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# International Currencies and Capital Allocation

*Matteo Maggiori, Brent Neiman, and Jesse Schreger*

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Matteo Maggiori<sup>†</sup>      Brent Neiman<sup>‡</sup>      Jesse Schreger<sup>§</sup>

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## Abstract

We establish currency as an important factor shaping global portfolios. Using a new security-level dataset, we demonstrate that investor holdings are biased toward their own currencies to such an extent that countries typically hold most of the foreign debt securities denominated in their currency. While large firms issue in foreign currency and borrow from foreigners, most firms issue only in local currency and do not directly access foreign capital. These patterns hold broadly across countries except for the United States, as foreign investors hold significant shares of US dollar bonds. The share of dollar-denominated cross-border holdings surged after 2008.

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<sup>†</sup>Maggiori: Harvard University, Department of Economics, NBER, and CEPR. Email: maggiiori@fas.harvard.edu.

<sup>‡</sup>Neiman: University of Chicago, Booth School of Business, and NBER. Email: brent.neiman@chicagobooth.edu.

<sup>§</sup>Schreger: Columbia Business School and NBER. Email: jesse.schreger@columbia.edu.

# 1 Introduction

Capital crosses international borders far more today than only a few decades ago. In the late 1970s, almost none of the total outstanding value of US corporate debt was held by foreigners. Today, more than one-quarter is held abroad. In part due to a lack of detailed data, however, surprisingly little is known about the determinants of cross-border investment. We introduce a novel security-level dataset covering, as of 2017, \$32 trillion in global investment positions to demonstrate that portfolios at both the macro and micro levels are driven by an often neglected aspect: the currency of denomination of assets.

We emphasize four findings. First, investors' bond portfolios exhibit strong *home-currency bias* as they disproportionately invest in bonds denominated in their own country's currency. Using micro data, we identify this effect by measuring the extent to which investors disproportionately hold bonds in their own currency relative to debt in other currencies issued by the same firm. This within-firm analysis allows us to disentangle the importance of the currency of denomination of a bond from possible confounding factors such as maturity, legal jurisdiction, and an issuer's credit risk and sector of operation. This home-currency bias holds to such an extent that countries typically own the majority of bonds denominated in their currency, even when the issuer is foreign and resides in a developed country. In fact, given the currency of denomination of a bond, knowledge of the issuer's nationality – the focus of a large and influential literature on home bias – offers very little additional information for predicting the investor's nationality. It is well known that investors dedicate a larger share of their bond portfolios to the set of domestic companies than foreign investors dedicate to those same companies. This home-country bias attenuates or even disappears if, instead of pooling all bonds together, one separately studies the portfolio shares of bonds denominated in any particular currency.

Second, home-currency bias is associated with a stark pattern of capital allocation across firms. In each country, a small number of large firms issue debt denominated in foreign currency and borrow from foreigners. By contrast, a large number of medium or smaller sized firms issue bonds only in their local currency (LC) and do not borrow substantially from foreigners. To demonstrate that this pattern does not simply reflect an unobservable characteristic of local currency borrowers that makes them unappealing to foreign investors, we show that these same local currency borrowers do receive equity investments from abroad. These facts suggest that the currency of issuance itself is a key factor associated with the differential receipt of foreign capital.

Third, the United States is the exception to the above patterns, with global investors uniquely willing to hold US dollars. In addition to their own currencies, foreigners invest a substantial portion of their portfolio in dollar-denominated securities when they invest in all destination countries, what we refer to as an international-currency or dollar bias. This implies that when foreigners buy

US securities, they predominantly buy dollar-denominated securities, thus behaving similarly to US domestic investors. Relatedly, US firms that borrow exclusively in dollars place their bonds in domestic and foreign portfolios with comparable ease. This is not true for any other country in our data. Our work offers a novel perspective on the potential benefits that accrue to countries that issue an international currency like the dollar – international currencies effectively open up the capital account for firms that only borrow in domestic currency.

Fourth, we uncover a striking shift in the time-series of global portfolios. The US dollar appears today to be the world’s only international currency. As recently as ten years ago, however, this was not the case. While the dollar was the currency of denomination for 41 percent of global cross-border holdings of corporate debt in our data in 2005, the euro also accounted for a substantial amount, 38 percent. These shares were largely stable until the global financial crisis of 2008, after which the euro’s share rapidly declined to 22 percent, while the dollar’s share rose to 63 percent. This massive international portfolio reallocation is not only interesting in its own right, but also offers a unique opportunity to assess how the above cross-sectional stylized facts changed in response to variation in the international status of the dollar and the euro. In line with the time-series shift of global portfolios toward the dollar, we find that differences between foreign and domestic investors in the European Monetary Union (EMU) and in the US, which are large in 2017, were more muted earlier in our sample.

Our security-level dataset covers holdings of mutual funds and exchange-traded funds (ETFs) around the world. ETFs were rare in the early years of our data and by 2017 only constitute about 10 percent of the fixed income assets under management (AUM) that we study. For ease of exposition, therefore, we often omit mention of “ETFs” and discuss our data in what follows as covering the holdings of “mutual funds” or “funds”.<sup>1</sup>

We confront some common but thorny issues in international financial data as well as challenges specific to our data. We use the procedure described in Coppola et al. (2019) and unwind issuance in tax havens and opaque international ownership structures in order to attribute securities to their ultimate parent firm (and its industry and country of operation), the revenues of which are used to repay the debt. We offer evidence that mutual funds domiciled in a particular country primarily invest on behalf of domestic residents, an assumption maintained throughout our analysis. Finally, we benchmark our data against other aggregates to verify that our core results are externally valid and are informative of patterns in the broader set of portfolio investments.

These new facts on the critical role of currency for understanding global capital flows have the potential to shape international macroeconomics models in much the same way as the stylized facts

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<sup>1</sup> Some fund managers report data on both mutual funds and ETFs, making it difficult to separate them in our analyses. We have confirmed, however, that all qualitative results from analyses of 2017 data also hold if we instead use data from several years earlier, when ETFs constituted an even smaller share of overall AUM.

on home-country bias, uncovered in French and Poterba (1991), influenced the earlier theoretical literature. Our intent is to establish these four facts in a simple and transparent way, leaving it to future work to identify the exact mechanisms underlying them. There are a number of possibilities. For example, investor home-currency bias may reflect the optimal allocation if home-currency bonds are a good hedge for investors' risks. Alternatively, this bias may reflect a combination of financial frictions like hedging costs and behavioral factors that effectively segment the market by currency. If foreign currency debt issuance requires incurring a fixed cost and if investors exhibit a bias toward local currency, only the largest firms would access foreign capital, much like the selection into exporting in the Melitz (2003) model of trade.

Our dataset includes quantities, i.e. bond positions, but not prices and therefore does not allow us to directly assess the borrowing cost of issuers. As with the trade literature, estimating the real economic impact of selection into foreign currency issuance will likely require a heavy structural apparatus. Measuring the benefits of selling bonds to foreigners or quantifying the "privilege" from issuing in a global currency like the US dollar is beyond the scope of this paper. In light of our results, however, we believe these are worthy goals for future work.

**Related Literature.** Our work relates to a large empirical literature linking net foreign asset dynamics to the differential composition of gross assets and gross liabilities, including important contributions by Lane and Milesi-Ferretti (2007), Gourinchas and Rey (2007), and Curcuru et al. (2008).<sup>2</sup> Our finding that foreigners' portfolios are underweight local-currency debt to such an extent that the external debt liabilities of countries are in large part denominated in foreign currency complements the work by Lane and Shambaugh (2010) and Bénétrix et al. (2015). The dataset of Lane and Shambaugh shows that foreign debt liabilities are often in foreign currency, but our micro data first directly links the currency composition of those liabilities to the country composition of foreign investors. Further, we exploit security-level variation to confirm that exposure to currency itself, rather than to potentially correlated factors like firms or industries, drives this pattern.

Our finding that home-country bias is largely attenuated within the set of local currency bonds expands upon the message in Burger et al. (2017), who first found using TIC data that US for-

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<sup>2</sup>Other recent work includes Alfaro et al. (2008), Bertaut et al. (2014), Du and Schreger (2017), and Lane and Milesi-Ferretti (2018). These papers make use of the IMF's International Investment Position (IIP) and Coordinated Portfolio Investment Survey (CPIS), the US Treasury's International Capital Flow (TIC) data, and the BIS's Debt Security Statistics and Locational Banking Statistics. A related literature studies international mutual fund data, but typically concentrates on equity flows or includes only a small subset of countries (see, for example, Chan et al. (2005), Hau and Rey (2004, 2008b,a), Forbes et al. (2016), Jotikasthira et al. (2012), Raddatz and Schmukler (2012), and Didier et al. (2013)). Hau and Lai (2016) focus on European money market funds to study monetary policy. Hale and Obstfeld (2016) examine the effect of the euro on the geography of cross-border debt investment. Kalemli-Ozcan et al. (2017) uses loan-level data to examine how global shocks drive capital flows to Turkey. Koijen and Yogo (2017) demonstrate how to estimate a demand system for equity investments using a dataset of holdings at the institutional investor level. Our work suggests currency would be an important factor in such estimates for bond investments. Choi and Kronlund (2017) study Morningstar data on US corporate bond mutual funds.

foreign investment across destination countries does not appear home-country biased in the subset of debt that is dollar denominated and suggested it might apply more generally across countries and debt markets. Boermans and Vermeulen (2016) find that a common currency is an important explanatory variable in a gravity portfolio setting for EMU-based investors.

Our results on which firms select into foreign currency borrowing and the heterogeneity across countries in such selection have analogies both with the international corporate finance literature, including Gozzi et al. (2010, 2015) and Larrain and Stumpner (2017), and the trade literature following Melitz (2003). The model of Salomao and Varela (2016) features an endogenous funding choice by heterogeneous firms that must pay a fixed cost to borrow in foreign currency. They apply their framework to data on Hungarian firms and study the link between their borrowing and investment decisions. Liao (2016) shows that variation in the currency-hedged cost of debt across different currencies predicts firms issuance: firms issue the most in those currencies in which borrowing is cheaper (including the cost of currency hedging). Bruno and Shin (2015a,b) study how movements in the dollar affect capital allocation and corporate investment via a balance sheet channel, and Bruno and Shin (2017) provide evidence that the recent increase in dollar borrowing by emerging market non-financial corporates is driven by these firms running a carry trade.

Our results on the special role of the dollar and its use in denominating internationally held bond contracts complements a growing body of research. The existing literature including Caballero et al. (2008), Mendoza et al. (2009), Gourinchas et al. (2011), He et al. (2019), Maggiori (2017), and Farhi and Maggiori (2018) has mostly focused on the safe-haven properties of the US dollar and the lower risk-free rate it affords to US government bonds, whereas we focus on the allocation of capital among corporate borrowers and offer evidence that the US “exorbitant privilege” includes the unique ability of US corporates that only borrow in dollars to raise capital from foreigners. Our finding that most cross-border bond positions are denominated in dollars, including a large share even when neither the investor nor the issuer are based in the US, has a mirror in the dominance of the dollar in invoicing traded goods, discussed in Goldberg and Tille (2008), Goldberg (2010), Gopinath (2016), and Gopinath and Stein (2018). It also relates to the international use of the dollar as a unit of account and means of payment modeled by Matsuyama et al. (1993), Doepke and Schneider (2017), and Chahrour and Valchev (2017).

Finally, the empirical patterns that we document offer a challenge as well as new guidance for international macro models. Benchmark models cannot match our facts because they generate no bond trading, as in Lucas (1982), or because they predict that foreign investors, conditional on investing in a country, tend to take on direct exposure to the borrower’s local currency, as in Alvarez et al. (2009), Bacchetta and Van Wincoop (2010), Pavlova and Rigobon (2012), and Lustig and Verdelhan (2016).<sup>3</sup> A few models do generate home-currency bias either as the optimal

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<sup>3</sup>Also see Corsetti et al. (2008), Tille and Van Wincoop (2010), Devereux and Sutherland (2011), Dou and Verdelhan

solution of a frictionless portfolio choice as in Solnik (1974), Adler and Dumas (1983), Engel and Matsumoto (2009), and Coeurdacier and Gourinchas (2016), or exogenously by postulating that households invest abroad in bonds denominated in their own domestic currency as in Gabaix and Maggiori (2015). Even these few models, however, would struggle to match the skewed foreign capital allocation – in which foreign currency issuers receive the bulk of foreign investment – that we show is a critical feature of the data. We conclude in Section 6 by elaborating on these points and suggesting how future work might generate models in which currency is critical for both debt investors and issuers and in which the US dollar plays a special global role.

