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International Capital Mobility
and Financial Fragility - Part
2. The Demand for Safe
Assets in Emerging
Economies and Global
Imbalances: New Empirical
Evidence

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**INTERNATIONAL CAPITAL MOBILITY AND FINANCIAL FRAGILITY
PART 2: THE DEMAND FOR SAFE ASSETS IN EMERGING ECONOMIES AND GLOBAL
IMBALANCES: NEW EMPIRICAL EVIDENCE**

ECONOMICS DEPARTMENT WORKING PAPERS No. 903

by Rudiger Ahrend and Cyrille Schwellnus

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ABSTRACT/RÉSUMÉ

International Capital Mobility and Financial Fragility
Part 2: The Demand for Safe Assets in Emerging Economies and Global Imbalances:
New Empirical Evidence

Mismatches between the supply and the demand of safe financial assets in fast-growing emerging countries have been singled out by economic theory as drivers of international capital flows and, ultimately, global current account imbalances. This paper assesses empirically the contribution of the search for safe assets to the size and composition of emerging countries' international asset portfolios. Excess demand for safe assets in financially less-developed countries would imply that these countries hold disproportionately high shares of their total portfolios in foreign assets. Moreover, financially less-developed countries would be expected to hold disproportionately high shares of their foreign portfolios in financially highly-developed countries, as ostensibly safe assets are predominantly produced by the latter. This paper finds little empirical support for these predictions. Financially less-developed countries allocate a larger proportion of their total holdings to domestic assets. Even when focusing on less-developed countries' foreign portfolios, there is no evidence of a general bias toward the assets of financially highly-developed countries. Overall, asset mismatches do not appear to be significant drivers of asset allocation of financially less-developed countries.

JEL classification codes: F2; F3; F4; G1

Keywords: Global imbalances; asset mismatches; home bias; foreign investment; capital flows; financial development

Flux de capitaux internationaux et fragilité financière
Partie 2 : La demande d'actifs sûrs des pays émergents et les déséquilibres financiers
internationaux : évidence empirique

Le déséquilibre entre l'offre et la demande d'actifs financiers sûrs des pays émergents à forte croissance a été identifié comme une des explications théoriques des flux de capitaux internationaux et des déséquilibres mondiaux. Ce papier évalue empiriquement la contribution de la demande d'actifs sûrs au volume et à la composition des portefeuilles d'actifs des pays émergents. L'excès de demande d'actifs sûrs dans les pays financièrement moins développés impliquerait que ces pays affectent une partie disproportionnée de leurs portefeuilles globaux aux actifs extérieurs. Une partie disproportionnée des portefeuilles extérieurs devrait de surcroît être affectée aux pays financièrement très développés, ceux-ci produisant de grandes quantités d'actifs perçus comme sûrs. Ce papier ne trouve que peu de support empirique pour ces prédictions. Les pays financièrement moins développés affectent une plus grande partie de leurs portefeuilles globaux aux actifs domestiques que les pays financièrement très développés. L'analyse de la composition des portefeuilles extérieurs des pays financièrement moins développés ne permet pas non plus de détecter un biais systématique vers les pays financièrement très développés. Dans l'ensemble, le déséquilibre entre l'offre et la demande d'actifs sûrs des pays financièrement moins développés ne semble pas être à l'origine de leurs choix d'allocation d'actifs.

Codes JEL : F2 ; F3 ; F4 ; G1

Mots Clés : Déséquilibres mondiaux ; excès de demande d'actifs sûrs ; biais domestique ; investissement étranger ; flux de capitaux ; développement financier

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**INTERNATIONAL CAPITAL MOBILITY AND FINANCIAL FRAGILITY
PART 2: THE DEMAND FOR SAFE ASSETS IN EMERGING ECONOMIES AND GLOBAL
IMBALANCES: NEW EMPIRICAL EVIDENCE**

by

Rudiger Ahrend and Cyrille Schwellnus¹

Introduction

1. The emergence of large global current account imbalances over the past decade has sparked concerns, particularly as regards their implications for financial stability. While the causes of global imbalances remain a subject of debate, one influential view sees them as driven by a mismatch between the supply and the demand of safe financial assets. According to this view, fast-growing emerging and commodity-producing countries have seen fast increases in disposable income without corresponding increases in financial development and supply of safe financial assets. The resulting excess demand has been re-directed to financially highly-developed countries capable of producing vast amounts of financial assets perceived as safe (Caballero, 2006; Caballero *et al.*, 2008; Mendoza *et al.*, 2009). This has put downward pressure on long-term interest rates in safe-asset producing countries, and may thereby have contributed to increasing financial leverage. As financial development in emerging countries changes only gradually over time, the asset mismatch hypothesis would imply limited short-term scope for reducing global imbalances. Instead, policy would predominantly need to deal with their consequences, *e.g.* by strengthening prudential regulation. Over the medium term, global imbalances would narrow as financial markets in fast-growing emerging economies develop. An appropriate medium-term policy would therefore include measures to spur financial market development in emerging economies.

2. The asset mismatch hypothesis has two empirically-testable implications. In the model of Caballero *et al.* (2008), a positive shock to growth in financially less-developed countries leads to excess demand for safe assets.² In equilibrium, this results in lower world interest rates and in financially-less developed countries importing assets from financially highly-developed countries. While financially developed countries fully satisfy their asset demand domestically, the portfolio of financially less-developed countries includes foreign assets. A first empirically-testable implication of the asset mismatch hypothesis is thus that financially less-developed countries should hold a higher share of their *total* portfolio in foreign securities than financially more-developed countries. Second, they should hold a particularly high share of their *foreign* portfolio in financially highly-developed countries, as ostensibly

1. We would like to thank Romain Duval, Jorgen Elmeskov, Antoine Goujard, Mauro Pisu, Jean-Luc Schneider, other colleagues in the OECD Economics Department and delegates of Working Party No.1 on Macroeconomic and Structural Policy Analysis for useful suggestions, as well as Celia Rutkoski and Diane Scott for editorial support. Fabian Stephany and Olga Tschekassin provided excellent statistical assistance. All remaining errors are those of the authors. The views expressed in this Working Paper are those of the authors and do not necessarily represent those of the OECD or its member countries.

2. In Caballero *et al.* (2008) there is no difference in the risk structure of the assets produced by financially highly-developed and financially less-developed countries, but the latter are assumed to produce a lower share of assets relative to income.

safe assets are predominantly produced by the latter. This paper uses these theoretical predictions to assess the practical relevance of the asset-mismatch hypothesis.³

3. The existing empirical evidence on the asset-mismatch hypothesis is based on asset holdings in the United States. Forbes (2010) uses data on US foreign financial liabilities to determine what drives investments into the United States.⁴ The main finding of the paper is that financially less-developed countries tend to invest a larger share of their total portfolio in the United States than financially more-developed countries. This result is found to hold for both debt and equity securities. Insofar as the United States is among the countries producing a large amount of ostensibly safe assets, this would support the asset-mismatch hypothesis. However, one drawback of Forbes (2010) is that the United States is the only receiving country in the sample, which makes it impossible to assess whether financially less-developed countries generally hold higher portfolio shares in other countries producing assets perceived as safe. The result of Forbes (2010) could therefore reflect a US-specific effect, perhaps related to the US dollar's role as the world main reserve and transaction currency, rather than a general preference of financially less-developed countries for the assets of financially highly-developed countries.⁵

4. This paper assesses the validity of the asset-mismatch hypothesis in a fully bilateral setup with a large number of receiving and investing countries. The main result is that financially less-developed countries generally hold smaller shares of their *total* portfolio in financially more-developed countries than the latter do among themselves. This result is attributable to a larger "home bias" in financially less-developed countries, in the sense that financially less-developed countries allocate larger shares of their *total* portfolios to domestic assets than financially more-developed countries despite their domestic securities markets accounting for a smaller share of the world market capitalisation. However, even when analysing only the composition of financially less-developed countries' *foreign* portfolios, there is no evidence of a general preference for the assets of financially highly-developed countries. The results in this paper thus do not support the empirical implications of the asset mismatch hypothesis, but are consistent with the view that financially highly-developed countries engage in larger cross-investments because of lower financial transaction costs (Martin and Rey, 2004).⁶ Focusing on single destination countries that may be perceived as producing safe assets, such as those English-speaking countries explicitly considered by Caballero *et al.* (2008) (Australia, the United Kingdom and the United States) or Germany and Switzerland does not change this conclusion.⁷

3. Theoretically, asset mismatches drive both capital outflows from emerging markets and a fall in world interest rates. However, it is empirically more convenient to test the predictions on capital flows than those on interest rates, as it is difficult to disentangle the effect of asset mismatches on interest rates from other factors.

4. Chen and Imam (2011) adopt a different approach and construct an asset shortage index as the difference between domestic savings and the issuance of domestic financial instruments. They find that asset shortages are widespread among emerging economies.

5. The status of the US dollar as the world reserve and transaction currency is related to its status as a producer of safe assets, as private investors may view official US debt securities as particularly liquid.

6. The results are also consistent with a strand in the finance literature that emphasises that more sophisticated investors tend to invest more in unfamiliar environments than unsophisticated investors, presumably because of their superior information-gathering capabilities (Grinblatt and Keloharju, 2001) or the availability of hedging instruments.

7. The results for the United States are at odds with Forbes (2010). This may to some extent be due to an underestimation of domestic market capitalisation in Forbes (2010) and thus an overestimation of the share of foreign assets in financially less-developed countries' portfolios. See footnote 30 below.

5. The remainder of this paper is structured as follows. The first section describes the underlying data and the methodology adopted for the empirical analysis. Section 2 presents descriptive statistics on asset allocation across selected investing and receiving countries, with a particular focus on emerging countries. It is shown that asset allocation in emerging countries exhibits a particular strong home bias with no generalised preference for safe-haven assets. Section 3 presents the results from the econometric analysis of debt securities, both in a fully bilateral setup and focusing on selected “safe haven” countries. In line with the descriptive statistics, no evidence for over-investment of financially less-developed countries in their financially more-developed counterparts is detected. The sensitivity checks in Section 4 show that these results are robust to different measures of financial development and different estimation samples. Section 5 concludes. The Appendix shows that similar results are obtained when conducting the analysis for equity instead of debt securities.

