.613	0.393	-3.187	1.064
Domestic	9044	0.036	0.186	0	1
Sovereign CDS	253	0.0663	0.259	0.00108	1.490
Leverage	253	0.942	0.0264	0.848	1.033
Government ownership	241	0.0538	0.149	0	0.828
Corporate governance	183	24.66	2.688	20	31
Board	183	12.8	2.085	8	17
Audit	183	1.71	0.755	0	3
Takeover	183	3.967	0.479	2	5
Competition and ownership	183	6.175	1.372	4	9
Tobin's q	253	0.984	0.0329	0.928	1.195
Assets	191	11.97	1.354	8.556	14.59
Deposits to liabilities	191	0.498	0.155	0.189	0.927
Return on equity	191	0.111	0.0947	-0.565	0.569
Income diversity	191	0.697	0.204	0.00527	0.998
Asset diversity	191	0.560	0.216	0.144	0.996
Asset growth	191	-0.00249	0.0677	-0.144	0.731
Operating income growth	191	0.0567	0.253	-0.457	2.143

Table 2. Correlation matrix

Tobin's q is computed as the market value of equity plus book value of liabilities divided by book value of assets. Home bias is 1 minus the ratio of a bank's sovereign debt portfolio share allocated to foreign EU countries divided by the share of foreign EU country sovereign debt in all EU sovereign debt held by banks in the sample. Leverage is total liabilities divided by total assets. Sovereign CDS is the CDS spread for five-year senior sovereign debt (in basis points/10,000). Corporate governance is an overall corporate governance index. Board is a corporate governance index based on board attributes. Audit is a corporate governance index based on auditing attributes. Takeover is a corporate governance index based on antitakeover attributes. Competition and ownership is a corporate governance index based on compensation and ownership attributes. Government ownership is the share of domestic government ownership of a bank. Deposits to liabilities is total deposits divided by total liabilities. Assets is the logarithm of total assets. Income diversity is 1-Abs((Net interest income - (Net noninterest income))/Total operating income). Asset diversity is 1-Abs((Net loans - Total securities)/(Net loans +Total securities)). Return on equity is operating income divided by total equity. Asset growth is the quarterly rate of change of total assets. Operating income growth is the growth rate of operating income. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Tobin's q	Home bias	Leverage	Sovereign CDS	Corporate governance	Government ownership	Deposits to liabilities	Assets	Income diversity	Asset diversity	Return on equity	Asset growth	Operating income growth
Tobin's q	1												
Home bias	0.0508	1											
Leverage	0.00372	-0.228***	1										
Sovereign CDS	0.0885	0.134*	0.128*	1									
Corporate governance	0.299***	-0.109	0.116	0.0800	1								
Government ownership	0.254***	0.0612	-0.0493	-0.0566	-0.0973	1							
Deposits to liabilities	0.172**	0.271***	-0.582***	0.126	0.0109	0.202**	1						
Assets	-0.0765	-0.357***	0.346***	-0.167**	0.282***	-0.150*	-0.576***	1					
Income diversity	-0.0411	-0.156*	0.139*	-0.230***	-0.0768	-0.0959	-0.341***	0.251***	1				
Asset diversity	-0.0106	-0.214**	0.277***	-0.153*	0.173*	0.0964	-0.368***	0.407***	0.167*	1			
Return on equity	-0.0527	0.0265	-0.136*	-0.365***	-0.0748	0.0244	0.144*	-0.0803	0.0404	-0.0222	1		
Asset growth	0.0309	-0.0364	-0.116	0.102	0.0462	-0.0947	0.00631	-0.0753	0.0112	-0.0663	-0.0377	1	
Operating income growth	0.0167	-0.0355	0.194**	0.114	-0.0449	-0.00445	-0.133	0.106	0.181**	0.169*	-0.0719	0.0462	1

Table 3. Determinants of bank exposure to sovereign debt

The dependent variable is a bank's exposure to the sovereign debt of an EU country divided by total assets. Domestic is a dummy variable indicating domestic sovereign debt exposure. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)
Domestic	0.059*** (9.41)	0.059*** (9.37)	0.059*** (9.28)
Fixed effects			
<i>Bank</i>	Yes	Yes	
<i>Time</i>	Yes		
<i>Country*Time</i>		Yes	
<i>Bank*Time</i>			Yes
Clustering	Bank	Bank	Bank
adj. R-sq	0.522	0.519	0.51
N	9044	9044	9044