## **2 Mutual Fund Investment Data**

Morningstar, Inc., one of the world’s largest providers of investment research to the asset management industry, provided us with their complete position-level data collected from mutual funds and ETFs domiciled in over 50 countries. These data are collected from open-end funds that invest in equities, fixed income, and a variety of other asset classes including commodities, convertible bonds, and housing properties.<sup>4</sup> The funds report all positions including stocks, bonds, cash, and alternative investments. Funds occasionally list derivative holdings, but we exclude these due to erratic reporting. Positions include a 9-digit identifier (the CUSIP) which we use to match with information on the security’s characteristics such as currency, maturity, coupon or dividend, and the security issuer’s geographic location and industry. Reporting is typically monthly and, when not, is almost always quarterly. At the most disaggregate level, our dataset contains millions of individual positions. For example, prior to the additional filtering done below, we observe about 5 million unique positions held by approximately 9,000 US funds and about 6 million unique positions held by approximately 52,000 funds domiciled in the rest of the world in December 2017.

### **2.1 Morningstar’s Coverage of the Mutual Fund Industry**

Our data account for a substantial fraction of all worldwide open-end fund assets under management (AUM). The Investment Company Institute (ICI), a major association of mutual funds and other regulated investment vehicles, reports that the US mutual fund and ETF industry had about \$22 trillion of AUM as of 2017 across equity, fixed income, allocation, and money market

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(2015), Colacito and Croce (2011), Colacito et al. (2017), Hassan (2013), and Hassan et al. (2016).

<sup>4</sup>Fund managers are not required by law to report their holdings to Morningstar but choose to do so in order to be included in Morningstar’s ratings and reviews. In principle, fund managers might not wish to correctly report their positions to Morningstar in order to “window dress”. Morningstar’s internal procedures verify the accuracy of the data against publicly available returns of the funds. Our own independent checks of the data against regulatory filings, voluntary disclosures, and other datasets of investment fund positions revealed the data to be accurate.

funds. Figure 1a compares the total value of fixed income funds' assets under management in US-domiciled funds in our dataset and in the ICI data. From very low levels of AUM in the 1980s, the industry grew at a rapid pace in the 1990s and 2000s, as captured in the solid blue line. AUM grew slowly during the 2008 recession but rapidly recovered and expanded to their present levels. Our data, displayed as a dashed red line in Figure 1a, exhibit meaningful coverage of US-domiciled AUM starting in the late-1990s and by 2017 account for 93 percent of the value reported by ICI. The Appendix includes figures that plot equivalent comparisons for the value of AUM managed by equity and allocation (or hybrid) funds. By the end of the sample, the coverage of our data for the US is nearly complete across all major types of funds.

Our data also include holdings of mutual funds and ETFs domiciled in more than 50 other countries. ICI reports that these countries together have \$19 trillion of AUM in 2017. Substantial coverage of these funds in our data starts in the early-to-mid 2000s. Figure 1b shows that over the last decade our data capture between half and three-quarters of fixed-income AUM outside the US.<sup>5</sup> To ensure that analyses are not influenced by domiciles for which Morningstar data are unrepresentative, we work with a subsample of the data that includes those developed economies for which Morningstar's coverage of fixed-income AUM is at least one-quarter of what ICI reports for that market at the end of 2017. These criteria select a final sample of 23 countries, 14 of which are subsumed into the EMU.<sup>6</sup> Table 1 lists the remaining 10 effective countries, ranked by the order of their AUM in 2017 in our data. While the US and EMU clearly account for the bulk of global AUM, we observe nearly \$1.5 trillion in AUM for Canada and for the United Kingdom.

## 2.2 Representativeness of Mutual Fund Investments

Mutual fund and ETF data are valuable for studying global capital allocation both because funds directly constitute a sizable share of all global portfolio investments and because their investments are in many ways representative of aggregate cross-border portfolio investment. While these funds are differentially important across countries, they always constitute one of the main holders of securities. According to OECD data, the share of total bond investment in 2017 that is intermediated by investment funds is 43 percent in the EMU, 23 percent in the US, and averages 36 percent across the 10 countries included in our analysis (though it varies from a low of 9 percent in Norway to a high of 82 percent in Denmark).

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<sup>5</sup>The ICI data for non-US domiciled funds are available quarterly on their web page when they release their "Worldwide Public Tables". We were able to obtain these tables for most quarters since the first quarter of 2005 using the Internet Archive (<https://web.archive.org/>). We log-linearly interpolate between the ICI values in the first quarter of 2005 and their values in the second quarter of 2002, which we obtained from Khorana et al. (2005).

<sup>6</sup>The countries included in EMU in our data are: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovenia, and Spain. All countries only enter our sample after their respective adoption date of the euro.

Comparisons with publicly available datasets suggest that, in the characteristics that we emphasize, our data appear largely representative of the broader set of portfolio investments. In the Appendix, we include figures demonstrating that the country and currency shares of US outward investment in our data broadly match their equivalents in TIC data. Since TIC covers all portfolio investment, including positions by pensions and hedge funds, for example, this suggests that US mutual fund and ETF positions are broadly representative of US portfolios. We also report similar statistics for inward investments, which do not align well with our data. This likely owes to large foreign entities directly investing in US securities, such as government institutions in China and Japan or large European insurance companies.

To examine the representativeness of non-US mutual funds and ETFs, we compare our data with reported positions from CPIS, a survey of cross-border portfolio holdings conducted by the IMF. The Appendix shows that our data aligns well with the bilateral country composition of foreign assets for all nine non-US economies in our sample. CPIS also includes information on the currency of foreign debt holdings for a few countries in recent years. In the Appendix, we demonstrate that the currency composition of Canadian, Danish, Swiss, and US portfolios in 2017 are similar in our data and in CPIS, as is also the case for a number of EMU member countries. We cannot directly compare the data for the EMU as a whole since CPIS does not report a consolidated EMU figure that removes intra-EMU investment. Our data align less well with aggregates reported by the European Central Bank (ECB). For example, the ECB reports the dollar share of EMU foreign bond holdings in 2017 to be 37 percent, below the 59 percent in our data. The discrepancy likely reflects the fact that Luxembourg and Ireland, countries that are disproportionately important in the mutual fund sector, have higher shares of their foreign holdings in dollars than the EMU average.

In some cases, our reporting of the currency or country composition of foreign bond liabilities differs from that in national data due to the exclusion or under-representation of key investor countries in our data. For example, we do not include any Japanese domiciled funds in our analyses and have less complete coverage of funds domiciled in the UK than of those domiciled in the US. Similarly, we do not cover official investors such as governments or sovereign wealth funds in China. The aggregate liabilities of the EMU in our data therefore have a currency composition that overweights investment from the US relative to investment from Japan, the United Kingdom, and China.

Finally, it is important to highlight that our analysis focuses on bond finance and therefore excludes information on bank lending.<sup>7</sup> According to OECD data, US non-financial corporations rely more heavily on bond financing (77 percent of total debt financing) than do European firms

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<sup>7</sup>Relatedly, our analysis excludes foreign currency borrowing from banks by households, including mortgage loans, as has been documented in countries including Hungary or Iceland.

(17 percent).<sup>8</sup> The share of bonds in total debt financing of non-financial corporations is between one-third and one-half in countries like Australia, Canada, and the UK. Despite this heterogeneity, we note that the key patterns we highlight hold similarly among all non-US countries.

## 2.3 Mapping Positions to Firms, Industries, and Countries

Morningstar reports the domicile country of each fund but does not have information on the nationality of individuals who invest in each fund. In general, tax optimization and regulatory restrictions make it unlikely that investors buy mutual funds domiciled in other countries.<sup>9</sup> Based on this principle, we assume that the domicile of a fund is also the country of residency of its investors and we use the two concepts interchangeably in the rest of the paper. Notable exceptions are funds domiciled in Ireland and Luxembourg, which include a large number of Undertakings for Collective Investment in Transferable Securities (UCITS) funds that are designed to be sold throughout the European Union under a harmonized regulatory regime. Given our focus on currency, we pool all data for countries within the EMU, including Luxembourg and Ireland, and treat the EMU itself as a single consolidated country in our benchmark analyses.<sup>10</sup> We demonstrate in the Appendix the robustness of our main analyses to the removal of Luxembourg, Ireland, and the EMU from our dataset.

Turning from investors to issuers, one benefit of working with security-level data is that we can trace issuers to their ultimate parent company, which allows us to associate security issuance with the industry and country that faces the economic liability and deploys the borrowed capital. The raw data from Morningstar associates each portfolio position with an industry and country of issuer, but these entries are not standardized across funds and dates. We use the methodology detailed in Coppola et al. (2019) to aggregate firms to their ultimate parent as well as to make sure that we standardize the characteristics of each security across all funds that hold a particular security in our data. Coppola et al. offer an algorithm that uses several different data sources including CUSIP Global Services, Capital IQ, SDC Platinum, Dealogic, Factset, and Orbis to associate each CUSIP 9-digit security code with a unique CUSIP 6-digit code indicating the ultimate parent of the issuer. We show in the Appendix that the procedure has no qualitative impact on the key patterns that are the focus of this paper.

In summary, our data tracks well the best publicly available information on the aggregate scale of mutual fund and ETF assets, domiciled inside and outside the US. These data clearly represent

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<sup>8</sup>See De Fiore and Uhlig (2011) for an analysis of the sources of the differential reliance on bond and loan finance in the US and Europe.

<sup>9</sup>In the Appendix, we provide support for this assumption using TIC data that shows that US outward investment is only rarely directed to foreign funds and that foreign investment into the US is only rarely directed to US funds.

<sup>10</sup>This leaves open the possibility that we misclassify investors that buy UCITS funds in Luxembourg and Ireland and are from countries inside the European Union but outside the EMU (such as Sweden or the United Kingdom).

only a subset of cross-border investment positions but a comparison with public aggregate data suggests that they are informative about many facets of non-mutual fund and ETF intermediated portfolio positions, such as those held by insurance companies and hedge funds. Our data are security-level, providing enhanced details that allow us to link borrowing to the industry and country of the ultimate parent of the issuer, and give insight into domestic and foreign investment by the same type of investors in many countries around the world.

### **3 Investor Home-Currency Bias**

In this section we demonstrate the strength of investor home-currency bias at the security, fund, and country level. Surprisingly, currency is such a strong predictor of the nationality of a security's holder that the nationality of the issuer – to date, the most powerful predictor in a voluminous literature on portfolio determination – has little additional explanatory power. We also document the extent of dollar bias, the tendency in our data of investors to disproportionately hold securities denominated in US dollars.

#### **3.1 Country-Level Results**

We find that domestic bond investments are almost always denominated in the domestic currency. For example, when Canadian investors buy bonds issued by Canadian companies, the bonds are almost always denominated in Canadian dollars. However, foreigners invest differently. When Australians buy bonds issued by Canadian companies, the bonds are rarely denominated in Canadian dollars.

Figure 2 plots the shares of investment that are in the issuer's currency for corporate bond portfolios in our data as of December 2017. The shaded red bars on the left illustrate for each country the share of all lending by that country's investors to that same country's corporate issuers that is denominated in the local currency. For example, the second red shaded bar from the top shows that about 95 percent of lending by Canadian investors to Canadian firms is denominated in Canadian dollars, as per the example above. The red shaded bars are all above 0.8 and most are quite close to 1. Unsurprisingly, and consistent with conventional modeling assumptions in the literature, all countries invest overwhelmingly in local currency when buying the bonds of domestic issuers.

More surprising, however, is our finding that foreigners invest differently. The hollow blue bars on the right of Figure 2 show the same statistic but for foreign investment portfolios, i.e. the share of foreign investment in each country's corporate bonds that is denominated in the issuer's

currency.<sup>11</sup> For example, the second blue hollow bar from the top shows that about 5 percent of bonds purchased by non-Canadian investors and issued by Canadian companies are denominated in Canadian dollars. If foreign and domestic investors held similar portfolios in each market, then the length of red and blue bars would be similar in each row. On the contrary, Figure 2 shows that the blue bars are systematically (much) smaller than the red bars for each row. Domestic investment is almost always in the local currency. Excluding (for now) investment in the United States, a minority of foreign investment is in the local currency.

In the Appendix, we perform this same analysis for sovereign bonds and show that this pattern still holds but is more muted. The difference is perhaps not surprising since most developed countries' sovereigns issue a very limited amount of foreign currency bonds (the US government, for example, does not issue at all in foreign currency).<sup>12</sup> Unlike sovereigns, many corporations issue a substantial fraction of their debt in multiple foreign currencies, thus offering investors the possibility to hold bonds issued by the same company but denominated in the currency of their choice. Since our focus is precisely on this currency choice, both from the investor and the issuer perspective, we focus our analysis in the rest of the paper on the corporate bond market.

Rather than holding local-currency bonds, foreigners tend to hold bonds denominated either in their own domestic currency or in US dollars. Figure 3 shows the currency composition of each country's external bond investments. We exclude investment in the United States to focus purely on the international role of the dollar. The vast majority of all foreign investment is either denominated in the investing country's currency or in US dollars.