1. Methodology and data

1.1. Methodology

6. Solnik (1974) and Sercu (1980) show that in an international version of the simple Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965), under purchasing power parity and perfect capital-market integration, in equilibrium investors hold the world portfolio, with each country receiving a weight equal to its share in world market capitalisation. Although this equilibrium only holds under the specific assumptions of these models, it provides a useful and widely-used benchmark against which to assess empirical portfolio allocations (Chan *et al.*, 2005; De Santis, 2006; Forbes, 2010). The deviation of each sending country’s portfolio share in a specific receiving country from the receiving country’s share in the world market capitalisation is thus used as the dependent variable in the empirical analysis. More specifically, the focus is on:

$$TotalBias_{od,t}^j = \ln \left(\frac{\frac{Holdings_{od,t}^j}{TotalHoldings_{o,t}^j}}{\frac{MarketCapitalisation_{d,t}^j}{WorldMarketCapitalisation_t^j}} \right)$$

$TotalBias_{od,t}^j$ denotes the logarithmic deviation of country o ’s share of holdings of security j in country d from country d ’s share in the global market portfolio of security j in year t . To ensure that results do not depend on this definition of the dependent variable and the specific CAPM benchmark, an alternative specification that relies on a simple gravity equation with bilateral holdings as the dependent variable is also estimated.

7. $TotalHoldings_{o,t}^j$ is calculated as the total market capitalisation of country o plus the total foreign holdings of country o less all foreign holdings of country o ’s liabilities. Total foreign holdings and liabilities of country o can either be calculated as the sums of all bilateral holdings and liabilities in the IMF CPIS data or directly taken from the multilateral data in Lane and Milesi-Ferretti (2007). The results in the main text refer to total foreign assets and liabilities calculated as the sums of bilateral holdings and liabilities. Sensitivity checks using the Lane and Milesi-Ferretti (2007) data are conducted in Appendix A1.

8. The deviation of each sending country’s portfolio shares from recipient countries’ shares in the world market capitalisation can be decomposed into a foreign bias and a country-specific bias (Appendix A3). The foreign bias captures to which extent the investing country allocates a higher share of its *total* portfolio to foreign assets than predicted by the simple international CAPM benchmark used in this

paper. In the sense that the foreign bias captures overinvestment abroad with respect to the benchmark, it can be thought of as an inverse measure of the investing country's home bias.⁸ The country-specific bias captures to which extent the investing country allocates a higher share of its *foreign* portfolio to a specific receiving country than predicted by the benchmark. Algebraically, the foreign and country-specific biases can be expressed as follows:

$$\begin{aligned}
 \text{ForeignBias}_{ot}^j &= \ln \left(\frac{\frac{\text{ForeignHoldings}_{o,t}^j}{\text{TotalHoldings}_{o,t}^j}}{\frac{\text{ForeignMarketCap}_{o,t}^j}{\text{WorldMarketCap}_t^j}} \right), \\
 \text{CountryBias}_{od,t}^j &= \ln \left(\frac{\frac{\text{Holdings}_{od,t}^j}{\text{ForeignHoldings}_{o,t}^j}}{\frac{\text{MarketCap}_{d,t}^j}{\text{ForeignMarketCap}_{o,t}^j}} \right).
 \end{aligned}$$

9. The observed portfolio allocation can deviate from the simple international CAPM benchmark for a number of factors. The empirical literature has identified information frictions, capital controls, institutional quality and bilateral trade as important determinants of international portfolio allocation (Portes *et al.*, 2001; Lane and Milesi-Ferretti, 2008; Alfaro *et al.*, 2008). This motivates the following empirical model of the deviation from the benchmark:

$$\begin{aligned}
 \text{TotalBias}_{od,t}^j &= \beta_1 \text{Closeness}_{od,t} + \beta_3 \text{CapitalControls}_{d,t} \\
 &+ \beta_4 \text{InstitutionalQuality}_{d,t} + \beta_5 \text{Trade}_{od,t} \\
 &+ \beta_6 \left(\text{FinancialDevelopment}_{d,t} / \text{FinancialDevelopment}_{o,t} \right) + \delta_t + \varepsilon_{od,t} \quad (1)
 \end{aligned}$$

10. The precise definition of the explanatory variables in Equation (1) is as follows:

- *Closeness*_{od,t} is the first standardised principal component of indicator variables for common language, common border, colonial relationship, as well as the logarithm of geographical distance between countries *o* and *d* and the logarithm of bilateral newspaper imports of *o* from *d*. These variables are included to control for cultural and geographical proximity and are fairly standard in the literature on the determinants of bilateral investment positions.
- *InstitutionalQuality*_{d,t} is the first standardised principal component of the abovementioned World Bank indices measuring control of corruption, the rule of law, government effectiveness and the overall quality of regulation in the receiving country. These are standard variables in the literature on the determinants of international capital flows. It should be noted that institutional quality enters the estimating equation as a receiving country variable because the empirical literature generally emphasises the role of institutions in the *receiving* rather the *investing* country for the size of bilateral capital flows.⁹ Moreover, at least in the baseline specification, it is not desirable to treat asset mismatches in the investing country as conditional on institutional quality. From a policy perspective, the relevant question is whether asset mismatches in financially less-

8. See Appendix A3 for an algebraic expression of the home bias as defined in the present paper.

9. See Alfaro *et al.* (2008) for a recent study.

developed countries are large in unconditional terms, rather than conditional on a large array of other country characteristics, such as institutional development. For completeness, the baseline specification is nonetheless augmented by institutional quality in the investing country and other origin country characteristics in a subset of the regressions reported in Section 3.

- $CapitalControls_{d,t}$ is the Schindler (2009) index of capital inflow restrictions in the receiving country. The restrictiveness index for debt securities is used in the bond regressions and the equity securities index in the portfolio equity regressions. For the same reasons as for institutional quality, in the baseline specification capital controls enter the estimating equation as a *receiving* country variable. For completeness, the baseline specification is augmented by capital outflow controls in the investing country in a subset of the regressions reported in Section 3.
- $Trade_{od,t}$ denotes the logarithm of bilateral trade between countries o and d divided by the product of the countries' GDPs. Several studies (*e.g.* Lane and Milesi-Ferretti, 2008) have shown that bilateral trade is a strong predictor of bilateral asset holdings. The bilateral trade variable can be thought of as measuring residual information frictions not captured by the geographical and cultural proximity variables.¹⁰
- $FinancialDevelopment_{d,t}/FinancialDevelopment_{o,t}$ denotes the logarithm of the ratio of financial development in country d to financial development in country o . According to the asset mismatch hypothesis, the estimated coefficient on this variable should be positive. A negative estimated coefficient on this variable implies that countries at low levels of financial development hold particularly low shares of their portfolios in financially highly-developed countries, which is inconsistent with the asset mismatch hypothesis. Financial development is proxied by different measures of financial market size, such as the ratio of bond or equity market capitalisation to GDP or the ratio of private credit to GDP.¹¹
- δ_t is a year fixed effect that controls for shocks that are common to all countries in the sample.

11. This parsimonious baseline specification is chosen to include a maximum number of countries and avoid potential multicollinearity issues. Some empirical studies (Portes *et al.*, 2001; Lane and Milesi-Ferretti, 2008; Forbes, 2010) include proxies for the return differential or the correlation of returns between the sending and the receiving countries to assess the relevance of “return chasing” or “diversification” motives as drivers of international investment patterns. However, these variables are found to have no or weak explanatory power for international investment patterns. This is especially the case for debt securities, which are the main focus of this paper.¹² Moreover, data on bond returns are not readily

10. To some extent, the bilateral trade variable may also pick up short-term asset trade for trade financing purposes.

11. These measures are close to the theoretical measure of financial development in Caballero *et al.* (2008), in the sense that they approximate the share of income that is tradable in financial markets. Although precise measures of bond market liquidity are not available at the cross-country level, the positive correlation between measures of equity market capitalisation and equity market liquidity suggests that the measures of financial development used in this paper also partly capture bond market liquidity.

12. For the sake of completeness, bond return differentials and correlations based on Datastream were included in unreported regressions (available upon request). The estimated coefficients of these variables were statistically not significant and the estimated coefficient of the relative financial development variable remained unchanged. This is in line with Forbes (2010) who finds that neither the return differential nor the correlation variables are statistically significant in the bond regressions.

available for all countries, which would significantly reduce the number of countries included in the analysis. Other possible explanatory variables include institutional quality in the investing country, or the ratio of receiving country to sending country income per capita, which captures the effect of relative economic development on international investment positions more broadly. However, inclusion of a large number of explanatory variables in the baseline regression risks making the interpretation of the results difficult due to multicollinearity. For instance, measures of financial development are generally highly correlated with income per capita. Additional explanatory variables are therefore gradually added to the baseline model in Section 3 and in the robustness checks.

12. Further econometric issues are the treatment of unobserved country heterogeneity and the computation of standard errors. Due to the short time series and the strong persistence of bilateral investment positions, the main source of variation in the dependent variable is cross-sectional, which renders the inclusion of investing and receiving country fixed effects inappropriate.¹³ In any event, the objective of this paper is not to establish a causal link between financial development and international portfolio investment. Instead, the aim is to test whether, controlling for a number of other drivers of international portfolio investment, the pattern of correlation between financial development and international portfolio investment is consistent with the asset mismatch hypothesis. While, as in Forbes (2010), a specification without fixed effects is therefore adopted, caution needs to be exerted in attaching a causal interpretation to the estimated coefficients. In particular, the estimated coefficient on relative financial development may partly reflect the effect of an unobserved omitted variable, although the inclusion of relative income per capita in an augmented specification mitigates this problem. Standard errors are clustered at the sending and receiving country level, applying the two-way clustering method developed by Cameron *et al.* (2008), which allows the error term to be correlated both within sending and receiving countries across time. Two-way clustering results in more conservative standard errors than clustering at the investing- or receiving-country level alone or clustering at the country-pair level.