Table 4. Determinants of bank exposure to sovereign debt

The dependent variable is a bank's exposure to the sovereign debt of an EU country divided by total assets. Domestic is a dummy variable indicating domestic sovereign debt exposure. Sovereign CDS is the CDS spread for five-year senior sovereign debt (in basis points/10,000). Leverage is total liabilities divided by total assets. *, **, and *** denote significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)	(5)	(6)
Domestic	0.0583*** (8.95)	0.0583*** (8.87)	0.322 (1.33)	0.322 (1.32)	0.0584*** (8.95)	0.0584*** (8.86)
Domestic * Sovereign CDS	0.0159 (1.41)	0.0159 (1.39)	-0.301* (-1.73)	-0.301* (-1.71)	-0.0993** (-2.09)	-0.0993** (-2.07)
Domestic * Leverage			-0.279 (-1.08)	-0.279 (-1.07)		
Domestic * Leverage * Sovereign CDS			0.332* (1.78)	0.332* (1.77)	0.120** (2.45)	0.120** (2.43)
Leverage			0.0201 (1.43)		0.0101 (1.15)	
Leverage * Sovereign CDS			-0.0210 (-1.45)		-0.0134 (-1.05)	
Fixed effects						
<i>Bank</i>	Yes		Yes		Yes	
<i>Country*Time</i>	Yes		Yes		Yes	
<i>Bank*Time</i>		Yes		Yes		Yes
Clustering	Bank	Bank	Bank	Bank	Bank	Bank
adj. R-sq	0.521	0.512	0.527	0.519	0.521	0.512
N	9044	9044	9044	9044	9044	9044

Table 5. Government ownership and bank exposure to sovereign debt

The dependent variable is a bank's exposure to the sovereign debt of an EU country divided by total assets. Domestic is a dummy variable indicating domestic sovereign debt exposure. Sovereign CDS is the CDS spread for five-year senior sovereign debt (in basis points/10,000). Government ownership is the share of domestic government ownership of a bank. *, **, and *** denote significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)
Domestic	0.052*** (8.51)	0.052*** (8.43)	0.052*** (8.84)	0.052*** (8.76)
Domestic*Sovereign CDS	0.028** (2.09)	0.028** (2.07)	0.024* (1.91)	0.024* (1.89)
Domestic*Government ownership	0.050 (0.97)	0.0497 (0.96)	-0.034 (-1.11)	-0.0343 (-1.12)
Domestic*Sovereign CDS*Government ownership			4.701*** (4.33)	4.728*** (4.31)
Fixed effects				
<i>Bank</i>	Yes		Yes	
<i>Country*Time</i>	Yes		Yes	
<i>Bank*Time</i>		Yes		Yes
Clustering	Bank	Bank	Bank	Bank
adj. R-sq	0.535	0.527	0.618	0.613
N	8232	8232	8232	8232

Table 6. Corporate governance and bank exposure to sovereign debt

The dependent variable is a bank's exposure to the sovereign debt of an EU country divided by total assets. Domestic is a dummy variable indicating domestic sovereign debt exposure. Sovereign CDS is the CDS spread for five-year senior sovereign debt (in basis points/10,000). Corporate governance is an overall corporate governance index. *, **, and *** denote significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)
Domestic	0.128*	0.128*	0.150**	0.150**
	(1.92)	(1.90)	(2.22)	(2.20)
Domestic*Sovereign CDS	0.031*	0.0305*	-0.170***	-0.172***
	(1.77)	(1.75)	(-3.06)	(-3.03)
Domestic*Corporate governance	-0.003	-0.003	-0.004	-0.004
	(-1.21)	(-1.20)	(-1.52)	(-1.51)
Domestic*Sovereign CDS*Corporate governance			0.008***	0.008***
			(3.61)	(3.57)
Fixed effects				
<i>Bank</i>	Yes		Yes	
<i>Country*Time</i>	Yes		Yes	
<i>Bank*Time</i>		Yes		Yes
Clustering	Bank	Bank	Bank	Bank
adj. R-sq	0.525	0.517	0.527	0.519
N	5152	5152	5152	5152