Our results imply a strong sorting of foreign investment away from local currency bonds, despite the fact that these bonds constitute the bulk of the corporate bond market in each country. This sorting underlies the importance of studying portfolio holdings and not just the stock of securities outstanding to understand the external positions of countries. For example, a naive assumption that foreign and domestic investors buy securities in each country in proportion to their market-value weights would imply that developed countries have external liabilities denominated in their own currency and external assets denominated in foreign currency to a greater extent than is in fact the case.<sup>13</sup> An important consequence is that a domestic currency depreciation might not have as

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<sup>11</sup>The hollow blue bars on the right are calculated by simply adding up positions over multiple foreign investors that purchase from each issuer country. The relative weight of these foreign investors therefore implicitly relates to its scale of AUM in our data and therefore may differ from equivalent values reported by national statistical agencies. We have disaggregated the hollow blue bars into the portfolios from individual investor countries and verified that these patterns hold robustly across bilateral pairs.

<sup>12</sup>For an analysis of determinants of the currency composition of sovereign debt, see Ottonello and Perez (2016), Engel and Park (2018), Du et al. (2016), and Sunder-Plassmann (2018).

<sup>13</sup>A large literature on "Original Sin" such as Eichengreen and Hausmann (1999) and Eichengreen and Hausmann (2005) has emphasized the similar fact that emerging economies borrow from foreigners in "hard" currencies like the US dollar, presumably due to their inflation risk, weaker institutions, or less developed internal capital markets. We show, however, that even rich and developed economies that do not suffer from these problems borrow in foreign

much of a positive wealth effect as is commonly conjectured.<sup>14</sup>

### 3.2 Security-Level Results

The above results suggest that investors exhibit “home-currency bias”, in that they disproportionately hold securities denominated in their domestic currency, and “dollar bias”, in that they disproportionately hold securities denominated in US dollars. To demonstrate that currency is a critical factor driving this pattern, we must overcome the concern that correlated and omitted factors such as the borrower’s sector, participation in international trade, and credit worthiness, or the security’s maturity, coupon, legal jurisdiction, and place of issuance are in fact the true drivers of the bias and are simply correlated with the security’s currency. Our security-level dataset offers sufficient variation across all these elements to allow us to affirmatively demonstrate that currency itself is an important factor.

We start by exploiting security-level variation in the currency of denomination of multiple bonds offered by the same issuer. After all, a given issuer has the identical nationality, industry, trade exposure, and very similar default risk, regardless of which currency its debt is denominated in. Further, we can control for each security’s maturity and coupon. If Canadians, for instance, are much more likely to hold a given UK firm’s long-term Canadian dollar debt than that firm’s long-term British pound debt, this would support the conclusion that currency is the true underlying factor driving that investment decision.

Let  $s_{j,p,c}$  denote the share of the total holdings in our data of a particular corporate bond  $c$  (i.e. a 9-digit CUSIP) issued by parent firm  $p$  (i.e. a 6-digit CUSIP) that is held by investors from country  $j$ . A value of  $s_{j,p,c}$  equal to 0.1 means that funds domiciled in countries other than  $j$  account for 90 percent of the investment in that security in our data. We pool all individual corporate bonds  $c$  in our data and estimate the following regression separately for each investing country  $j$ :

$$s_{j,p,c} = \alpha_{j,p} + \beta_j \mathbf{1}_{\{\text{Currency}_c = \text{Currency}_j\}} + \text{Controls} + \varepsilon_{j,p,c}, \quad (1)$$

where  $\alpha_{j,p}$  is a fixed effect for the parent firm and  $\mathbf{1}_{\{\text{Currency}_c = \text{Currency}_j\}}$  is an indicator variable that equals one when security  $c$  is denominated in the currency of the investing country  $j$ . We restrict the analysis to a balanced set of investor and issuer countries. The coefficient of interest is the estimate of  $\beta_j$ , which reports the extent to which a country disproportionately holds securities denominated in its home currency. If country  $j$  had no home-currency bias then  $\beta_j$  would be

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currency from foreigners to a surprising extent via their corporate sector.

<sup>14</sup>The wealth effect would also be affected by the extent of hedging and the residency of the counterparties with whom the bonds are hedged, as this would determine whether the exchange rate exposure remained in the country or not. Liao (2016) offers useful evidence suggestive that firms often hedge, but the lack of systematic data on derivatives use precludes us from drawing too strong a conclusion.

zero.<sup>15</sup> Our benchmark estimates are run using data for 2017, are weighted by the total holdings in our data of each security, and control for maturity and coupon payment.<sup>16</sup>

Table 2 reports our estimates of equation (1). Looking across the top row, the  $\beta_j$  coefficients are all positive, statistically significant, and large in magnitude. For example, the top row of column 3 shows that if a security is denominated in Canadian dollars, Canadian funds hold a share of the total holdings of this security that is 90 percentage points larger than what they hold of securities that are not denominated in Canadian dollars but issued by the same issuer. This implies that Canadian investors hold the vast majority of Canadian dollar securities that are issued around the world. A similar effect holds for all other countries. Even among bonds issued by the same company, investors disproportionately hold those bonds that are denominated in their home currency.

Table 3 demonstrates the robustness of our results by reporting the same  $\beta_j$  coefficients from various alternative samples and specifications.<sup>17</sup> The first specification estimates equation (1) when we drop firms that only issue in local currency and restrict the sample to only those firms that issue in multiple currencies (MC), since variation within these firms is what identifies the currency bias. To be included in this specification as an MC issuer, a firm must issue in the local currency of the investor country and at least one other currency. The second specification only includes foreign issuers and the third specification additionally excludes any issuance by these firms that is done in the issuer's domestic market. The fourth and fifth specifications restrict the sample to financial and non-financial corporates, respectively. The sixth and seventh specifications also examine financial and non-financial corporates separately, but additionally restrict the sample to only include foreign firms. The eighth specification includes borrowing by local governments and municipalities, sovranationals such as the World Bank, and various structured fixed income products. The ninth specification includes all bonds in our dataset (including sovereigns). Our tenth specification distinguishes securities not only by issuer and currency, but also by residence (i.e. the country where the security is issued). In particular, we add to the currency dummy in equation (1) a dummy for the security being issued in the investors' country ( $j$ ).<sup>18</sup> Finally, our eleventh specification similarly

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<sup>15</sup>Our approach differs from that more commonly used in the home-bias literature in two ways. First, we use in our benchmark regressions of equation (1) a country's share of total holdings rather than measure the ratio of the share that a security accounts for in a country's portfolio relative to the share that security accounts for in total holdings. These two measures are linear transformations of each other within countries, so regressions that use either measure as the dependent variable contain the same information. Second, whereas the literature often uses worldwide market capitalization to measure total holdings, we measure total holdings internal to our mutual fund and ETF data.

<sup>16</sup>We control for maturity with dummies corresponding to the categories: less than 2 years, between 2 and 5 years, between 5 and 10 years, and greater than 10 years. We treat coupon similarly by using seven equally spaced buckets from below 1 percent to greater than 6 percent.

<sup>17</sup>We denote statistical significance using asterisks, but to improve the presentation, we do not report standard errors. Standard errors are clustered at the level of the fixed effects.

<sup>18</sup>For example, imagine that British investors are unaware that a local firm has a French parent and so they hold the local firm's pound debt rather than even considering the parent's euro debt. Our baseline regression would draw inference from the investor's choice between these euro and pound securities. This tenth specification addresses this

adds a dummy for bonds issued under the investor’s country’s governing law. (We only include countries with at least 100 bonds issued under their governing law.) While for some countries, the residence or legal jurisdiction of bond issuance do enter statistically significantly, these additions only modestly change the coefficient on currency. In all these analyses, despite the extensive differences in the included sample of issuers and the variation used to estimate fixed effects, the coefficient on home currency bias remains economically large, stable, and precisely estimated.

### 3.3 Fund-Level Results

The above results demonstrate that, in the aggregate, investors’ portfolios of foreign corporate bonds have a surprisingly large share of securities denominated in the investors’ currency or in US dollars, even when investing in developed countries. We turn next to a fund-level analysis that shows that these aggregate findings are not driven by outliers. Rather, the disproportionate share of home-currency and US-dollar positions in external positions is pervasive across funds.

In Figure 4a, we select the 300 funds in our data with the largest value of external corporate bond holdings and order them from the largest on the left to the smallest on the right.<sup>19</sup> We limit the analysis in the figure to 300 funds to facilitate visualization, but our Appendix tables report results using the full universe of funds. Each dot represents the share of investment in foreign corporate bonds that is denominated in that fund’s home currency. The large majority of funds holds either all or none of their foreign investment in their local currency. However, home-currency bias does not vary systematically with the size of funds’ foreign investment. To demonstrate this, the figure plots with a solid black line the fit of a lowess regression of home-currency share on the size rank of funds’ foreign investment. The line is effectively flat.

Next, consistent with our aggregate results, we demonstrate that the bulk of funds hold nearly all of their external positions in either their home currency or in US dollars. Figure 4b repeats the exercise but plots the share of each fund’s foreign investments that is denominated in either the investor’s home currency or the dollar. Indeed, the dots are now nearly universally clustered near one, and this holds across funds of different type, investment mandate, and geographic domicile. We therefore conclude that home-currency and dollar bias are widespread and not driven by a few outlier funds.<sup>20</sup>

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concern because it separates bonds associated with the same ultimate parent into those issued locally versus those issued abroad. A more general approach to this concern is to disregard the Coppola et al. (2019) parent-matching algorithm so the securities issued by parents and subsidiaries are never compared. The Appendix shows that the  $\beta_j$  coefficients all remain large and statistically significant even when estimated on data that does not use the parent-matching algorithm.

<sup>19</sup>These 300 funds are distributed across domiciles as follows: about 1 percent in Canada, 71 percent in the EMU, 5 percent in the United Kingdom, 21 percent in the United States, and about 3 percent in the other domiciles.

<sup>20</sup>The Appendix shows that patterns are similar if we plot separate versions of Figures 4a and 4b for each domicile country. We also report results from fund-level regressions of the home-currency share of external debt portfolios on

### 3.4 Home-Country Bias and Home-Currency Bias

A voluminous prior literature has documented the strength and pervasive presence of home-country bias, more commonly referred to as simply “home bias.” The influential work of French and Poterba (1991) found that investors disproportionately hold equity securities issued by domestic firms. The subsequent literature demonstrated that the same is true, to an even greater extent, for bonds. Furthermore, while equity home-country bias has seen a marked decline over the recent years, bond home bias has declined much less, as shown in Coeurdacier and Rey (2013). Home-country bias is to date the singularly effective force for empirically characterizing global portfolios and is essential for the quantitative performance of models in international macroeconomics and finance.<sup>21</sup>

Our results, however, offer the intriguing possibility that home-country bias largely reflects home-currency bias, since the propensity to issue in local currency is greater for local borrowers. Indeed, Burger et al. (2017) first suggested this possibility by demonstrating with US TIC data that home bias measures greatly attenuate when excluding non-dollar securities. Ultimately, distinguishing a bias for home currency from a bias for home country requires exogenous variation in either country or currency. While we do not have such exogenous variation, we compare the relative explanatory power of country and currency by estimating equation (1), adding a home-country indicator ( $\mathbf{1}_{\{\text{Country}_p=j\}}$ , equal to one when parent issuer  $p$  is located in country  $j$ ) and dropping the firm fixed effects since the country and firm indicators are collinear. We run three related regressions:

$$s_{j,p,c} = \alpha_{j,0} + \gamma_{j,0}\mathbf{1}_{\{\text{Country}_p=j\}} + \varepsilon_{j,p,c}, \quad (2)$$

$$s_{j,p,c} = \alpha_{j,1} + \beta_{j,0}\mathbf{1}_{\{\text{Currency}_c=\text{Currency}_j\}} + \varepsilon_{j,p,c}, \quad (3)$$

$$s_{j,p,c} = \alpha_{j,2} + \gamma_{j,1}\mathbf{1}_{\{\text{Country}_p=j\}} + \beta_{j,1}\mathbf{1}_{\{\text{Currency}_c=\text{Currency}_j\}} + \varepsilon_{j,p,c}. \quad (4)$$

Equation (2) is a home-country bias regression that measures the extent to which a country is overweight securities issued by domestic firms. Panel A of Table 4 reports the estimates of the country dummy  $\gamma_{j,0}$  from this regression. Consistent with the large literature on home-country bias, all these coefficients are positive and range from 10 percent to 71 percent depending on the country, thus confirming that countries are overweight securities issued by domestic firms.<sup>22</sup>

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fund characteristics. Funds that specialize in foreign investment, identified as those with larger shares of their total AUM accounted for by foreign positions, hold less of their foreign portfolio in their home currency and so exhibit less home-currency bias. Less robust evidence suggests that home-currency bias also very mildly decreases as total fund size grows.