1.2. Data

- **Bilateral foreign debt and equity securities.** The IMF Consolidated Portfolio Investment Survey (CPIS) reports bilateral portfolio equity and debt holdings for 74 reporting countries and 231 partner countries for the years 2001-09. While around half the countries reporting to the IMF CPIS are emerging countries, China and some major oil-exporting countries, such as Saudi Arabia, are not included as reporters in the IMF CPIS. The CPIS data include private portfolio holdings but exclude official holdings, such as foreign reserve holdings of central banks. Holdings of quasi-official entities, such as sovereign funds, are generally included. The asset mismatch theory emphasises mismatches between the asset supply and demand of *private* agents in emerging economies. Caballero *et al.* (2008) acknowledge explicitly that capital flows resulting from *official* reserve accumulation may be motivated by other objectives, not least by exchange rate objectives as in Dooley and Garber (2007). It therefore seems appropriate to focus on private capital flows to assess the empirical relevance of the asset mismatch hypothesis, and the IMF CPIS data are hence well-suited for this purpose. As the largest part of China's external assets is held as foreign currency reserves at the central bank, the absence of China as a reporting country in the IMF CPIS data is highly unlikely to make a major difference to the analysis.
- **Aggregate foreign positions** can be constructed by summing each country's bilateral positions in the IMF CPIS data or by using the updated and extended version of the dataset constructed by

13. Note that in the cross section the logarithmic ratio of sending-to-receiving country financial development would be fully absorbed by the sending and receiving country fixed effects. The log-log regression of bilateral debt assets on their lags for the period 2001-09 gives an elasticity of 0.96 and an R-squared of 0.86, indicating that there is little time variation in bilateral asset holdings.

Lane and Milesi-Ferretti (2007). The results reported in the main part of this paper are based on aggregate positions constructed by summing each country's bilateral positions in the IMF CPIS data. The results based on the Lane and Milesi-Ferretti (2007) data are similar and reported as robustness checks in Section 4.

- **Domestic equity and debt securities.** Domestic stock market capitalisation for 136 countries is taken from the World Bank World Development Indicators. Domestic bond market capitalisation for 55 countries is taken from the BIS Securities Statistics.¹⁴
- **Financial centres** are excluded from the regressions reported in the main part of this paper, as is standard in the literature (Lane and Milesi-Ferretti, 2008).¹⁵ The rationale for this decision is that financial centres act as pure intermediaries that are neither the true source nor the true destination of foreign investments. Several checks on the sensitivity of the results to the precise list of excluded financial centres are conducted in Section 4.
- **Sample period.** It is focused on the years 2005 and 2006 in order to avoid the data being contaminated by the global financial crisis of 2007-09. The sensitivity of the results to different sample periods is reported in Section 4.
- **Explanatory variables.** The bilateral data on geographical and cultural proximity (geographical distance, common language, common border) are taken from CEPII's distance database and the bilateral trade data from UNCTAD's COMTRADE database. Measures of capital flow restrictions are taken from Schindler (2009). The indicators for institutional quality are taken from the World Bank Governance Indicators database. The financial development indicators based on market capitalisation are constructed using stock market capitalisation data from the World Bank World Development Indicators and using bond market capitalisation data from the BIS. The remaining financial development indicators (private credit to GDP and liquid liabilities to GDP) are extracted from the database compiled by Beck and Demirgüç-Kunt (2009). Exchange rate volatility is constructed as the standard deviation between 2000 and 2004 of a monthly exchange rate index of the respective national currency with IMF Special Drawing Rights obtained from the IMF International Financial Statistics.¹⁶

2. Descriptive statistics

13. A first impression of the plausibility of the asset mismatch hypothesis can be gleaned from Table 1. At around 97%, the share of domestic debt securities in emerging markets' *total* bond portfolios is higher than in any other country or region in the sample.¹⁷ This is even more striking when it is taken into account that, in the case of debt securities, emerging markets account for only 4% of the world market capitalisation, which is the share emerging markets would be predicted to allocate to domestic bonds

14. BIS Quarterly Review, Tables 11 and 16. Available at <http://www.bis.org/statistics/secstats.htm> (accessed July 2011). Domestic bond market capitalisation is calculated as the sum of domestic and international debt securities issued by the government, financial institutions and the corporate sector. Where either domestic or international debt securities are not available, domestic market capitalisation is treated as missing.

15. Both small international financial centres as defined by Lane and Milesi-Ferretti (2011) and Hong Kong, China; Luxembourg and Singapore are excluded from the analysis.

16. The index is normalised to one in the year 2000.

17. The emerging countries included in Table 1 are Argentina, Bulgaria, Brazil, Chile, Colombia, Costa Rica, Egypt, Indonesia, India, Kazakhstan, Lebanon, Mexico, Mauritius, Malaysia, Pakistan, Panama, Philippines, Romania, Russia, Thailand, Turkey, Ukraine, Uruguay, Venezuela and South Africa.

according to a simple international CAPM. As a consequence, for debt securities, the home bias of emerging markets relative to that of developed countries in Table 1 is even stronger when it is expressed as the ratio of the share of the portfolio held domestically to the share of the domestic bond market in the world bond market capitalisation. This appears to be at odds with the asset mismatch hypothesis.

14. The home bias of emerging countries is similar, though somewhat smaller, in equity securities. The share of those countries' domestic markets in world market capitalisation is higher in equities than in debt securities, largely due to well-developed equity markets in some large emerging economies, such as Brazil, India and South Africa. The ratio of the observed share invested in domestic emerging market equities to that predicted by the simple international CAPM is thus lower than for bonds and even lower than in some financially more-developed countries, such as Germany.

Table 1. Share of domestically-held securities (2006)

Country	Debt securities		
	Predicted share	Observed share	Ratio
Emerging	4.4%	96.8%	21.8
Germany	6.2%	64.6%	10.3
Other Euro area	19.6%	58.8%	3.0
United Kingdom	5.7%	56.2%	9.9
Japan	13.0%	82.7%	6.3
USA	38.9%	93.3%	2.4
Other CPIS reporters (high-income)	8.5%	81.9%	9.7

Country	Equity securities		
	Predicted share	Observed share	Ratio
Emerging	9.5%	96.7%	10.2
Germany	3.1%	51.7%	16.6
Other Euro area	12.4%	62.7%	5.1
United Kingdom	7.2%	63.2%	8.8
Japan	9.0%	87.7%	9.8
USA	36.9%	80.0%	2.2
Other CPIS reporters (high-income)	10.6%	75.8%	7.2

Notes:

(1) Predicted share: ratio of domestic market capitalisation to world market capitalisation.

(2) Observed share: ratio of domestic market capitalisation less the country's liabilities held by foreigners to total holdings. Total holdings: domestic market capitalisation plus the country's foreign asset holdings minus liabilities held by foreigners. For the "emerging" and "other Euro area" zones, the observed share denotes the ratio of the sum of all member countries' domestic holdings to the sum of their total holdings, *i.e.* intra-zone but non-domestic holdings are considered as foreign holdings.

(3) The sum of the predicted shares is smaller than 100% because not all countries with non-missing values for domestic market capitalisation report to the IMF CPIS.

Source: OECD calculations based on IMF CPIS and BIS Securities Statistics.

15. Turning to the structure of *foreign* portfolios, emerging countries invest around 57% of their foreign bond portfolio in the United States, which amounts to 1.4 times the share of the United States in the world bond market capitalisation (Table 2). As the United States were perceived as the country with the largest supply of safe assets before the global financial crisis of 2007-09, the high weight of the United States in emerging markets' foreign bond portfolio would appear to lend some support to the asset mismatch hypothesis. However, the weight in emerging markets' bond portfolios of other financially highly-developed countries, such as Germany or Switzerland, which are often perceived as supplying safe

assets, is below that predicted by a simple international CAPM.¹⁸ As regards the allocation of their equity portfolios, emerging countries are not biased toward US equities, but tend to favour financial centres. Compared with the predictions of the simple international CAPM, they put a particularly large weight on the United Kingdom and the Euro area excluding Germany, the latter mainly because of large holdings in Luxembourg.

Table 2. Specific country shares in foreign securities portfolio of emerging economies (2006)

Origin	Destination	Debt securities		
		Predicted share	Actual share	Ratio
Emerging	Switzerland	0.4%	0.3%	0.9
Emerging	Germany	6.5%	4.8%	0.7
Emerging	Rest of Euro area	21.1%	18.0%	0.9
Emerging	United Kingdom	6.0%	6.3%	1.1
Emerging	Japan	13.7%	1.0%	0.1
Emerging	USA	40.8%	56.6%	1.4
Emerging	Other	11.6%	12.9%	1.1

Origin	Destination	Equity securities		
		Predicted share	Actual share	Ratio
Emerging	Switzerland	2.5%	0.6%	0.2
Emerging	Germany	3.4%	0.5%	0.1
Emerging	Rest of Euro area	14.2%	26.8%	1.9
Emerging	United Kingdom	8.0%	23.8%	3.0
Emerging	Japan	9.9%	1.4%	0.1
Emerging	USA	40.7%	29.9%	0.7
Emerging	Other	21.3%	16.9%	0.8

Notes:

(1) Predicted share calculated as the ratio of the destination country's total market capitalisation to the world market capitalisation minus the origin country's market capitalisation.

(2) Actual share calculated as the ratio of the origin country's foreign holdings in the destination country to the total foreign holdings of the source country.

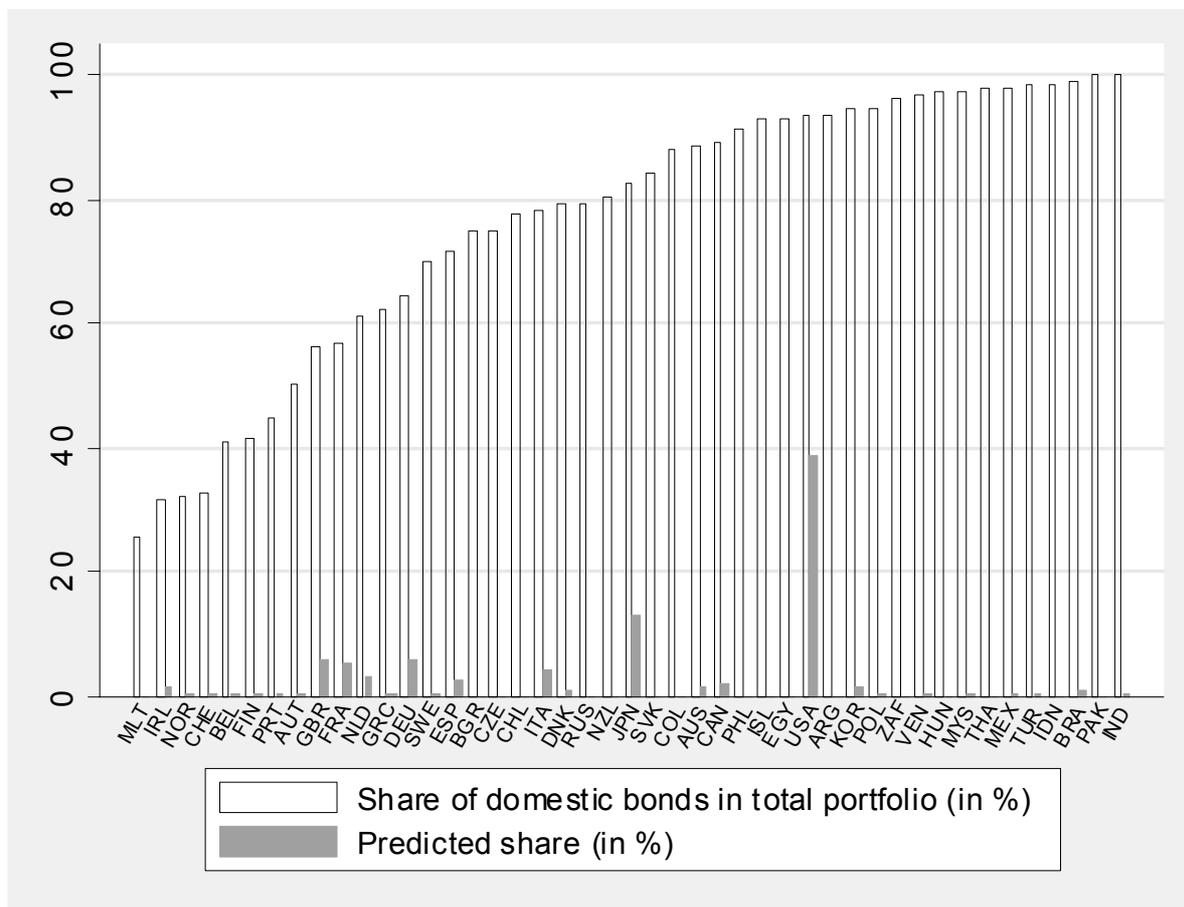
(3) The destination zone "other" includes other high-income countries, low-income countries and emerging countries not reporting to the IMF CPIS.