Table 7. Corporate governance subindices and bank exposure to sovereign debt

The dependent variable is a bank's exposure to the sovereign debt of an EU country divided by total assets. Domestic is a dummy variable indicating domestic sovereign debt exposure. Sovereign CDS is the CDS spread for five-year senior sovereign debt (in basis points/10,000). Board is a corporate governance index based on board attributes. Audit is a corporate governance index based on auditing attributes. Takeover is a corporate governance index based on antitakeover attributes. Competition and ownership is a corporate governance index based on compensation and ownership attributes. *, **, and *** denote significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)	(5)
Domestic	0.143*** (3.44)	0.047*** (2.89)	0.005 (0.13)	0.053 (1.65)	0.139* (1.73)
Domestic*Sovereign CDS	-0.152*** (-4.47)	-0.034 (-0.99)	-2.165** (-2.42)	-0.054 (-0.86)	-0.103 (-0.05)
Domestic*Board	-0.007** (-2.38)				-0.008*** (-2.74)
Domestic*Sovereign CDS*Board	0.015*** (5.57)				0.074* (1.99)
Domestic*Audit		0.000 (0.05)			0.006 (0.61)
Domestic*Sovereign CDS*Audit		0.026* (2.02)			0.220 (1.00)
Domestic*Takeover			0.011 (1.02)		-0.002 (-0.16)
Domestic*Sovereign CDS*Takeover			0.548** (2.45)		0.159 (0.35)
Domestic*Compensation and ownership				-0.001 (-0.15)	0.002 (0.40)
Domestic*Sovereign CDS*Compensation and ownership				0.011 (1.40)	-0.249 (-1.44)
Bank*Time fixed effects	Yes	Yes	Yes	Yes	Yes
Clustering	Bank	Bank	Bank	Bank	Bank
adj. R-sq	0.524	0.478	0.494	0.477	0.550
N	5152	5152	5152	5152	5152

Table 8. Bank valuation and the sovereign debt home bias

The dependent variable is Tobin's q computed as the market value of equity plus book value of liabilities divided by book value of assets. Home bias is 1 minus the ratio of a bank's sovereign debt portfolio share allocated to foreign EU countries divided by the share of foreign EU country sovereign debt in all EU sovereign debt held by banks in the sample. Sovereign CDS is the CDS spread for five-year senior sovereign debt (in basis points/10,000). Leverage is total liabilities divided by total assets. Assets is the logarithm of total assets. Deposits to liabilities is Deposits to liabilities is total deposits divided by total liabilities. Return on equity is operating income divided by total equity. Income diversity is 1-Abs((Net interest income - (Net noninterest income))/Total operating income). Asset diversity is 1-Abs((Net loans - Total securities)/(Net loans +Total securities)). Asset growth is the quarterly rate of change of total assets. Operating income growth is the growth rate of operating income. Regressions with portfolio shares additionally include the bank's sovereign exposures to each country as a share of total bank assets. *, **, and *** denote significance at 10%, 5%, and 1%.

	Without portfolio shares								With portfolio shares			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Home Bias	0.00687** (2.55)	0.00570*** (6.28)	0.00721** (2.49)	0.00643*** (7.54)	0.175 (0.33)	0.538 (1.19)	0.00752*** (6.84)	0.00673*** (6.12)	-0.333 (-0.81)	-0.181 (-0.36)	0.00906*** (3.50)	0.00863 (1.49)
Home Bias * Sovereign CDS			-0.0587 (-1.38)	-0.143*** (-4.12)	-1.703*** (-4.47)	-1.887*** (-6.43)	-1.577*** (-10.49)	-1.518*** (-14.16)	-1.183*** (-4.45)	-1.000*** (-2.95)	-1.427*** (-12.52)	-1.130*** (-6.34)
Home Bias * Leverage					-0.175 (-0.32)	-0.558 (-1.17)			0.359 (0.83)	0.199 (0.38)		
Home Bias * Sovereign CDS					1.638*** (4.08)	1.839*** (5.85)	1.502*** (11.21)	1.439*** (14.46)	1.162*** (4.06)	1.100*** (3.13)	1.424*** (15.52)	1.238*** (6.78)
* Leverage												
Leverage	0.717** (2.77)		0.929*** (4.34)	1.095* (2.08)	1.242*** (2.97)	0.969*** (4.54)	0.900** (2.80)	0.550 (1.45)	0.567 (1.30)	0.852*** (5.56)	0.721*** (3.67)	
Leverage * Sovereign CDS					-1.273*** (-3.34)	-1.366*** (-4.67)	-1.172*** (-6.55)	-1.130*** (-6.55)	-0.747*** (-2.94)	-0.535* (-1.92)	-0.967*** (-9.35)	-0.638*** (-3.44)
Assets	-0.0294** (-2.16)		-0.0249*** (-3.24)		-0.0219** (-2.62)		-0.0255*** (-3.10)		-0.00646 (-0.19)			-0.00507 (-0.16)
Deposits/liabilities	-0.0650 (-0.88)		-0.0493 (-0.75)		-0.0457 (-0.66)		-0.0500 (-0.76)		-0.0360 (-0.73)			-0.0368 (-0.72)
ROE	0.00480 (0.94)		0.0128 (1.59)		0.0122*** (3.19)		0.00911* (2.04)		0.00585 (1.09)			0.00670 (1.57)
Income diversity	-0.00831 (-1.13)		0.00106 (0.14)		0.000386 (0.06)		-0.000312 (-0.05)		-0.0110 (-1.30)			-0.0107 (-1.24)
Asset diversity	-0.0215 (-0.81)		-0.0274 (-0.96)		-0.0277 (-0.88)		-0.0185 (-0.65)		0.00340 (0.07)			-0.000874 (-0.02)
Asset growth	-0.00256		-0.00565		-0.0134		-0.00721		0.00776			0.00485