<sup>21</sup>Additionally, see Fidora et al. (2007), De Moor and Vanpée (2013a,b), and Adams and Barrett (2018) for studies of home-country bias in bond portfolios and Lewis (1999), Sercu and Vanpée (2007), and Bekaert and Wang (2009) for surveys of the literature.

<sup>22</sup>Standard errors are shown in the Appendix, but nearly all reported coefficients are statistically significant at the

The large  $R^2$  values in the third column indicate that country information alone explains roughly one-third of the variation in securities' holdings around the world.<sup>23</sup> Estimates of equation (2) remind the reader of why home-country bias is the focus of such a large academic literature and is considered a critical moment to match in theoretical models.

However, as we have emphasized, data limitations have meant that traditional analyses have not included information on currency. We report in Panel B of Table 4 the estimates of equation (3), in which we replace the home-country indicator from equation (2) with a home-currency indicator. The results are much stronger, with the point estimates on the home-currency indicator and the  $R^2$ s both approximately twice as large as what they are in Panel A. This regression at the country level re-affirms our result from Table 2, which exploited only within-firm variation: the currency of denomination of an asset on its own has surprisingly high predictive power for the nationality of the holder of the asset.

Finally, to demonstrate that the results in Panel A are mostly driven by the correlation of issuers' countries with their securities' currencies of denomination, Panel C reports the estimates of equation (4), in which we include both the home-country and home-currency indicators. The coefficient on currency of denomination ( $\beta_{j,1}$ ) is little changed from the corresponding variable in the univariate regression ( $\beta_{j,0}$ ) in Panel B. Likewise, the  $R^2$ s are only slightly larger than those in Panel B. By contrast, the coefficient on country of issuance ( $\gamma_{j,1}$ ) is dramatically reduced from the corresponding univariate regression ( $\gamma_{j,0}$ ) in Panel A. Once we account for a security's currency of denomination, there is little additional scope for the security issuer's country to add information regarding the nationality of the holder. At least for corporate bonds, inference of home-country bias is confounded by the presence of home-currency bias. Open-economy macroeconomic models must face these new facts: whatever structural mechanism the theories are proposing, the resulting equilibrium must feature a pairing between issuers and investors that is mostly associated with the currency of denomination.

## 4 Currency Bias: The Firms' Perspective

Having documented the importance of the currency of denomination of bonds for the composition of investors' portfolios, we now turn to characterizing the implications from the perspective of borrowing firms. We show that in each country a small number of foreign-currency borrowers are typically the only firms that borrow substantially from foreigners. In each country, most firms borrow only in local currency and their debt is mostly held by domestic investors. We also show

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one percent level. The only exceptions are the country coefficients ( $\gamma_{j,1}$ ) in Panel C for Denmark, New Zealand, and Sweden.

<sup>23</sup>In order to make the  $R^2$  statistics easily interpretable we have removed security-level controls such as maturity and coupon. The controls, if included, would add minimal explanatory power.

that, consistent with the country-level results in Figure 2, the United States is an exception to this rule: US firms that only borrow in dollars place their debt into foreign and domestic portfolios with comparable ease.

## 4.1 Foreign Currency Issuers Borrow from Foreigners

In most countries, only firms that issue in foreign currency place substantial shares of their bond debt in foreign portfolios. For example, Figure 5a plots for each Canadian firm with debt in our data in 2017 the share of the total firm debt that is denominated in foreign currency, i.e. currencies other than the Canadian dollar, against the share of the total firm debt that is held by foreigners. The scale of each firm's bubble captures the market value of its total bond borrowing. We have aggregated the data across all debt securities issued by each firm, including those issued by subsidiaries or other associated issuers. This plot exemplifies two common features of the data. First, a large mass of smaller (by debt) firms are at the origin or slightly above it. These are smaller Canadian firms that borrow only in Canadian dollars and almost entirely borrow from Canadian investors. Second, as firms borrow more and more in foreign currency, they borrow more and more from foreigners. The relationship is nearly one for one, with the data points clustered along the 45 degree line. Figures 5b and 5c show similar patterns for the European Monetary Union and the United Kingdom.<sup>24</sup>

An important caveat is that we do not observe firm loan financing by banks. Hence, our data do not rule out the possibility that local-currency firms access the international market indirectly by receiving loans from domestic banks that themselves borrow from abroad in foreign currency. Even in this case, however, local-currency firms might be adversely affected since the loans are likely to come at a premium over direct bond financing from the foreigners. An extensive corporate finance literature has indeed shown that loan financing is in general more expensive than bond financing, including Diamond (1991), Rajan (1992), Bolton and Scharfstein (1996), De Fiore and Uhlig (2011), and De Fiore and Uhlig (2015).

The relationship between foreign currency issuance and foreign borrowing is markedly different for firms in the United States, as shown in Figure 5d. While it is still true that foreign-currency borrowers tend to borrow more from foreigners, there is a significant mass of medium-sized firms that issues only in US dollars but receives substantial financing from foreigners. One way to interpret these data is that the global taste for holding dollar debt securities effectively opens up the

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<sup>24</sup>The fact that we measure foreign ownership and foreign currency issuance from the same dataset, which does not capture the universe of bonds or of investors, may impart a bias toward the 45 degree line in these plots. As a robustness check, in the Appendix we present equivalent plots where instead of measuring the foreign currency shares in our Morningstar data, we obtain them from the SDC Platinum and Dealogic databases. For Canada, the EMU, the United Kingdom, and the United States, the correlation between these foreign currency shares in the SDC/Dealogic data and in our Morningstar data exceeds 75 percent. It is unsurprising, therefore, that the qualitative conclusions from these alternative figures are the same as those from Figure 5.

capital account for local currency borrowers in the US, whereas local currency borrowers in other countries are relegated to borrowing predominantly from domestic investors.

The fact that the bubbles located away from the vertical axis in Figure 5 are generally larger shows that bigger firms are more likely to borrow in foreign currencies. For example, for the case of Canada, Figure 6a ranks firms along the x-axis in terms of their total borrowing, from the largest borrower on the left to the smallest borrower on the right. The y-axis plots the number of currencies in which the debt of each firm is denominated. Toward the right end of the plot, nearly all firms only issue bonds denominated in a single currency (which, in this case, is typically Canadian dollars). Moving to the left, as firms' borrowing increases, firms issue in an increasing number of currencies. The largest Canadian borrower in our data issues bonds denominated in 7 different currencies. Figures 6b, 6c, and 6d show a similar pattern in the EMU, the UK, and the US. Together with Figure 5, this implies that large borrowers issue in foreign currency and borrow from abroad, whereas small and medium borrowers issue in domestic currency and borrow from domestic investors.

We can more formally analyze selection into foreign currency borrowing by estimating on data for 2017 the following probit model:

$$Pr\left(\mathbf{1}_{\{MC_p\}} = 1\right) = \Phi\left(\alpha_j + \beta_j Size_p + \gamma_{j,p} Industry_p\right), \quad (5)$$

where  $\mathbf{1}_{\{MC_p\}}$  is an indicator for a firm  $p$  having debt in foreign currency,  $Size_p$  is a measure of firm size, and  $Industry_p$  are a set of fixed effects capturing the firm's two-digit SIC. Unlike our prior analyses, we estimate equation (5) using operating and balance sheet data from Compustat (North America and Global) and Worldscope and using bond issuance data from the SDC New Issues database.<sup>25</sup> We proxy for firm size using four alternative measures: total bond principal outstanding, profits (EBIT), total assets, and revenues. We include industry fixed effects to account for differences in capital intensity, the collateral value of the firm, and propensity to be involved in export/import activity since these might in turn affect the capital structure decision by the firm. This regression is run separately for each country in our sample, and so the intercept  $\alpha_j$ , the industry fixed effects  $\gamma_{j,p}$ , and coefficients on the different proxies for size  $\beta_j$  are allowed to vary across countries.

Table 5 presents the average marginal effects for the country listed atop each column from estimates of equation (5) using each of our four size proxies. All estimates are positive and statistically significant: Bigger firms, all else equal, are more likely to issue in foreign currency. All the different measures of firm size point in the same direction. This type of size-dependence is a hall-

<sup>25</sup>In the regressions, we use data from SDC instead of our data from Morningstar to allow for the possibility that firms may issue bonds that are not held by mutual funds or ETFs in our dataset. The results are robust, however, to instead using Morningstar data. We merge the SDC database with firm-level balance sheet data using the CUSIP6 of the Ultimate Parent as reported in SDC.

mark of selection in the presence of fixed costs. Indeed, issuing in foreign currency often involves substantial set-up costs. Firms need to build an enriched accounting infrastructure and arrange for and pay costs of currency hedges. This often involves establishing a more sophisticated corporate treasurer's department. Foreign currency issuance also generally involves a relationship with an international investment bank, roadshows in foreign countries, and investor meetings aimed at familiarizing foreign investors with the firm.

One possible confounding factor may be that size is correlated with participation in international trade or foreign investment, and firms with significant foreign revenues may have a greater exposure to foreign currency risk. Their greater propensity to issue debt in foreign currency, therefore, may reflect the desire to hedge operating exposures rather than their willingness to pay a fixed issuance cost.<sup>26</sup> Our ability to address this possibility is limited as we only have information on the geographical distribution of sales for a small share of issuers in our data. Nonetheless, in the Appendix, we replicate these results in probit estimates that also condition on the share of a firm's sales earned abroad, as measured in Thompson Reuters Worldscope Segment Tables. For some countries such as the United Kingdom and the United States, a higher foreign sales share is associated with a significantly greater likelihood of issuing foreign-currency debt, whereas for other countries such as Canada and the EMU the relationship is insignificant or negative. Across the vast majority of specifications, firm size remains strongly and positively correlated with the likelihood a firm issues foreign-currency debt.

## 4.2 Foreign Borrowing by LC Firms and the US Dollar

We now turn our attention to those smaller firms that borrow only in local currency, the firms in Figure 5 that are located along the y-axis. Figure 7 demonstrates the extent to which foreign investors are underweight the bonds of Canadian firms that only issue in Canadian dollars, their local currency. To see this, start with the left panel. The solid red circles plot investment in each Canadian issuer (the parent firm) by Canadian investors in 2017 as a share of those Canadian investors' total investment in Canadian corporate bonds. Similarly, the blue hollow diamonds plot investment in each Canadian issuer by foreign investors as a share of the total foreign portfolio of Canadian corporate bonds. The sum of the solid red dots and the sum of the blue hollow diamonds, therefore, each equals one. The firms are ordered along the x-axis based on their shares of domestic investment in Canadian firms, as opposed to the foreign or overall holdings, so the solid red dots monotonically decline by construction. Looking across the plot, there are some firms for which the solid red dots are above the hollow blue diamonds – indicating domestic investors are overweight

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<sup>26</sup>We note that while large exporters may in fact wish to issue debt in foreign currency to match their foreign-currency-denominated export receipts, large importers in fact have the opposite incentive and may exacerbate currency mismatch if they issue foreign-currency debt.

relative to foreign investors – and others for which the opposite is true.

A striking pattern emerges if we remove the points corresponding to firms that issue in foreign currencies, while keeping the ranking along the x-axis unchanged. The right panel of Figure 7 plots the exact same objects as the left panel but restricts the sample to include only the subset of firms that issue only in local currency (i.e. in Canadian dollars). As noted earlier, LC-only issuers are typically smaller, and indeed the data for the largest (i.e. leftmost) firms in the figure's left panel are missing from the right panel. The difference between the solid red dots and hollow blue diamonds in the right panel is clear – the red dots are almost uniformly above the blue diamonds. Canadian firms that issue only in their local currency represent significantly larger shares of Canadian investors' portfolios than of foreign investors' portfolios.

Figure 8 conducts this same analysis of domestic and foreign investment in LC-only firms in the European Monetary Union, the United Kingdom, and the United States, as well as repeating the analysis for Canada for comparison. The solid red dots in the plots for Canada, the European Monetary Union, and the United Kingdom are all almost uniformly above the hollow blue diamonds. In those countries, LC-only issuers do not typically place their debt into foreign portfolios and therefore borrow almost exclusively from local investors. The one exception is the US, where the solid red dots roughly split through the center of the hollow blue diamonds, indicating that LC-only firms in the US are almost equally likely to represent a given share of domestic or foreign portfolios. US firms that borrow only in dollars, unlike LC-only firms in the other countries, borrow substantially from foreigners.<sup>27</sup>

Aggregating across firms, we sum the solid red dots and hollow blue diamonds from each of the sub-plots in Figure 8 and plot in Figure 9a the aggregate shares of LC-only issuers' debt in domestic portfolios as red bars and the aggregate shares of LC-only issuers' debt in foreign portfolios as blue bars. The red bars are almost always dramatically taller than the blue bars, confirming that LC-only firms account for a far larger share of domestic than of foreign investment portfolios. The one exception is the United States, where the red and blue bars are of similar height. US firms that issue only dollar-denominated debt account for similar shares of domestic and foreign investment portfolios.<sup>28</sup>

Taken together, the above results are consistent with the view that selection into foreign currency borrowing leads to different outcomes across countries. In this view, US firms face ample demand for their bonds, both by domestic and by foreign investors, even when just borrowing

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<sup>27</sup>In the Appendix, we repeat this analysis separating issuers into financial and non-financial corporations as well as into the industries of consumer products, energy and utilities, IT and telecommunications, and industrials and materials. The documented patterns hold across almost all of these subsamples.