Source: OECD calculations based on IMF CPIS.

16. The strong home bias of emerging countries is confirmed when looking at individual countries instead of country groupings. Figure 1 shows that large emerging countries such as India, Pakistan, Brazil, Indonesia or Mexico hold disproportionately high shares of their total debt securities in domestic bonds, even though their domestic bond markets only account for a small fraction of the world bond market capitalisation. Some high-income countries also hold a high share of their total portfolio in domestic bonds, but their excess holdings with respect to the simple international CAPM benchmark are generally smaller, given that their domestic bond markets account for a larger share of the world bond market capitalisation.

18. Emerging markets' over-exposure to US bonds implies under-exposure of at least one other country, as bond portfolio shares sum to one. However, the bond market capitalisation of Switzerland and, to a lesser extent, Germany is small relative to the world market capitalisation. Therefore, it would be possible for observed portfolio shares in the United States, Switzerland and Germany to be simultaneously above those predicted by a simple international CAPM, while being below for one or several other large bond markets.

Figure 1. Share of domestic bonds in total portfolio (2006)

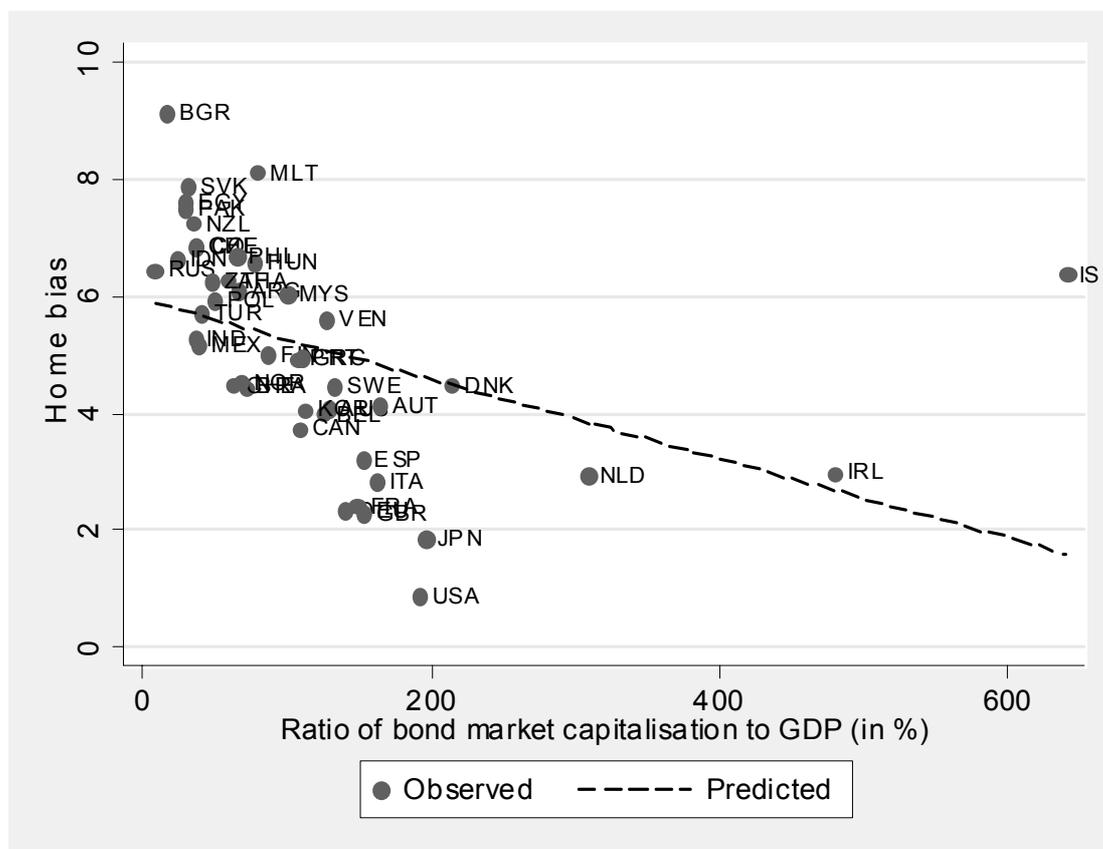


Note: Predicted share is the ratio of domestic market capitalisation to world market capitalisation.
Source: OECD calculations based on IMF CPIS and BIS Securities Statistics.

17. The home bias tends to decrease with financial market development. Figure 2 shows that there is a strong negative correlation between the measure of home bias and the ratio of bond market capitalisation to GDP. This result is robust to different measures of financial development, such as, for instance, the share of private bond market capitalisation in total market capitalisation (see Appendix, Figure A2.1).¹⁹

19. To some extent, the correlation between the home bias and financial development in Figure 2 is obtained mechanically, as the domestic bond market capitalisation enters both the home bias variable and the financial development variable. This endogeneity problem is bypassed by using the share of the private bond market capitalisation in the total bond market capitalisation as a measure of financial development in Figure A2.1 in the Appendix. The sample correlation between the share of the private bond market capitalisation in the total bond market capitalisation and the ratio of total bond market capitalisation to GDP is 0.66.

Figure 2. The home bias in bonds decreases with financial development (2006)



Note: Home bias is the logarithm of the ratio of share of domestic bonds in total portfolio to the ratio predicted by a simple international CAPM. The CAPM ratio is the ratio of domestic market capitalisation to world market capitalisation.
Source: OECD calculations based on IMF CPIS and BIS Securities Statistics.

3. Regression analysis

18. The empirical implications of the asset-mismatch hypothesis should hold for debt and equity securities. However, the asset mismatch hypothesis is generally formulated with special reference to debt securities, in particular AAA-rated bonds and tranches (Caballero, 2010a). Therefore, this section focuses on debt securities. The results for equity securities are reported in the Appendix.

3.1. Full set of receiving and sending countries

19. Regression analysis indicates that the deviation of bond portfolio holdings from the simple international CAPM benchmark *decreases* with the ratio of recipient to investing country financial development, which is at odds with the asset mismatch hypothesis. Column (1) of Table 3 shows the results of estimating Equation (1) by ordinary least squares, using the ratio of private credit to GDP as a measure of financial development.²⁰ The estimated coefficients on the other explanatory variables generally have the expected sign and are statistically significant. Countries allocate higher shares of their total bond portfolios to countries with which they have close cultural or trade links. They also tend to

20. A simple gravity equation with bilateral holdings as the dependent variable gives qualitatively and quantitatively similar results. These results are available from the authors upon request.

allocate higher shares of their portfolios to countries with better institutions, whereas regulatory bond inflow restrictions do not seem to have a long-term effect on investors' portfolio choices. Even though there generally is no statistically significant effect of capital controls on bilateral investment positions, the capital controls variable is retained in the following regressions to ensure comparability with the literature.²¹

Table 3. OLS regression result for bonds (2005-06)¹

Dependent variable	(1)	(2)	(3)	(4)
	Total bias	Total bias	Country bias	Foreign bias
Closeness	0.587*** (0.104)	0.582*** (0.105)	0.378*** (0.075)	0.209** (0.082)
Trade	0.398*** (0.112)	0.380*** (0.110)	0.436*** (0.078)	-0.038 (0.100)
Receiving country bond inflow restrictiveness	0.399 (0.544)	0.333 (0.557)	0.115 (0.575)	0.284* (0.164)
Receiving country institutional quality	0.685*** (0.201)	0.593*** (0.190)	0.380** (0.172)	0.305** (0.127)
Receiving country relative financial development	-0.741*** (0.157)		-0.211* (0.122)	-0.530*** (0.137)
Receiving country relative financial development (> 1)		-0.914*** (0.230)		
Receiving country relative financial development (< 1)		-0.527*** (0.199)		
Observations	2144	2144	2144	2144
Investing countries	45	45	45	45
Receiving countries	43	43	43	43
R-squared	0.35	0.35	0.29	0.19
Estimation method	OLS	OLS	OLS	OLS

1. Note that data on domestic bond market capitalisation are only available for 55 countries. Even though there are 74 investing and 231 receiving countries in the IMF CPIS data, the econometric analysis can therefore only be conducted on a restricted number of sending and receiving countries. Given that financial centres are dropped and not all explanatory variables are available for the 55 countries with domestic bond market capitalisation, the econometric analysis is conducted on 45 investing countries and 43 receiving countries. Note that due to these data constraints Forbes (2010) includes a similar number of investing countries (53) in the bond regressions.
 2. * denotes significant at 10%; ** significant at 5%; *** significant at 1%.
 3. Two-way clustered robust standard errors in parentheses
 4. Receiving country relative ratio of private credit to GDP used as the measure of relative financial development.
- Source: OECD calculations.