		(-0.25)		(-0.53)		(-1.18)		(-0.71)		(0.12)		(0.08)
Operative income growth		0.00481		0.00516		0.00277		0.00265		0.000874		0.00120
		(0.59)		(0.64)		(0.74)		(0.66)		(0.21)		(0.36)
Constant	0.986***	0.754	0.986***	0.473	-0.0734	0.130	0.0477	0.507	0.457	0.554	0.166	0.389
	(1046.71)	(1.75)	(970.68)	(1.72)	(-0.14)	(0.32)	(0.23)	(1.57)	(1.25)	(0.68)	(1.12)	(0.67)
Fixed effects												
Bank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country	Country
adj. R-sq	0.926	0.950	0.927	0.962	0.968	0.969	0.968	0.968	0.980	0.983	0.980	0.984
N	253	191	253	191	253	191	253	191	253	191	253	191

Table 9. Bank valuation and the sovereign debt home bias over time

This table reports separate valuation regressions for each of the six stress tests dates in our sample. The specification corresponds to regression 5 in Table 8. The dependent variable is Tobin's q computed as the market value of equity plus book value of liabilities divided by book value of assets. Home bias is 1 minus the ratio of a bank's sovereign debt portfolio share allocated to foreign EU countries divided by the share of foreign EU country sovereign debt in all EU sovereign debt held by banks in the sample. Sovereign CDS is the CDS spread for five-year senior sovereign debt (in basis points/10,000). Leverage is total liabilities divided by total assets. Assets is the logarithm of total assets. Deposits to liabilities is Deposits to liabilities is total deposits divided by total liabilities. Return on equity is operating income divided by total equity. Income diversity is 1-Abs((Net interest income - (Net noninterest income))/Total operating income). Asset diversity is 1-Abs((Net loans - Total securities)/(Net loans +Total securities)). Asset growth is the quarterly rate of change of total assets. Operating income growth is the growth rate of operating income. *, **, and *** denote significance at 10%, 5%, and 1%.

	(1) 31/03/10	(2) 31/12/10	(3) 31/12/11	(4) 30/06/12	(5) 31/12/12	(6) 30/06/13
Home Bias	2.147 (1.24)	2.208 (1.34)	2.710* (2.08)	3.210** (2.65)	1.874 (1.71)	2.338* (2.12)
Home Bias * Sovereign CDS	-22.64 (-0.44)	-19.57 (-1.31)	-18.16 (-1.53)	-31.61** (-2.23)	-0.989** (-2.27)	-1.065*** (-3.41)
Home Bias * Leverage	-2.254 (-1.24)	-2.344 (-1.34)	-2.834* (-2.06)	-3.354** (-2.64)	-1.990 (-1.72)	-2.483** (-2.13)
Home Bias * Sovereign CDS * Leverage	23.47 (0.43)	21.72 (1.38)	18.62 (1.50)	32.14** (2.19)	1.095** (2.31)	0.958*** (3.04)
Leverage * Sovereign CDS	-0.189 (-0.10)	-1.122 (-1.66)	0.0550 (0.52)	0.426* (2.01)	-0.0654** (-2.22)	0.180*** (12.04)
Leverage	1.028* (2.02)	1.095* (1.97)	1.700*** (3.58)	1.775*** (3.55)	1.523** (2.37)	1.976** (2.82)
Constant	0.00909 (0.02)	-0.0413 (-0.08)	-0.644 (-1.43)	-0.714 (-1.51)	-0.455 (-0.75)	-0.883 (-1.34)
Clustering	Country	Country	Country	Country	Country	Country
adj. R-sq	0.163	0.165	0.330	0.445	0.223	0.145
N	44	49	38	39	42	41