<sup>28</sup>Relatedly, LC-only firms account for nearly 60 percent of the US's total corporate bonds in our data, whereas the equivalent value for Canada, the European Monetary Union, and the United Kingdom ranges from about 15 to 25 percent.

in dollars. These firms, consequently, mostly borrow in dollars and only issue in foreign currency when their borrowing needs grow extremely large. Firms in countries with a smaller local-currency debt market, like Sweden, quickly outgrow the demand for their local currency debt and in order to borrow more (without pushing interest rates too high) switch to foreign currency borrowing. In these countries, even relatively small firms borrow in multiple currencies and MC-firms account for most of the countries' overall borrowing. Since we lack bond-level interest rate data, we leave further investigation of this view to future research.

One might worry that the above patterns, at least for countries other than the US, reflect differences between the local-currency and multi-currency firms that are distinct from, though correlated with, the currency of the debt security. Perhaps local-currency firms are in industries for which foreign investors naturally lack expertise or interest. Alternatively, multi-currency firms might be those that export a lot to foreign destinations and are therefore well known to foreign investors. To evaluate this possibility, we proxy a firm's appeal to foreign investors using the firm's equity portfolio shares. After all, though debt and equity do not offer identical payoffs, if something about a firm caused it to be a fundamentally unappealing investment for foreigners, foreign investors should avoid both the firm's equity and its debt. If equity markets are unaffected by currency-related frictions (for example, because equities are real assets not affected by the currency of denomination), then the equity portfolio shares provide a helpful model-free benchmark for what optimal debt portfolio shares might look like in the absence of home-currency bias. Figure 9b considers the same LC-only firms as in Figure 9a, but plots their share of domestic and foreign equity portfolios for that market. It is clear that the difference in LC-only firms' shares of foreign and domestic equity portfolios, if any, is far more muted than is the case for their debt securities, even for countries other than the United States. For example, there is only a small positive difference for Europe, Sweden, and Norway, and the gap is actually negative for Denmark, New Zealand, and Australia.<sup>29</sup>

In sum, investor home-currency bias and the firm-size dependency for foreign-currency issuance together imply that most firms issue only local-currency debt and do not borrow much from abroad. The United States, however, issues an international currency and represents an exception to these patterns. Even smaller US firms place their dollar-denominated bonds into foreign portfolios. In the US, these LC firms account for comparable shares of domestic and foreign portfolios and for a large share of overall US borrowing.

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<sup>29</sup>To investigate this further, the Appendix explores the joint holdings of equity and debt of the same firm by foreign and domestic investors. In general, firms that attract a lot of foreign equity investment only attract a lot of foreign debt investment if they issue in multiple currencies. The US again constitutes an exception, with the foreign and domestic investors behaving similarly in MC and LC firms.

## 5 The Rise of the Dollar and Fall of the Euro

The above results demonstrate that, as of 2017, the US appears to be the only international currency issuer and that it receives a unique capital allocation from the rest of the world. One might understandably assume that the US dollar has had this status for many decades or more, perhaps since the advent of the Bretton Woods system following the Second World War, if not earlier. In this section, we demonstrate that in fact the euro was also used to denominate a significant share of global bonds held across borders as recently as 2007. Following the global financial and eurozone crises, however, its share fell pervasively and dramatically and this fall was mirrored by a rise in the use of the dollar. We conclude that international currency status may be less stable than is typically assumed.

Figure 10 shows the share of all cross-border corporate bond positions in our data accounted for by bonds denominated in dollars and in euros. The solid red line shows that, on the eve of the 2008 global financial crisis, dollar-denominated bonds represented approximately 40 percent of these positions in our data. The dashed blue line shows that euro-denominated bonds accounted for a bit above 30 percent at that point in time. Further, these shares had been largely stable during the preceding four years. No other currencies came close to representing such large shares in cross-border portfolios.

Strikingly, starting immediately after the crisis, international bond portfolios exhibited a dramatic shift away from the euro and into the dollar. The euro share of total cross-border bond positions collapsed by late 2017 to about 20 percent while the dollar share exceeded 60 percent. The currency switch is similarly apparent when one includes sovereigns, local governments, and all other bonds in our data, as shown in Figure 11a.<sup>30</sup>

This pattern is not driven (directly) by something specific to investors or borrowers in the US or the EMU. Indeed, Figure 11b plots the currency shares in global cross-border corporate bond portfolios after excluding the US and EMU as either the investor in or issuer of the bonds.<sup>31</sup> The fact that the pattern remains strong in this subset of data shows that the shift is not simply attributable to changes in the relative size of the US and EMU markets nor is it directly driven by the unconventional monetary policy (quantitative easing) of the Fed or the ECB. Another possibility is that the dollar-euro exchange rate underlies these patterns and indeed, the dollar has strengthened

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<sup>30</sup>The BIS International Debt Securities database collects information on the currency of securities that are issued in foreign markets (i.e. for which the nationality of the issuer and the market of issuance of the security are different). The database, therefore, excludes domestic issuance of debt securities and only captures a subset of the world debt market. Nonetheless, we demonstrate in the Appendix that even in these BIS data there is a rise in the share of dollar-denominated bonds and a collapse in euro-denominated bonds that moves similarly to our measures.

<sup>31</sup>Figure 11b makes clear that the dollar and the euro are used to denominate a large share of bonds between borrowers and lenders which do not use either as their home currency. In this sense, our notion of international currency echoes that discussed in the literature on the invoicing of international trade in goods. See, for instance, Goldberg and Tille (2008), Goldberg (2010), Gopinath (2016), and Gopinath and Stein (2018).

relative to the euro since 2008. This relative price movement, however, can only directly explain a small portion of the relative trends in the previous charts. We have verified this by regenerating Figure 10 using an alternative dataset constructed using exchange rates fixed at their 2005 levels.

One might be concerned that these patterns merely reflect compositional changes in our data. For example, if Canada hypothetically entered late in the dataset and predominantly held dollar bonds, it would plausibly explain the above trends. To address this concern, we regress the share of euro-denominated bonds and dollar-denominated bonds in the portfolio of country  $j$  invested in securities issued by  $i$  on time fixed effects and country-pair (issuer  $i$  and investor  $j$ ) fixed effects. We run this regression separately for the euro and dollar, for various assets, and for various country pair rules (such as excluding domestic investment or excluding the USA or EMU as issuers, investors, or both). The country-pair fixed effect ensures that changes in the composition of countries in our sample do not drive our inference on the time series variation in the roles of the dollar and euro in cross-border bond portfolios. We run this regression on the baseline as well as constant exchange rate data sets and find that composition is not driving this trend. Figure 11c plots time fixed effects, both normalized to zero in 2005, from specifications that focus on cross-border corporate bond positions valued at constant (2005 base) exchange rates and weighted with the size of portfolios in the first quarter of 2009. The pattern remains.

Finally, one might wonder if the shift is driven by the banking sector alone. Figure 11d restricts the sample to only contain non-financial corporate borrowers. There is a levels difference from the earlier plots as non-financial corporates more commonly borrow in US dollars. The shift away from euro-denominated bonds and into dollar-denominated bonds, however, is robust even after excluding financial institutions.

Table 6 summarizes this evidence on the shift in global portfolios away from euro and into dollar bonds. The table shows the euro and dollar portfolio shares for each specification in the fourth quarters of 2005, 2008, and 2017. Across most of these specifications, the share of dollar-denominated bonds rises by about 10 to 20 percentage points whereas the share of euro denominated debt declines by about the same magnitude. The rise of the dollar and fall of the euro since 2008 as international currencies is a robust global pattern.

This dramatic shift in the currency composition of global portfolios toward the US dollar has accompanied an increase in the extent to which the dollar stands out in the cross-sectional relationships emphasized above. For example, we demonstrated that the US in 2017 is unique in that the foreign investment it receives is denominated in US dollars to an extent comparable to what it receives domestically. In the Appendix, we replicate this analysis using data from 2005, when the dollar and euro shares were less dissimilar in cross-border portfolios. We find that the US dollar share of foreign investment into US corporate bonds is smaller, equal to about 40 percent in 2005 compared to about 75 percent in 2017, while the euro share of foreign investment into

EMU corporate bonds was nearly 25 percent in 2005, close to recent levels. We similarly show that whereas in 2017 US LC-firms accounted for similar shares in domestic and foreign portfolios, their relative share in domestic investment increases as we move back earlier in our dataset, both in levels and relative to that for EMU LC-firms. We view these results as suggestive that the roles of the dollar and euro in shaping cross-border capital allocation have changed during this period, but an important aim for future work is to identify the driver of this shift away from euros and toward the dollar and to further elaborate on the global implications.

## 6 Interpreting the Facts

Before concluding, we discuss the implications of our four facts for international macroeconomic models and suggest how they might shape the research agenda moving forward. In the same way that home-country bias in portfolios is a key calibration target in the existing literature, our evidence demands that – contrary to most current practice – models must also produce portfolios that strongly exhibit home-currency bias. Further, while home-currency bias arises in some frictionless portfolio models such as Solnik (1974) and Adler and Dumas (1983), it does not manifest in those models in the same way we show it manifests in the data. In particular, those models do not replicate our finding that foreign investors almost entirely avoid debt exposure to firms that issue only in local currency even when they buy the equity of those same firms. Rather, with perfect markets, investors would not distort their allocation across firms and would instead adjust any undesired currency exposure in their overall portfolio using a long-short position in short-term risk-free bonds in the different currencies.

The difficulty in reconciling our facts with frictionless models comes from the insight that, with complete markets and in the absence of frictions, currency risk can be traded (hedged) separately and therefore cannot be a source of distortions. Indeed, this is the logic used in Van Wincoop and Warnock (2006, 2010), Engel and Matsumoto (2009), and Coeurdacier and Gourinchas (2016) to argue that exchange-rate risk cannot be responsible for home-country bias in equities. We believe that equity markets are less affected by currency-related frictions because an equity is a claim to profits from producing and selling real goods, and indeed in the data, bilateral exchange rate movements affect the relative prices of equities across countries far less than they affect the relative prices of local-currency debt. We consequently view our results as pointing future work toward models with currency-related frictions in debt markets.

Future models will have to embed mechanisms capable of generating these patterns with differential strength across countries and currencies. Otherwise, they will be unable to capture the special role of the dollar, or to analyze the benefits that accrue to the US economy from the unique ability of its local currency borrowers to access foreign capital. Such heterogeneity is necessary

by construction to understand the rise of the dollar and the fall of the euro after the recent global financial and eurozone crises. The literature has examined many asymmetries in order to generate pricing implications consistent with the observed cross-country variation in the failure of uncovered interest parity, as discussed in Lustig and Verdelhan (2007), Colacito and Croce (2011), Hassan (2013), and Farhi and Gabaix (2016). This paper provides a new set of facts about asymmetries in portfolio allocations across countries. We view the next challenge as presenting a theory of exchange rates consistent with these observed patterns of portfolios in the same way that this earlier literature focused on matching the pricing patterns.

We think that home-currency bias reflects a combination of financial frictions, like hedging costs, and behavioral biases that effectively segment the investor pool for firm debt by currency. One might have thought that global bond investors would be the ones hedging their currency exposures, as prescribed, for instance, by Campbell et al. (2010). Indeed, we find that investors limit their exchange rate risk by avoiding foreign currency debt in the first place, leaving firms with the potential need to hedge. We view the size-dependency of foreign-currency issuance by firms as the result of fixed costs in issuing in foreign currency, and the cost of hedging may be an important component of these fixed costs.

We do not believe that regulatory barriers preventing mutual funds from hedging can explain home-currency bias. First, the bias is found across countries with different regulatory regimes, and we do observe at least some hedging activity via derivative positions in our data. Second, the Appendix documents that the shares of US outward investment allocated to large destinations like the EMU and the United Kingdom are similar in our mutual fund data and in US TIC data, which includes investment by entities that are not regulated like mutual funds are, and this holds even when we separately study portfolios of LCU- or dollar-denominated corporate debt. Finally, it may be natural for issuing firms to hedge instead of the investors. Firms need to only hedge once at issuance, keeping the position until maturity when they repay, and this is often a service bundled by the investment bank underwriting the issuance. By contrast, mutual funds frequently change their exposures, including due to withdrawals from the funds, so would likely have to incur larger associated costs.