20. The negative estimated coefficient on the ratio of receiving to sending country financial development is to a large extent due to countries at low levels of financial development allocating particularly low shares of their bond portfolios to financially highly-developed countries. *A priori* the negative estimated coefficient may, at least partially, also be driven by financially highly-developed countries allocating high portfolio shares to the least financially developed countries. To test which of the two mechanisms predominates, Column (2) of Table 3 splits the ratio of financial development in the receiving country to that in the sending country into two terms.²² The estimated coefficient on the ratio of

21. None of the reported results changes when the capital controls variable is excluded from the regressions.
22. The specification in Column (2) of Table 3 implicitly assumes that the deviation of observed portfolios from the simple CAPM benchmark is a continuous function of relative financial development. Similar results are obtained when the intercept is allowed to vary across observations with a ratio of receiving to sending country financial development above and below one.

financial development in the receiving country to that in the sending country when this ratio is larger than one, *i.e.* when the former is financially more-developed than the latter, is around -0.9 and statistically highly significant. The estimated coefficient on relative financial development when the ratio is smaller than one is smaller (-0.5) albeit also statistically significant, indicating that financially highly-developed countries indeed allocate high portfolio shares to those countries with the least developed financial markets.

21. The low shares of their *total* portfolios that financially less-developed countries allocate to advanced financial markets is mainly due to these countries' strong home bias in asset allocation, rather than to a country-specific bias in favour of financially less-developed countries. This can be shown by using a convenient decomposition of the dependent variable into the sending countries' foreign bias in total asset allocation and the country-specific bias in the structure of their foreign portfolio (see Section 2.1). Column (4) of Table 3 shows that the foreign bias (the inverse of the home bias) accounts for more than two thirds of the overall correlation.²³ In other words, financially less-developed countries are underweight with respect to the simple international CAPM benchmark in financially highly-developed countries mainly because they allocate a disproportionately large share of their total portfolio to domestic assets. But even in the regression with the country-specific bias as the dependent variable (Column 3), the estimated coefficient on the relative financial development variable is negative and statistically significant at the 10% level. This means that financially less-developed countries also allocate low shares of their foreign portfolio to financially highly-developed countries.

22. The result that financially less-developed countries tend to allocate particularly low portfolio shares to financially highly-developed countries is independent of the measure of financial development. In the context of bond portfolio allocation, a theoretically more appropriate measure of financial development than the ratio of private credit to GDP may be the ratio of domestic bond market capitalisation to GDP. However, domestic bond market capitalisation also enters the dependent variable in Equation (1), raising an endogeneity problem. Therefore, an instrumental variables technique is applied in which domestic bond market capitalisation is instrumented by the ratio of the private bond market capitalisation to total bond market capitalisation and the ratio of private credit to GDP.²⁴ Columns (1) and (2) of Table 4 confirm that the total bias decreases with the ratio of receiving to sending country bond market capitalisation, with countries at low levels of financial development being underweight in financially highly-developed countries. As in the OLS regressions, this result appears mainly attributable to the strong home bias (inverse of the foreign bias) of countries at low levels of financial development (Columns 3 and 4). Given that the instrumental variables and OLS estimates are similar and that the OLS results hold for all exogenous measures of financial development, the remainder of this paper focuses on the OLS estimates.²⁵ Sensitivity checks using different measures of the capacity to produce safe assets, including countries' sovereign ratings, are conducted in Section 4.

23. Note that the sum of the coefficients of the country and foreign bias regressions yields the coefficients of the total bias regression.

24. These instruments pass standard tests for instrument validity and strength.

25. The OLS estimates are more efficient and the results therefore more clear-cut, especially when the sample is restricted to specific receiving countries.

Table 4. Instrumental variable regression results for bonds (2005-06)

Dependent variable	(1) Total bias	(2) Total bias	(3) Country bias	(4) Foreign bias
Closeness	0.626*** (0.109)	0.614*** (0.125)	0.390*** (0.081)	0.236*** (0.080)
Trade	0.364** (0.136)	0.373** (0.151)	0.447*** (0.087)	-0.082 (0.113)
Receiving country bond inflow restrictiveness	0.167 (0.583)	0.194 (0.572)	0.202 (0.506)	-0.035 (0.440)
Receiving country institutional quality	0.602** (0.278)	0.586** (0.264)	0.324* (0.186)	0.278 (0.176)
Receiving country relative financial development	-1.040*** (0.347)		-0.300 (0.196)	-0.741*** (0.252)
Receiving country relative financial development (> 1)		-1.130* (0.678)		
Receiving country relative financial development (< 1)		-0.930* (0.494)		
Observations	1861	1861	1861	1861
Investing countries	41	41	41	41
Receiving countries	39	39	39	39

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%
2. Two-way clustered robust standard errors in parentheses
3. R-squared is not a valid measure of goodness-of-fit in IV regressions and therefore not reported (Verbeek, 2008)

Source: OECD calculations.

23. A liberalised capital account, high-quality institutions and exchange rate stability reduce the home bias. This induces countries at low levels of financial development to invest a larger share of their portfolio abroad, including in financially highly-developed countries (Table 5).²⁶ Columns (2)-(4) control for bond outflow restrictions, institutional quality in the investing country or the two at the same time, which makes the estimated equation symmetric on the investing- and recipient-country sides. Column (5) controls for exchange rate volatility in the investing country.²⁷ Including these investing-country controls reduces the estimated coefficient of the relative financial development variable, which nonetheless remains negative and statistically significant.²⁸ It should be noted that the major part of these reductions is attributable to the foreign bias component (inverse of the home bias) of the dependent variable. Conditional on capital account openness, institutional quality and exchange rate volatility, financially less-developed countries have less home bias than unconditionally. From a policy perspective, however, the relevant question is whether financially less-developed countries disproportionately seek assets of financially highly-developed countries *unconditionally*, rather than abstracting from these countries' levels of capital account openness, institutional quality or exchange rate volatility.

26. Other investing country characteristics, such as trade openness or the ratio of public debt to GDP, are not found to be systematically related to the home bias.

27. It is shown in Section 4 that bilateral exchange rate stability increases external portfolio holdings, but has no influence on the estimated coefficient of relative financial development.

28. Note that due to the coefficients in Columns (1)-(2) being estimated imprecisely, the difference between them is not statistically significant. Nonetheless, the negative sign and high statistical significance of the bond outflow restrictiveness variable both in the total and the unreported foreign bias regressions supports the interpretation given in this paragraph.

Table 5. Additional investing country controls (2005-06)

Dependent variable	(1) Total bias	(2) Total bias	(3) Country bias	(4) Country bias	(5) Foreign bias
Closeness	0.614*** (0.111)	0.555*** (0.104)	0.555*** (0.098)	0.541*** (0.100)	0.608*** (0.109)
Trade	0.393*** (0.122)	0.419*** (0.109)	0.401*** (0.108)	0.410*** (0.107)	0.377*** (0.116)
Receiving country bond inflow restrictiveness	0.383 (0.546)	0.249 (0.542)	0.074 (0.577)	0.072 (0.575)	0.237 (0.560)
Receiving country institutional quality	0.708*** (0.213)	0.596*** (0.205)	0.386* (0.222)	0.396* (0.224)	0.538** (0.215)
Receiving country relative financial development	-0.787*** (0.167)	-0.606*** (0.173)	-0.359* (0.191)	-0.359* (0.194)	-0.583*** (0.177)
Investing country bond outflow restrictiveness		-1.168** (0.474)		-0.498 (0.556)	
Investing country institutional quality			0.775*** (0.229)	0.636** (0.274)	
Investing country exchange rate volatility					-1.722*** (0.663)
Observations	1899	1899	1899	1899	1899
Investing countries	39	39	39	39	39
Receiving countries	43	43	43	43	43
R-squared	0.35	0.38	0.39	0.40	0.36
Estimation method	OLS	OLS	OLS	OLS	OLS

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

2. Two-way clustered robust standard errors in parentheses

Source: OECD calculations.

3.2. Controlling for income per capita levels

24. The result that the total bias in bond portfolio allocation decreases with the ratio of receiving-to-investing-country financial development is robust to the inclusion of the ratio of receiving-to-investing country income per capita. Theoretically, at a given ratio of receiving-to-investing country income per capita, financial development should be correlated with the demand for safe assets under the asset mismatch hypothesis. In practice, it is difficult to distinguish between the impact of income per capita and financial development as the two are highly positively correlated across countries, potentially leading to a multicollinearity problem when both are included in the regression analysis. However, omitting income per capita from the regressions bears the risk that part of the correlation between general economic development and the bias in asset allocation is unduly attributed to the financial development variable. Table 6 therefore reports results from specifications including the income-per-capita ratio and less-demanding specifications controlling for a qualitative indicator measuring the receiving country's income group relative to that of the sending country. The estimated coefficient on the financial development variable varies in size but always remains negative and statistically highly significant.

Table 6. Results are robust to controlling for relative income per capita levels (2005-06)

Dependent variable	(1)	(2)	(3)	(4)
	Total bias			
Closeness	0.575*** (0.099)	0.620*** (0.092)	0.461*** (0.099)	0.505*** (0.098)
Trade	0.406*** (0.111)	0.341*** (0.100)	0.419*** (0.104)	0.361*** (0.097)
Receiving country bond inflow restrictiveness	0.126 (0.649)	0.054 (0.612)	0.173 (0.550)	0.209 (0.507)
Receiving country institutional quality	0.753*** (0.205)	0.746*** (0.199)	0.428* (0.242)	0.415 (0.265)
Receiving country relative income per capita	-0.317 (0.248)	-0.464** (0.210)		
Receiving country relative private credit to GDP	-0.576*** (0.198)		-0.398** (0.156)	
Receiving country relative liquid liabilities to GDP		-0.918*** (0.208)		-0.762*** (0.218)
Receiving: High-income; Sending: Emerging			-0.903* (0.524)	-0.940* (0.552)
Receiving: High-income; Sending: High-income			0.704 (0.581)	0.651 (0.640)
Receiving: Emerging; Sending: High-income			0.432 (0.440)	0.393 (0.443)
Observations	2144	2079	2144	2079
Investing countries	45	44	45	44
Receiving countries	43	41	43	41
R-squared	0.36	0.39	0.40	0.42

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

2. Two-way clustered robust standard errors in parentheses

Source: OECD calculations.