We view our new facts as pointing to models with market segmentation by currency, as in Gabaix and Maggiori (2015), and size-based selection into foreign-currency issuance, as in Melitz (2003). Perhaps only the most productive firms choose to pay the fixed cost required to issue in foreign currency, which gives them access to more investors and a lower cost of borrowing. Perhaps the global willingness to buy US-dollar denominated assets means this tradeoff is least important for US firms. We suspect many of our facts would emerge in such an environment, but leave it to future work to formalize the logic.

## 7 Conclusion

In this paper, we demonstrate that currency plays a crucial role in shaping global capital allocation. Other than international currencies like the US dollar, investors take on much less currency risk when buying the debt of foreign countries than was previously thought, even when those countries are developed ones like Canada, the EMU, or the United Kingdom. Firms can borrow from abroad by issuing in foreign currency, but evidence suggests it is costly to do so. Unless a country issues an international currency, therefore, the firms from that country issuing only in the local currency may have to do without foreign capital. This highlights a potential new benefit that the US dollar brings to the United States: it effectively opens the capital account for its local currency firms that borrow only in US dollars. Our evidence suggests that the fall of the euro and the rise of the dollar as international currencies since the global financial and eurozone crises have important consequences for the global allocation of capital.

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Table 1: Domicile Countries Included in Analyses

		<b>Country Code</b>	<b>AUM in 2017 (\$ Billions)</b>
(1)	United States	USA	21,077
(2)	European Monetary Union	EMU	7,004
(3)	Canada	CAN	1,437
(4)	United Kingdom	GBR	1,408
(5)	Switzerland	CHE	431
(6)	Sweden	SWE	355
(7)	Australia	AUS	313
(8)	Norway	NOR	133
(9)	Denmark	DNK	127
(10)	New Zealand	NZL	43

**Note:** This table reports total Asset Under Management (AUM) for the countries (i.e. domiciles of mutual funds and ETFs) that have sufficient coverage relative to the level of AUM reported in ICI and therefore are included in our main analyses. All types of funds (equity, fixed income, allocation, and money markets) are included in the AUM figures.

Table 2: Home Currency Bias: Within-Firm Variation, 2017

<i>j</i>	AUS	CAN	CHE	DNK	EMU
Currency	0.607*** (0.042)	0.899*** (0.013)	0.722*** (0.011)	0.568*** (0.060)	0.559*** (0.012)
Obs.	36,229	36,229	36,229	36,229	36,229
# of Firms	7,802	7,802	7,802	7,802	7,802
$R^2$	0.779	0.958	0.934	0.775	0.848
Firm FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

<i>j</i>	GBR	NOR	NZL	SWE	USA
Currency	0.446*** (0.022)	0.801*** (0.028)	0.707*** (0.131)	0.640*** (0.024)	0.626*** (0.013)
Obs.	36,229	36,229	36,229	36,229	36,229
# of Firms	7,802	7,802	7,802	7,802	7,802
$R^2$	0.800	0.934	0.823	0.871	0.892
Firm FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

**Note:** This table reports estimates of the regression in equation (1). The dependent variable is the share of each security (at the CUSIP 9-digit level) bought by each country in our sample:  $s_{j,p,c}$ . We include fixed effects at the ultimate-parent firm level. Controls include maturity and coupon bins. Standard errors in parentheses are clustered at the ultimate-parent firm level. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 3: Home Currency Bias: Robustness, 2017

		AUS	CAN	CHE	DNK	EMU
(1) MC Only	$\beta$	0.606***	0.897***	0.721***	0.577***	0.555***
	Obs.	6,472	5,656	7,475	896	15,310
(2) Foreign	$\beta$	0.478***	0.905***	0.714***	0.849***	0.590***
	Obs.	34,814	33,626	34,835	35,329	26,309
(3) Foreign, Int'l	$\beta$	0.549***	0.935***	0.769***	0.809***	0.618***
	Obs.	4,586	4,581	4,369	4,754	3,503
(4) Financial	$\beta$	0.654***	0.885***	0.719***	0.552***	0.557***
	Obs.	15,457	15,457	15,457	15,457	15,457
(5) Non-Financial	$\beta$	0.534***	0.916***	0.727***	0.679***	0.560***
	Obs.	18,595	18,595	18,595	18,595	18,595
(6) Foreign Financial	$\beta$	0.493***	0.877***	0.713***	0.881***	0.588***
	Obs.	14,584	14,500	14,609	14,903	11,074
(7) Foreign Non-Fin.	$\beta$	0.460***	0.932***	0.717***	0.814***	0.593***
	Obs.	18,159	17,013	18,124	18,353	13,909
(8) SF, SV, LS	$\beta$	0.603***	0.900***	0.721***	0.551***	0.558***
	Obs.	65,001	65,001	65,001	65,001	65,001
(9) All bonds	$\beta$	0.597***	0.886***	0.719***	0.552***	0.566***
	Obs.	285,267	285,267	285,267	285,267	285,267
(10) Residency	$\beta$	0.605***	0.888***	0.721***	0.560***	0.555***
	Resid.	0.007	0.046***	0.020	0.135**	0.045**
	Obs.	36,229	36,229	36,229	36,229	36,229
(11) Own Governing Law	$\beta$	0.404***	—	—	—	0.598***
	Gov. Law	0.201***	—	—	—	-0.017
	Obs.	16,905	—	—	—	16,905

**Note:** (1) Includes only the debt of firms that issues in multiple currencies (MC), including the local currency of the issuer. (2) Includes only foreign firms from the perspective of the investing country. (3) Includes only the international issuance of foreign firms. (4) Includes only financial firms. (5) Includes only non-financial firms. (6) Includes only foreign financial firms. (7) Includes only foreign non-financial firms. (8) In addition to corporate bonds, includes structured finance (SF), sovranational issuance (SV), and local government debt (LS). (9) Includes all bonds. (10) Sample is the benchmark set of corporates; regression specification includes the usual dummy for the bond being denominated in the investing country's currency and also includes a dummy for the bond being issued in the investing country. (11) Similar to (10) but includes a dummy for the bond being issued under the investing country's governing law. Controls include maturity and coupon bins. Standard errors are omitted for readability, but are clustered at the ultimate-parent firm level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. For some specifications, there is not sufficient variation available to estimate the regression and therefore we leave those specifications blank.

Table 3: Home Currency Bias: Robustness, 2017 (Continued)

		<b>GBR</b>	<b>NOR</b>	<b>NZL</b>	<b>SWE</b>	<b>USA</b>
(1) MC Only	$\beta$	0.444***	0.800***	0.708***	0.648***	0.624***
	Obs.	10,818	3,160	3,161	3,243	14,686
(2) Foreign	$\beta$	0.453***	0.829***	0.700***	0.658***	0.579***
	Obs.	33,321	34,417	36,098	34,878	22,434
(3) Foreign, Int'l	$\beta$	0.457***	0.895***	0.958***	0.632***	0.628***
	Obs.	4,022	4,647	4,719	4,691	3,112
(4) Financial	$\beta$	0.408***	0.837***	0.854***	0.670***	0.615***
	Obs.	15,457	15,457	15,457	15,457	15,457
(5) Non-Financial	$\beta$	0.494***	0.614***	0.516**	0.551***	0.638***
	Obs.	18,595	18,595	18,595	18,595	18,595
(6) Foreign Financial	$\beta$	0.406***	0.860***	0.854***	0.751***	0.564***
	Obs.	13,996	14,408	15,444	14,536	11,059
(7) Foreign Non-Fin.	$\beta$	0.501***	0.614***	0.486**	0.474***	0.595***
	Obs.	17,275	18,138	18,533	18,211	9,640
(8) SF, SV, LS	$\beta$	0.445***	0.801***	0.708***	0.635***	0.625***
	Obs.	65,001	65,001	65,001	65,001	65,001
(9) All bonds	$\beta$	0.444***	0.799***	0.699***	0.631***	0.618***
	Obs.	285,267	285,267	285,267	285,267	285,267
(10) Residency	$\beta$	0.445***	0.792***	0.642***	0.642***	0.614***
	Resid.	0.023	0.047**	0.164*	-0.020	0.091***
	Obs.	36,229	36,229	36,229	36,229	36,229
(11) Own Governing Law	$\beta$	0.502***	—	—	0.658***	0.612***
	Gov. Law	0.002	—	—	0.032	0.087***
	Obs.	16,905	—	—	16,905	16,905

**Note:** (1) Includes only the debt of firms that issues in multiple currencies (MC), including the local currency of the issuer. (2) Includes only foreign firms from the perspective of the investing country. (3) Includes only the international issuance of foreign firms. (4) Includes only financial firms. (5) Includes only non-financial firms. (6) Includes only foreign financial firms. (7) Includes only foreign non-financial firms. (8) In addition to corporate bonds, includes structured finance (SF), sovranational issuance (SV), and local government debt (LS). (9) Includes all bonds. (10) Sample is the benchmark set of corporates; regression specification includes the usual dummy for the bond being denominated in the investing country's currency and also includes a dummy for the bond being issued in the investing country. (11) Similar to (10) but includes a dummy for the bond being issued under the investing country's governing law. Controls include maturity and coupon bins. Standard errors are omitted for readability, but are clustered at the ultimate-parent firm level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. For some specifications, there is no variation available to estimate the regression and therefore we leave those specifications blank.

Table 4: Home-Country Bias and Home-Currency Bias, 2017

	<b>Panel A: Only Home-Country Indicator</b>		<b>Panel B: Only Home-Currency Indicator</b>		<b>Panel C: Home-Country and Home-Currency Indicators</b>		
	$\gamma_{j,0}$	$R^2$	$\beta_{j,0}$	$R^2$	$\gamma_{j,1}$	$\beta_{j,1}$	$R^2$
AUS	0.100	0.089	0.659	0.712	0.027	0.642	0.718
CAN	0.497	0.433	0.930	0.936	0.035	0.901	0.937
CHE	0.356	0.240	0.851	0.903	0.051	0.823	0.907
DNK	0.402	0.470	0.597	0.698	0.023	0.575	0.699
EMU	0.438	0.296	0.666	0.695	0.093	0.615	0.704
GBR	0.166	0.132	0.475	0.664	0.026	0.463	0.667
NOR	0.547	0.521	0.833	0.885	0.029	0.808	0.885
NZL	0.711	0.373	0.805	0.738	0.138	0.736	0.747
SWE	0.416	0.458	0.656	0.823	0.018	0.641	0.823
USA	0.463	0.388	0.675	0.795	0.078	0.625	0.802

**Note:** Panel A reports estimates of the regression in equation (2). Panel B reports estimates of the regression in equation (3). Panel C reports estimates of the regression in equation (4). The dependent variable is the share of each security (at the CUSIP 9-digit level) bought by each country in our sample:  $s_{j,p,c}$ .

Table 5: Firm Size and Foreign Currency Debt Issuance

Measure of Size (Log \$B)		Bond Issuance	EBIT	Assets	Revenue
AUS	Size	0.093*** (0.011)	0.423*** (0.130)	0.092*** (0.030)	0.200*** (0.050)
	Obs.	497	81	83	93
CAN	Size	0.051*** (0.010)	0.226*** (0.064)	0.067*** (0.017)	0.133*** (0.026)
	Obs.	675	381	384	410
CHE	Size	0.018 (0.017)	0.321*** (0.041)	0.097*** (0.031)	0.158*** (0.026)
	Obs.	211	50	50	56
DNK	Size	0.128*** (0.017)	—	—	—
	Obs.	50	—	—	—
EMU	Size	0.031*** (0.005)	0.282*** (0.026)	0.050*** (0.011)	0.105*** (0.013)
	Obs.	2,998	682	687	810
GBR	Size	0.055*** (0.007)	0.268*** (0.075)	0.085*** (0.022)	0.194*** (0.027)
	Obs.	1,352	199	202	234
NOR	Size	0.110*** (0.010)	0.786* (0.414)	0.139*** (0.046)	0.277*** (0.065)
	Obs.	332	68	68	79
NZL	Size	0.234*** (0.017)	—	—	—
	Obs.	41	—	—	—
SWE	Size	0.105*** (0.014)	0.430*** (0.084)	0.159*** (0.037)	0.204*** (0.033)
	Obs.	239	54	54	79
USA	Size	0.023*** (0.001)	0.116*** (0.007)	0.050*** (0.003)	0.063*** (0.004)
	Obs.	9,822	3,350	3,389	3,708

**Note:** This table reports the results from the probit regression in equation (5). Each row is a different regression where “Size” is defined as (1) billions of USD of principal of bond issuance, (2) billions of USD of earnings before interest and tax (EBIT), (3) billions of dollars of total assets, and (4) billions of dollars of total revenue. Every specification includes two-digit SIC industry fixed effects. We do not run regressions with less than 20 observations. Coefficients reported are average marginal effects. Standard errors for marginal effects calculated using the delta method. All specifications are run using data for 2017. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

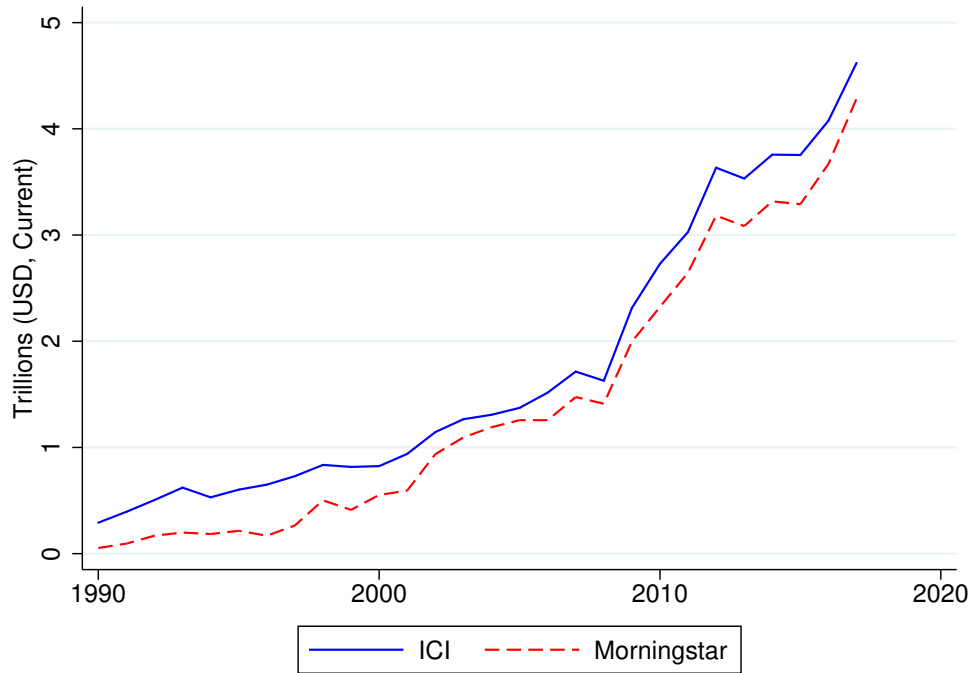
Table 6: The Rise of the Dollar and Fall of the Euro

Specification	2005	2008	2017
<i>(1) All Bonds</i>			
USD Share	0.556	0.667	0.696
EUR Share	0.312	0.219	0.161
<i>(2) All Bonds Held by Foreigners</i>			
USD Share	0.420	0.419	0.582
EUR Share	0.315	0.284	0.167
<i>(3) Govt Bonds Held by Foreigners</i>			
USD Share	0.457	0.441	0.497
EUR Share	0.181	0.184	0.099
<i>(4) Corp Bonds Held by Foreigners</i>			
USD Share	0.405	0.423	0.631
EUR Share	0.382	0.316	0.218
<i>(5) Financial Corp Bonds by Foreigners</i>			
USD Share	0.345	0.385	0.538
EUR Share	0.439	0.335	0.254
<i>(6) Non-Financial Corp Bonds by Foreigners</i>			
USD Share	0.520	0.533	0.701
EUR Share	0.282	0.261	0.191
<i>(7) Corp Bonds by Foreigners, Ex-USA/EMU</i>			
USD Share	0.294	0.227	0.322
EUR Share	0.203	0.243	0.165

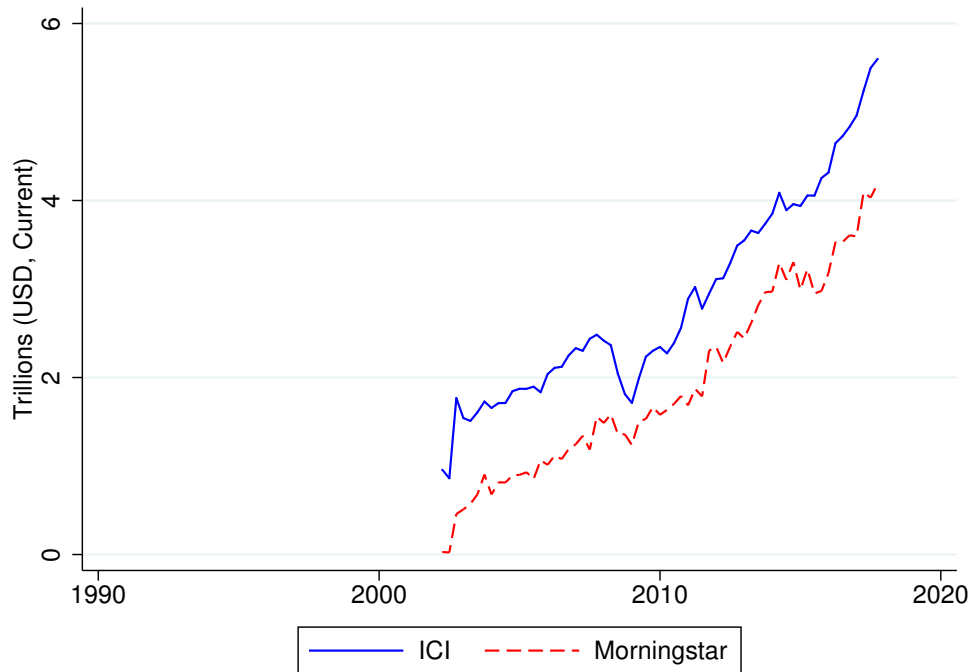
**Note:** This table reports the portfolio shares of euro and dollar denominated bonds at year end in 2005, 2008, and 2017. We study seven different sets of bonds and report the dollar shares in the first rows and the euro shares in the second rows.

Figure 1: Morningstar's Coverage of US Mutual Fund and ETF Assets Under Management

(a) US Fixed Income Funds

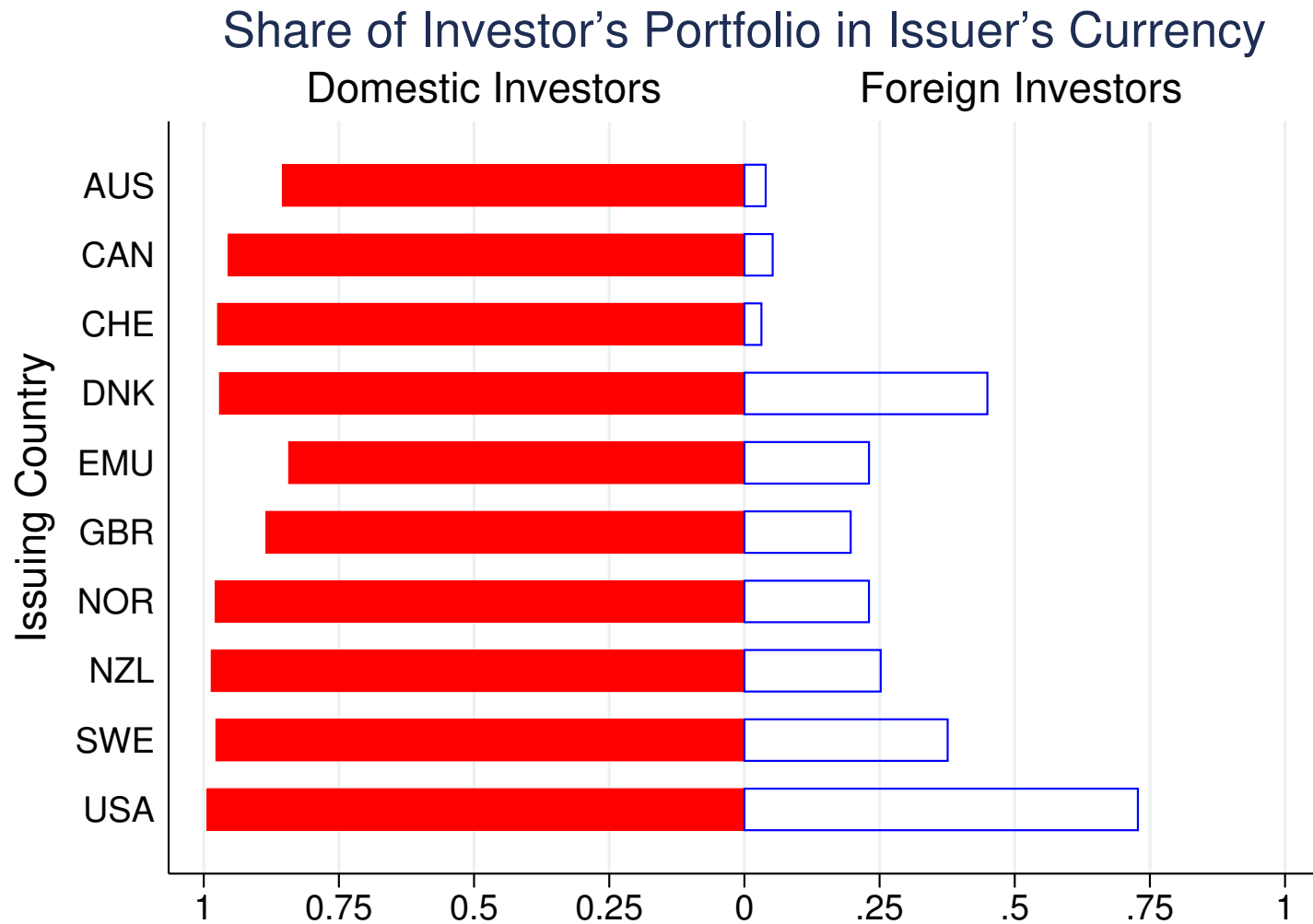


(b) Non-US Fixed Income Funds



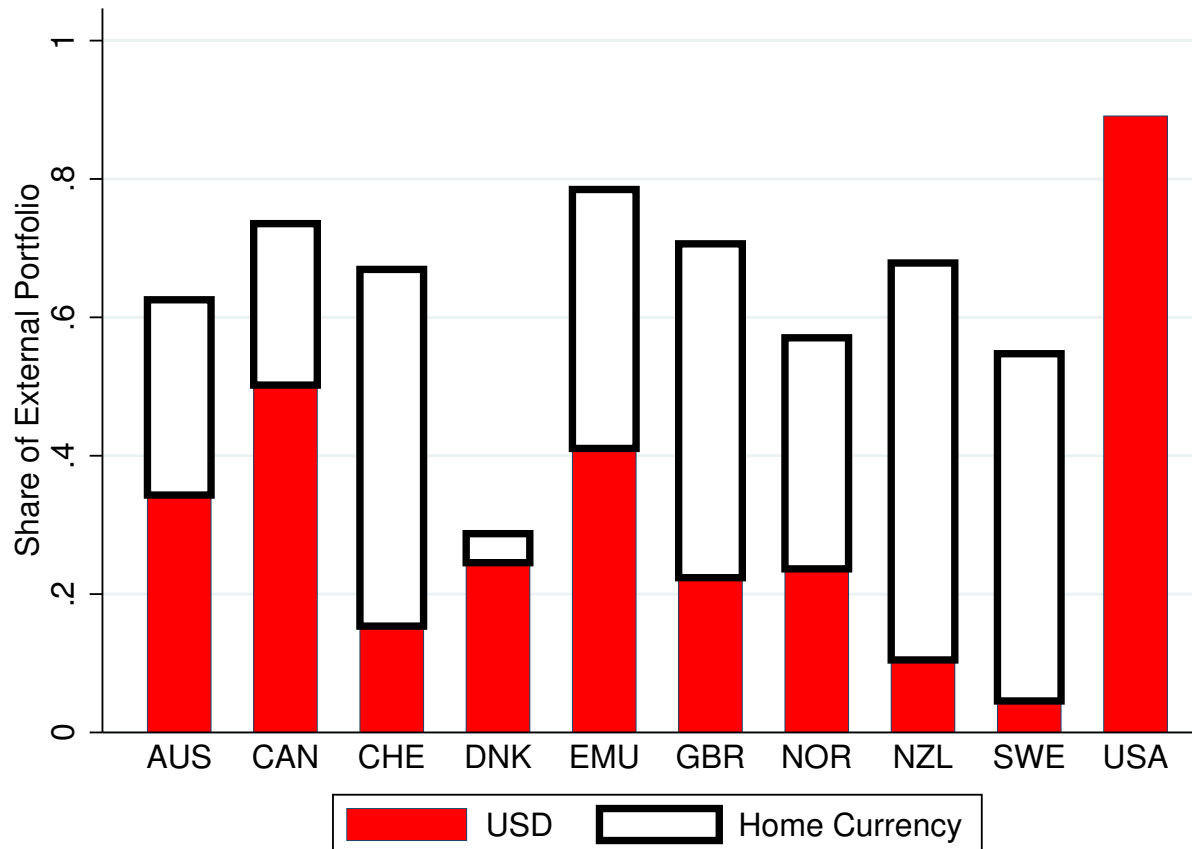
**Note:** The graphs compare total Asset Under Management (AUM) for open-end mutual funds and ETFs in our data (red dashed lines) with that measured by the Investment Company Institute (ICI, solid blue lines).