3.3. Individual receiving countries

25. Instead of analysing the full bilateral set of foreign investment positions for all sending and receiving countries available in the IMF CPIS data, it is possible to restrict the analysis to single destination countries. The rationale is that even though the above regression analysis suggests that countries at lower levels of financial development do not generally hold particularly large shares of their total investment portfolios in financially highly-developed countries, they may nonetheless over-invest in a selected number of receiving countries which are perceived as particularly safe. To test this hypothesis only the United States, Germany and Switzerland – three countries that are often perceived as “safe havens” – are retained as receiving countries.²⁹

29. Note that Caballero *et al.* (2008) consider Australia, the United Kingdom and the United States as safe-asset-producing countries. In their model, capital flows from emerging countries and continental Europe to these countries. For emerging countries capital outflows are driven by an asset shortage and for continental Europe by an interest rate differential (see the working paper version Caballero *et al.*, 2006 for the explicit modelling of capital flows from Europe to the United States). However, in more policy-oriented publications, *e.g.* Caballero (2010b), safe asset producing countries are characterised as those countries able to produce AAA-rated financial instruments. The reported results are robust to choosing alternative

26. Table 7 shows that while geographical distance and cultural ties appear to partly drive the allocation of the *total* bond portfolio, sending countries' financial development does not obviously play a significant role. The group of ten countries allocating the highest share of their total bond portfolio to the United States includes two South American, one North American and three other English-speaking countries, but is fairly balanced in terms of financial development. At the same time, the group of ten countries allocating the lowest share of their total bond portfolio to the United States includes a relatively large number of countries at low levels of financial development. A similar picture emerges for Germany. The set of countries holding the ten highest and ten lowest Swiss portfolio shares is somewhat more diverse in terms of financial development. The impact of geographical distance and cultural ties is even more apparent when it is focused on the shares of the *foreign* portfolio countries allocate to "safe havens" (Table 8). The set of countries allocating the highest shares of their foreign portfolio to the United States, and to some extent Switzerland, appears to be slightly skewed toward those at lower levels of financial development, whereas no such pattern is discernible for Germany.

Table 7. Ten countries allocating the highest and lowest total bond portfolio shares to "safe havens" (2006)³⁰

Receiving country: USA		Receiving country: Germany		Receiving country: Switzerland	
Sending country	Weight in total portfolio	Sending country	Weight in total portfolio	Sending country	Weight in total portfolio
Chile	18.8%	Norway	15.3%	Ireland	0.38%
Ireland	17.3%	Austria	12.8%	Malta	0.35%
Norway	13.5%	Switzerland	11.8%	United Kingdom	0.30%
United Kingdom	12.4%	Finland	11.1%	Norway	0.25%
New Zealand	10.9%	Netherlands	9.3%	Greece	0.23%
Colombia	9.9%	Portugal	7.6%	Finland	0.16%
Switzerland	9.1%	Belgium	6.6%	Germany	0.12%
Russia	8.4%	Malta	6.2%	Portugal	0.12%
Canada	7.0%	Ireland	6.0%	Korea	0.09%
Sweden	6.5%	France	5.4%	Chile	0.09%
Mexico	1.8%	Thailand	0.1%	Australia	0.01%
Poland	1.4%	Korea	0.1%	South Africa	0.01%
Hungary	1.0%	Chile	0.1%	United States	0.01%
Iceland	0.8%	South Africa	0.1%	Venezuela	0.01%
Turkey	0.5%	Malaysia	0.1%	Denmark	0.01%
Malaysia	0.4%	Indonesia	0.1%	Argentina	0.00%
Thailand	0.3%	Argentina	0.1%	Czech Republic	0.00%
Indonesia	0.2%	Brazil	0.0%	Bulgaria	0.00%
Brazil	0.1%	Venezuela	0.0%	Thailand	0.00%
India	0.0%	Mexico	0.0%	Iceland	0.00%
Mean	4.8%		3.3%		0.07%
Median	3.3%		1.6%		0.03%

Note: IMF CPIS reporting countries, excluding international financial centres.

Source: OECD calculations based on IMF CPIS and BIS Securities Statistics.

safe asset producing countries, notably choosing Australia and the United Kingdom as explicitly suggested by Caballero *et al.* (2008) (see the sensitivity checks in Section 4).

30. Forbes (2010), Table 2 reports the US share in the total bond portfolio of a number of countries. The figures reported in Forbes (2010) are generally higher than those reported in Column (1) of Table 7 in the present paper, reaching around 80% for Israel or 50% for Kazakhstan, for instance. These figures imply that these countries have a very small home bias. However, the BIS does not report data on domestic debt securities for these countries (BIS Quarterly Review, Table 16A). If Forbes (2010) sets domestic market capitalisation to zero for the countries which do not report domestic market capitalisation, she underestimates the domestic market capitalisation for these countries, as unreported values in the BIS data are true missing values with true domestic market capitalisation generally positive. This would explain the implausibly low values of the home bias for some of the countries in Table 2 of Forbes (2010).

Table 8. Countries allocating the highest and lowest foreign bond portfolio shares to “safe havens” (2006)

Receiving country: USA		Receiving country: Germany		Receiving country: Switzerland	
Sending country	Weight in foreign portfolio	Sending country	Weight in foreign portfolio	Sending country	Weight in foreign portfolio
Argentina	94.4%	Romania	46.1%	Indonesia	2.01%
Mexico	86.7%	Hungary	26.1%	Korea	1.64%
Venezuela	84.4%	Austria	25.6%	Malaysia	1.46%
Chile	83.4%	Denmark	24.9%	Hungary	1.11%
Colombia	83.3%	Netherlands	24.0%	Brazil	1.06%
Israel	75.1%	Norway	22.7%	Uruguay	0.99%
Canada	63.5%	Italy	22.2%	Turkey	0.78%
Costa Rica	60.5%	Poland	22.0%	United Kingdom	0.69%
New Zealand	55.7%	Estonia	20.3%	Greece	0.61%
Korea	55.2%	Finland	19.0%	Ireland	0.56%
Brazil	8.3%	Malaysia	2.4%	Netherlands	0.06%
Belgium	8.2%	Korea	2.1%	Argentina	0.05%
Estonia	7.7%	South Africa	1.8%	Denmark	0.03%
Czech Republic	7.5%	Colombia	1.5%	Czech Republic	0.01%
Malta	7.4%	Israel	1.4%	Bulgaria	0.00%
Austria	6.8%	Brazil	1.0%	Latvia	0.00%
Portugal	5.9%	Argentina	0.9%	Costa Rica	0.00%
Greece	5.9%	Chile	0.3%	Thailand	0.00%
Finland	4.2%	Mexico	0.1%	Romania	0.00%
Romania	0.1%	Venezuela	0.1%	Iceland	0.00%
Mean	31.3%		11.0%		0.36%
Median	23.1%		9.1%		0.18%

Notes: IMF CPIS reporting countries, excluding international financial centres.

Source: OECD calculations based on IMF CPIS.

27. To distinguish between geographical and cultural factors on the one hand, and financial development on the other, Table 9 reports the results from regressions focusing on a single destination country at a time. This reduces the number of observations and thus the degrees of freedom substantially. Only the measure of geographical and cultural closeness described above and a measure of financial development are therefore included as explanatory variables in the regressions. As expected from the descriptive analysis in Tables 7 and 8, the estimated coefficients on the closeness measure are positive and statistically significant in most specifications. The estimated coefficients on financial development in the total bias regressions are negative, indicating that financially more-developed countries allocate higher bond portfolio shares to “safe haven” countries. This is in line with the results obtained in the fully bilateral analysis above.

28. When neglecting the sending countries’ home bias and only focusing on the geographical structure of their *foreign* portfolios (Columns 2, 4 and 6), the estimated coefficient on financial development turns positive for the United States as the receiving country.³¹ This confirms the descriptive findings in Table 8 and suggests that financially less-developed countries allocate a particularly high share of their *foreign* bond portfolio to the United States.³²

31. Note that the decomposition of the dependent variable into a foreign- and a country-specific bias component is possible even in the regressions with individual recipient countries, as the foreign bias component varies along the investing country dimension.

32. This result is robust to using the ratio of liquid liabilities to GDP or the share of the private bond market capitalisation in the total bond market capitalisation as alternative measures of financial development. It is also robust to an instrumental variables specification with the ratio of bond market capitalisation to GDP instrumented by the ratio of private credit to GDP and the share of the private bond market capitalisation in the total bond market capitalisation. These results are available upon request.

29. It is difficult to interpret this as supporting the asset mismatch hypothesis, however. First, a shortage of domestic safe assets in financially less-developed countries is at the core of the asset mismatch theory of global imbalances, implying that financially less-developed countries have particularly low propensities to invest domestically. This should be reflected in a positive estimated coefficient on the financial development variable in the total bias regression in Column (1) of Table 9, while this coefficient is found to be negative. Second, no such “safe haven” effect in the foreign bond portfolio allocation of financially less-developed countries appears to be present for Germany or Switzerland (Columns 3 to 6 of Table 9). This suggests that the strong preference of financially less-developed countries for US bonds might reflect a preference for the assets of the country issuing the world reserve or transaction currency rather than a general preference for the assets of “safe havens”.

Table 9. Individual receiving country regressions for bonds (2005-06)

Receiving country Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	United States		Germany		Switzerland	
	Total bias	Country bias	Total bias	Country bias	Total bias	Country bias
Closeness	0.397** (0.182)	0.455*** (0.097)	0.809*** (0.108)	0.409*** (0.068)	0.219* (0.125)	-0.203* (0.118)
Relative financial development	-0.540* (0.301)	0.432*** (0.115)	-0.905*** (0.311)	-0.390 (0.280)	-0.554* (0.275)	0.053 (0.311)
Observations	86	86	83	83	66	66
Investing countries	43	43	42	42	33	33
R-squared	0.11	0.29	0.58	0.39	0.17	0.05

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

2. Clustered robust standard errors in parentheses

3. Receiving country relative ratio of private credit to GDP used as the measure of relative financial development.

Source: OECD calculations.

4. Robustness checks

30. Table 10 reports the results of a number of robustness checks. Columns (1)-(3) show that the results are independent of the precise measure of financial development included in the model. The estimated coefficient on the ratio of receiving-to_investing-country financial development is negative and statistically highly significant for either private credit to GDP, liquid liabilities to GDP or the ratio of private to total bond market capitalisation. Column (4) shows the results from re-estimating Equation (1) using the ratio of receiving-to-investing-country sovereign ratings as a measure of relative safe asset supply.³³ The results are similar as in the baseline case. Countries with low sovereign ratings tend to hold lower shares of their total portfolios in highly-rated countries than highly-rated countries do among themselves. Column (5) adds a dummy variable for country pairs with pegged exchange rates or forming part of the same currency union to the baseline specification. While the estimated coefficient on this dummy variable is positive and statistically highly significant, the estimated coefficient on the relative financial development variable is similar to that in the baseline specification. Finally, Column (6) reports the results when the total holdings in the dependent variable are extracted from the Lane and Milesi-Ferretti (2007) dataset instead of constructing them as the sum of the bilateral asset positions in the IMF CPIS dataset. The estimated coefficient on relative financial development is almost identical to that reported in the baseline specification of Table 3.

33. The sovereign ratings are taken from Institutional Investor, a survey of international bankers widely used in the literature on the determination of sovereign spreads and financial crises (Eichengreen and Mody, 2000; Reinhart, 2004). Higher ratings (on a scale from 0 to 100) indicate a lower probability of default. A lagged average over the period 1990-2004 was used to construct the variable included in the regressions.

Table 10. Sensitivity to alternative regressors and variable definitions: Bonds (2005-06)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Total bias	Total bias	Total bias	Total bias	Total bias	Total bias ³
Closeness	0.587*** (0.103)	0.638*** (0.098)	0.611*** (0.107)	0.569*** (0.096)	0.444*** (0.103)	0.591*** (0.104)
Trade	0.398*** (0.112)	0.332*** (0.102)	0.373*** (0.117)	0.399*** (0.106)	0.380*** (0.108)	0.390*** (0.112)
Receiving country bond inflow restrictiveness	0.399 (0.544)	0.397 (0.502)	-0.024 (0.807)	-0.440 (0.513)	0.442 (0.537)	0.399 (0.546)
Receiving country institutional quality	0.685*** (0.201)	0.512*** (0.183)	0.265 (0.219)	0.869*** (0.192)	0.650*** (0.212)	0.694*** (0.203)
Receiving country relative private credit	-0.741*** (0.157)				-0.717*** (0.155)	-0.738*** (0.158)
Receiving country relative liquid liabilities		-1.094*** (0.205)				
Receiving country relative private bond market			-0.313** (0.124)			
Receiving country relative sovereign rating				-2.011*** (0.394)		
Fixed bilateral exchange rate					1.129*** (0.267)	
Observations	2144	2079	1903	2190	2144	2144
Investing countries	45	44	41	45	45	45
Receiving countries	43	41	40	44	43	43
R-squared	0.35	0.36	0.30	0.40	0.38	0.34

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

2. Two-way clustered robust standard errors in parentheses.

3. Lane & Milesi-Ferretti (2007) for foreign portfolio data.

Source: OECD calculations.

31. Further sensitivity checks are reported in Table 11. When all international financial centres are included in the estimation sample (Column 1), the results are similar to those obtained in Table 3. The results in Column (2) refer to an estimation sample that includes all years available in the IMF CPIS data. Despite the substantial increase in the number of observations, the results are similar to those in the baseline specification in Table 3. The IMF CPIS data include a large number of bilateral investment positions which are coded as “small”, *i.e.* either zero or smaller than USD 0.5 million. Including these data as zeros in the estimation sample is not desirable, as it is impossible to distinguish true zeros from positive but small bilateral positions. Nevertheless, for the sake of completeness, Column (3) reports the results from estimating Equation (1) including these bilateral positions as zero values by the Poisson Maximum Likelihood procedure proposed by Santos Silva and Tenreiro (2006).³⁴ Although the estimated coefficient on the relative financial development variable is lower than in the baseline specification, it remains negative and statistically highly significant. Column (4) reports the estimation results when the sample is restricted to financially highly-developed receiving countries.³⁵ This results in a similar setup as in Forbes (2010), where only one high-income receiving country (the United States) and a full set of sending countries are considered. The coefficient on financial development in the receiving country relative to the sending country remains negative and statistically significant. Column (5) shows that the results are robust to restricting the receiving country sample to Australia, the United Kingdom and the United States, which

34. Note that the zero bilateral positions are automatically dropped in the logarithmic specification in Equation (1). The identical number of observations in Columns (1), which includes financial centres but excludes zeros, and (3), which excludes financial centres but includes zeros, of Table 11 is a pure coincidence.

35. High financial development is defined here as a ratio of bond market capitalisation to GDP above 70%. The results are robust to choosing different thresholds.

are explicitly considered as safe-asset-producing countries in Caballero *et al.* (2008). The estimated coefficient on the relative financial development variable is similar to that in the overall sample.³⁶ Moreover, Column (6) suggests that the country-specific bias of financially less-developed countries toward the United States reported in Table 9 is purely US specific, as it cannot be identified for the safe-asset producing countries highlighted by Caballero *et al.* (2008) more generally.

Table 11. Sensitivity to changes in sample: Bonds (2005-06)

Dependent variable	(1) Total bias	(2) Total bias	(3) Total bias	(4) Total bias	(5) Total bias	(6) Country bias
Sample	Incl. IFCs	2001-2009	Incl. 0s	Recipients: High fin. dev.	Safe asset producers	Safe asset producers
Closeness	0.519*** (0.094)	0.561*** (0.095)	0.257*** (0.063)	0.730*** (0.118)	0.454*** (0.132)	0.315*** (0.055)
Trade	0.459*** (0.104)	0.408*** (0.112)	0.504*** (0.114)	0.336** (0.136)	0.199 (0.136)	0.391*** (0.147)
Receiving country bond inflow restrictiveness	0.407 (0.517)	0.408 (0.573)	-0.497 (0.618)	1.380** (0.631)		
Receiving country institutional quality	0.720*** (0.209)	0.748*** (0.204)	0.092 (0.213)	0.733*** (0.212)	0.417* (0.244)	0.393* (0.224)
Receiving country relative financial development	-0.758*** (0.168)	-0.745*** (0.155)	-0.311*** (0.120)	-0.768*** (0.187)	-0.865*** (0.199)	-0.053 (0.265)
Observations	2501	6953	2501	1391	234	234
Investing countries	49	45	45	45	44	44
Receiving countries	46	43	43	26	3	3
R-squared	0.34	0.35	0.24	0.42	0.33	0.34
Estimation method	OLS	OLS	Poisson	OLS	OLS	OLS

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

2. Two-way clustered robust standard errors in parentheses.

3. Receiving country relative ratio of private credit to GDP used as the measure of relative financial development

Source: OECD calculations.

5. Conclusion

32. This paper uses a large data set covering the largest portfolio debt and equity investing countries to assess how financial development shapes the pattern of bilateral portfolio holdings. One recent strand of the literature emphasises the role of asset shortages in determining the level and structure of the foreign holdings of financially less-developed emerging countries (Caballero *et al.*, 2008). According to this view, these countries acquire safe assets abroad, thereby channelling their savings mainly to financially highly-developed countries. This paper finds little empirical support for this view. First, financially less-developed countries tend to hold a larger share of domestic securities in their *total* portfolios than financially highly-developed countries, *i.e.* they have greater home bias. Second, even when abstracting from such bias and focusing only on the geographical allocation of their *foreign* portfolio, financially less-developed countries do not display a general preference for the assets of financially highly-developed countries. One notable exception is debt securities holdings in the United States, to which financially less-developed countries allocate disproportionately high shares of their *foreign* bond portfolios. However, it is difficult to interpret this as supporting the asset mismatch hypothesis, as financially less-developed countries' home bias dominates their US bias in foreign portfolio allocation. Overall, financially less-developed countries hold lower shares of their total portfolios in the United States than financially highly-developed countries. Moreover, they also hold lower total and foreign portfolio shares in other safe asset producing countries explicitly analysed in this paper.

36. Note that according to Schindler (2009) Australia, the United Kingdom and the United States do not impose any type of bond inflow restrictions. The bond inflow restrictiveness variable in the destination country is thus constant for these countries and the corresponding coefficient cannot be estimated.

33. The results of this paper suggest that it is doubtful that further financial development in emerging markets will contribute to the unwinding of global current account imbalances and the resulting financial fragilities. According to the asset mismatch view of global imbalances, increased financial development in financially less-developed countries should eventually result in the increased production of safe assets. As in the asset-mismatch theory (Caballero *et al.*, 2008) asset shortages in emerging markets ultimately drive these countries' current account surpluses, a larger production of domestic safe assets should eventually lead to a narrowing of current account imbalances at the global level. By contrast, the results in this paper highlight a channel through which continued financial development may amplify global current account imbalances, as the home bias of emerging markets is likely to decrease as they reach higher levels of financial development. This might further raise rather than reduce emerging countries' purchases of foreign assets.

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APPENDIX A1. EQUITY RESULTS

34. As in the bond regressions, the total bias in equity *decreases* with the ratio of receiving-to-investing-country financial development (Column 1 of Table A1.1). This result is, if anything, stronger for equity than for bonds. Moreover, it is entirely due to countries at lower levels of financial development under-investing in financially more-developed countries, rather than financially highly-developed countries overinvesting in financially less-developed countries (Column 2). As in the bond regressions, the weak foreign bias (inverse of the home bias) of financially less-developed countries is the main driver of this result (Columns 3 and 4). Table A1.2 reports the regression results when the ratio of domestic stock market capitalisation to GDP is used as the measure of financial development, applying an instrumental variables estimation methodology to deal with endogeneity.³⁷ The results remain qualitatively unchanged. Tables A1.3 and A1.4 show, respectively, the regression results when relative income per capita is controlled for and when the set of receiving countries is restricted to single “safe haven” destination countries. The results are similar as in the bond regressions. One notable exception is the estimated coefficient on the relative financial development variable in the regression with the United States as the single destination country, which for equity does not show a US bias in the *foreign* portfolio of financially less-developed countries (Column 2 of Table A1.4).

Table A1.1. OLS regression results for equity (2005-06)

Dependent variable	(1) Total bias	(2) Total bias	(3) Country bias	(4) Foreign bias
Closeness	0.657*** (0.110)	0.650*** (0.113)	0.517*** (0.084)	0.140* (0.082)
Trade	0.340*** (0.121)	0.291** (0.120)	0.383*** (0.091)	-0.043 (0.090)
Receiving country equity inflow restrictiveness	0.262 (0.206)	0.133 (0.157)	0.063 (0.201)	0.199 (0.162)
Receiving country institutional quality	0.654*** (0.175)	0.465*** (0.141)	0.159 (0.164)	0.495*** (0.164)
Receiving country relative financial development	-0.770*** (0.171)		0.076 (0.115)	-0.845*** (0.186)
Receiving country relative financial development (> 1)		-1.203*** (0.321)		
Receiving country relative financial development (< 1)		-0.293* (0.177)		
Observations	2386	2386	2386	2386
Investing countries	52	52	52	52
Receiving countries	66	66	66	66
R-squared	0.29	0.31	0.28	0.23
Estimation method	OLS	OLS	OLS	OLS

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

2. Two-way clustered robust standard errors in parentheses

3. Receiving country relative ratio of private credit to GDP used as the measure of relative financial development.

Source: OECD calculations.

37. The ratio of domestic stock market capitalisation to GDP is instrumented by the ratio of private credit to GDP and the ratio of liquid liabilities to GDP. These instruments pass standard tests of instrument validity and strength.

Table A1.2. Instrumental variables results for equity (2005-06)

Dependent variable	(1) Total bias	(2) Total bias	(3) Country bias	(4) Foreign bias
Closeness	0.681*** (0.132)	0.610*** (0.146)	0.522*** (0.087)	0.159 (0.113)
Trade	0.299** (0.146)	0.361** (0.154)	0.395*** (0.093)	-0.097 (0.124)
Receiving country bond inflow restrictiveness	0.818** (0.320)	0.454** (0.212)	-0.039 (0.229)	0.856** (0.370)
Receiving country institutional quality	0.780*** (0.234)	0.515** (0.214)	0.143 (0.178)	0.638** (0.266)
Receiving country relative financial development	-1.228*** (0.350)		0.094 (0.180)	-1.322*** (0.380)
Receiving country relative financial development (> 1)		-2.092*** (0.770)		
Receiving country relative financial development (< 1)		-0.075 (0.562)		
Observations	2329	2329	2329	2329
Investing countries	51	51	51	51
Receiving countries	64	64	64	64

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

2. Two-way clustered robust standard errors in parentheses

3. R-squared is not a valid measure of goodness-of-fit in IV regressions and therefore not reported (Verbeek, 2008)

Source: OECD calculations.

Table A1.3. Equity results with relative income per capita control (2005-06)

Dependent variable	(1)	(2)	(3)	(4)
	Total bias			
Closeness	0.647*** (0.102)	0.666*** (0.111)	0.490*** (0.091)	0.491*** (0.096)
Trade	0.349*** (0.115)	0.324** (0.126)	0.398*** (0.092)	0.406*** (0.096)
Receiving country bond inflow restrictiveness	-0.153 (0.296)	0.130 (0.429)	0.211 (0.209)	0.339 (0.218)
Receiving country institutional quality	0.998*** (0.182)	1.050*** (0.204)	0.226 (0.172)	0.265 (0.193)
Receiving country relative income per capita	-0.836*** (0.220)	-0.805*** (0.274)		
Receiving country relative private credit to GDP	-0.383** (0.177)		-0.349** (0.147)	
Receiving country relative stock market to GDP		-0.645* (0.331)		-0.457** (0.196)
Receiving: High-income; Sending: Emerging			-0.209 (0.677)	-0.178 (0.604)
Receiving: High-income; Sending: High-income			2.072*** (0.704)	2.325*** (0.661)
Receiving: Emerging; Sending: High-income			1.510*** (0.568)	1.903*** (0.578)
Observations	2386	2329	2386	2329
Investing countries	52	51	52	51
Receiving countries	66	64	66	64
R-squared	0.34		0.39	
Estimation method	OLS	IV	OLS	IV

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

2. Two-way clustered robust standard errors in parentheses

3. R-squared is not a valid measure of goodness-of-fit in IV regressions and therefore not reported (Verbeek, 2008)

Source: OECD calculations.

Table A1.4. Single receiving country for equity (2005-06)

Receiving country	(1)	(2)	(3)	(4)	(5)	(6)
	United States		Germany		Switzerland	
Dependent variable	Total bias	Country bias	Total bias	Country bias	Total bias	Country bias
Closeness	0.680** (0.283)	0.575*** (0.151)	0.727*** (0.118)	0.415*** (0.086)	0.667*** (0.188)	0.343*** (0.116)
Relative financial development	-1.487*** (0.409)	0.011 (0.176)	-1.330*** (0.333)	-0.050 (0.245)	-1.582*** (0.399)	-0.396 (0.241)
Observations	97	97	83	83	76	76
Investing countries	50	50	44	44	40	40
R-squared	0.33	0.17	0.58	0.29	0.47	0.23

Notes:

1. * denotes significant at 10%; ** significant at 5%; *** significant at 1%

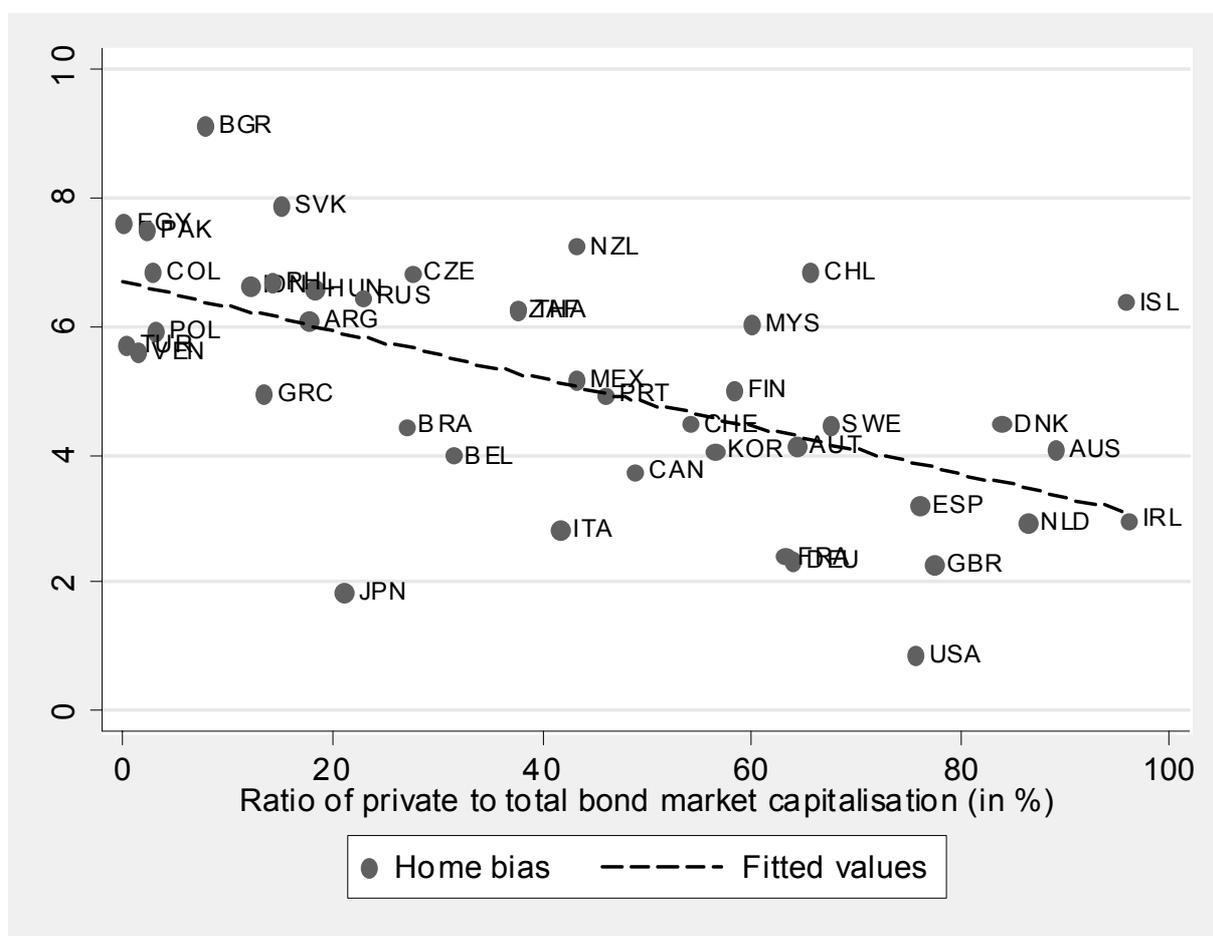
2. Clustered robust standard errors in parentheses

3. Receiving country relative ratio of private credit to GDP used as the measure of relative financial development.

Source: OECD calculations.

APPENDIX A2. SUPPLEMENTARY FIGURE

Figure A2.1. The home bias in bonds decreases with the share of private in total bond market capitalisation (2006)



Note: Home bias is the logarithm of the ratio of share of domestic bonds in total portfolio to the ratio predicted by a simple international CAPM. The CAPM ratio is the ratio of domestic market capitalisation to world market capitalisation.

Source: OECD calculations based on IMF CPIS, BIS Securities Statistics and Beck and Demirgüç-Kunt (2009).

APPENDIX A3. DECOMPOSITION OF THE DEPENDENT VARIABLE INTO A COUNTRY-SPECIFIC AND FOREIGN BIAS

35. The expression for the deviation of the observed portfolio share from the CAPM share can be re-written as:

$$TotalBias_{od,t}^j = \ln \left(\frac{\frac{Holdings_{od,t}^j}{ForeignHoldings_{o,t}^j} \frac{ForeignHoldings_{o,t}^j}{TotalHoldings_{o,t}^j}}{\frac{MarketCapitalisation_{d,t}^j}{ForeignMarketCapitalisation_{o,t}^j} \frac{ForeignMarketCapitalisation_{o,t}^j}{WorldMarketCapitalisation_t^j}} \right),$$

with

$$ForeignMarketCapitalisation_{o,t}^j \equiv WorldMarketCapitalisation_t^j - MarketCapitalisation_{o,t}^j.$$

36. This expression can then we re-written as:

$$TotalBias_{od,t}^j = \ln \left(\frac{\frac{ForeignHoldings_{o,t}^j}{TotalHoldings_{o,t}^j}}{\frac{ForeignMarketCap_{o,t}^j}{WorldMarketCap_t^j}} \right) + \ln \left(\frac{\frac{Holdings_{od,t}^j}{ForeignHoldings_{o,t}^j}}{\frac{MarketCap_{d,t}^j}{ForeignMarketCap_{o,t}^j}} \right).$$

The first term is a measure of the foreign bias of country o . The second term a measure of the country-specific bias of country o in country d . The link between this foreign bias measure and the home bias measure used in the present paper is as follows:

$$HomeBias_{od,t}^j = \ln \left(\frac{\left(1 - \frac{ForeignHoldings_{o,t}^j}{TotalHoldings_{o,t}^j} \right)}{\left(1 - \frac{ForeignMarketCap_{o,t}^j}{WorldMarketCap_t^j} \right)} \right).$$

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