Figure 2: Share of Corporate Bond Investment Denominated in the Issuer's Local Currency, 2017



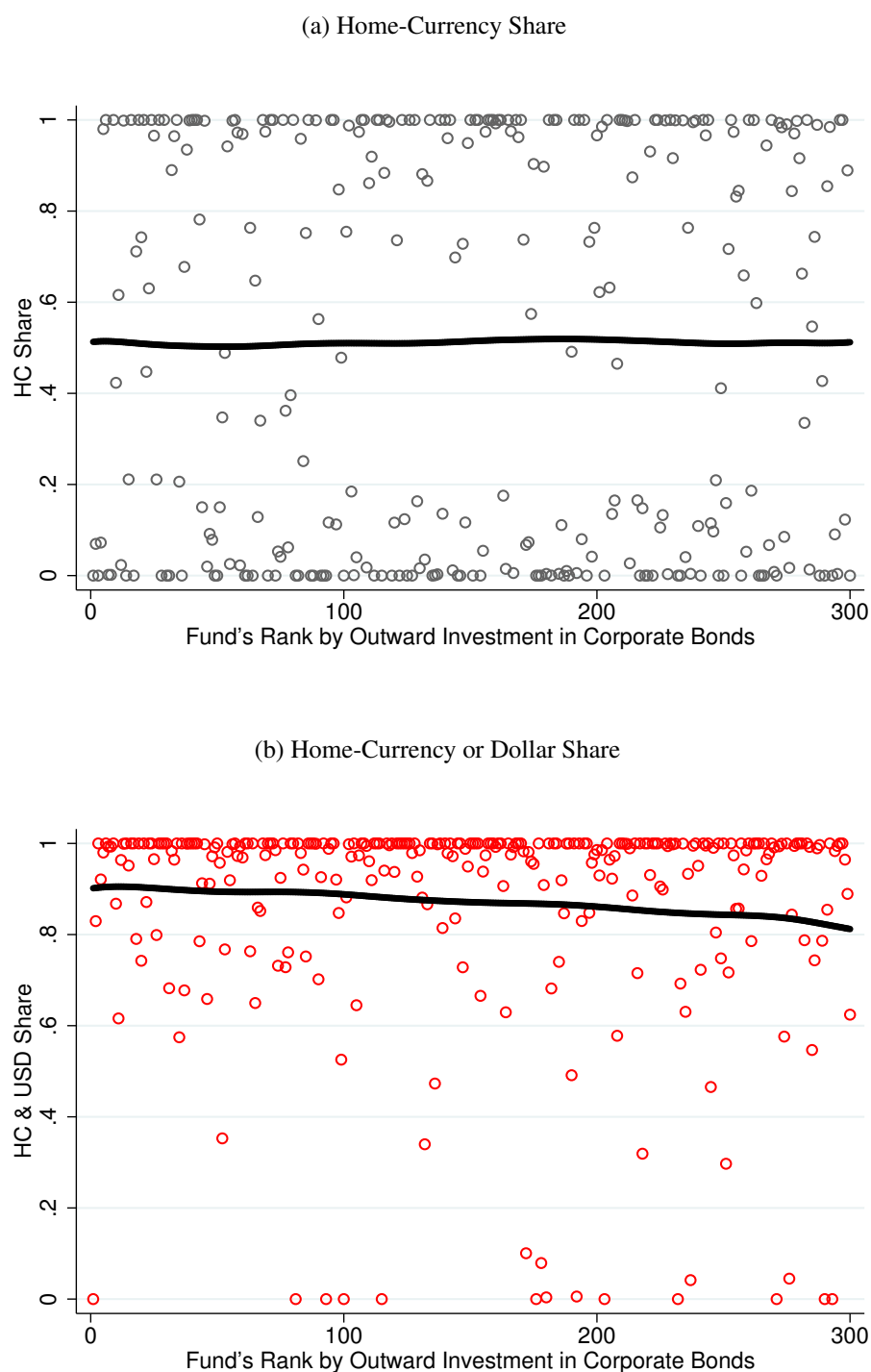
**Note:** The solid red shaded bars show for each issuing country the share of bonds denominated in the issuer's local currency out of all domestic investment in its corporate bonds. The hollow blue bars show for each issuing country the share of bonds denominated in the issuer's local currency out of all foreign investment in its corporate bonds.

Figure 3: Role of Home Currency and the US Dollar in External Portfolios, 2017



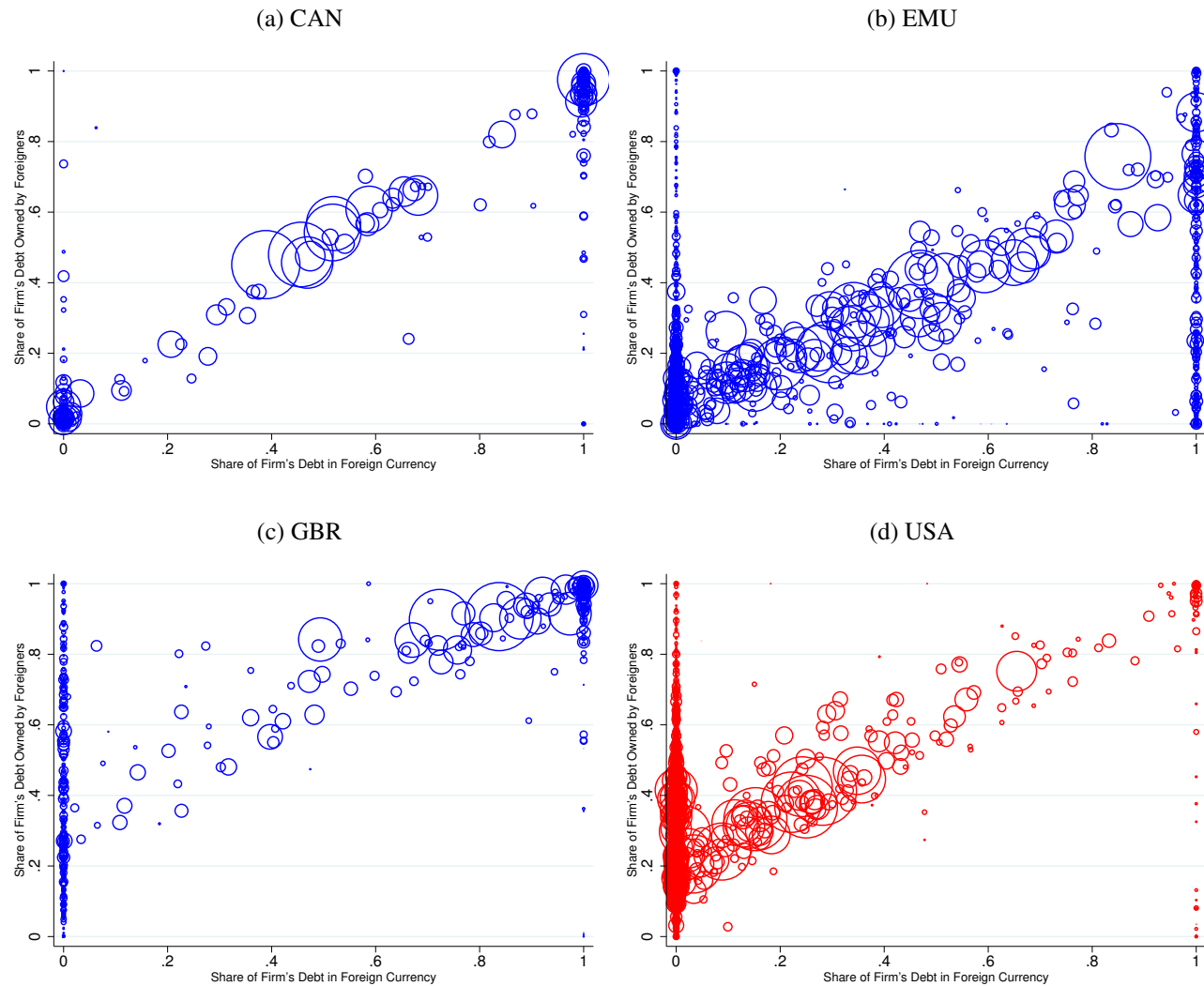
**Note:** The hollow black bars show for each investor country the share of investment abroad in corporate bonds that is denominated in the investor's home currency. The solid red bars show for each investor country the share of these same external investments that are denominated in US dollars. We exclude all investments directed to the United States in order to focus purely on the role of the US dollar as an international currency.

Figure 4: The Distribution of Home-Currency and Dollar Bias Across Funds, 2017



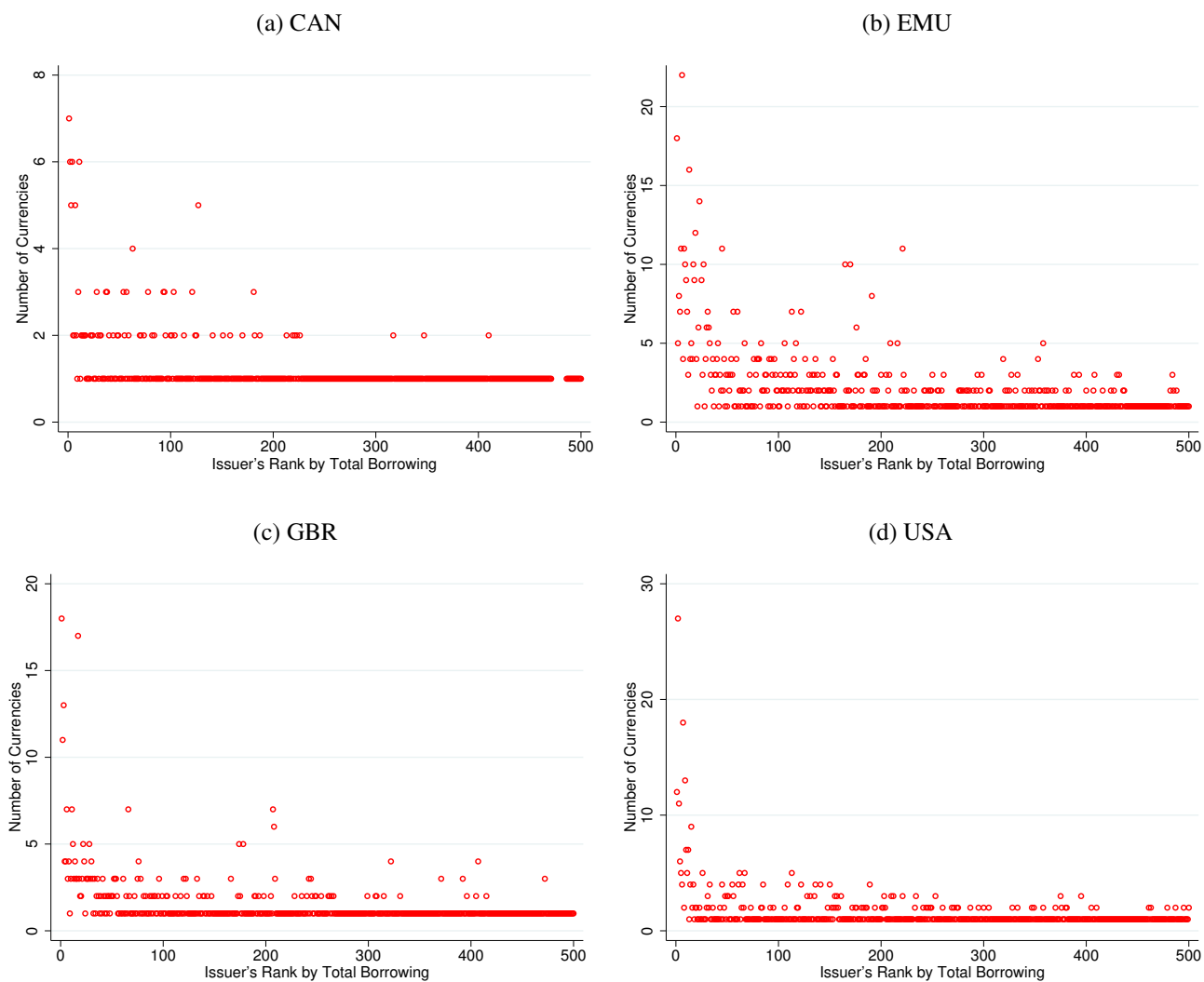
**Note:** The dots in panel (a) plot the share of investment in foreign corporate debt that is denominated in the fund's home currency. The dots in panel (b) plot the share that is denominated in the fund's home currency or the US dollar. Funds are ordered from largest (*left*) to smallest (*right*) in terms of their positions in foreign bonds. The black thick line in both panels is the fit of a lowess regression of the investment shares (the dots in each panel) on the fund rank. All data are from the end of 2017. Data are pooled for all funds in USA, EMU, GBR, CAN, CHE, AUS, SWE, DNK, NOR, and NZL.

Figure 5: Share of Corporate Bond Positions in Foreign Currency and Share of Borrowing from Foreigners, 2017



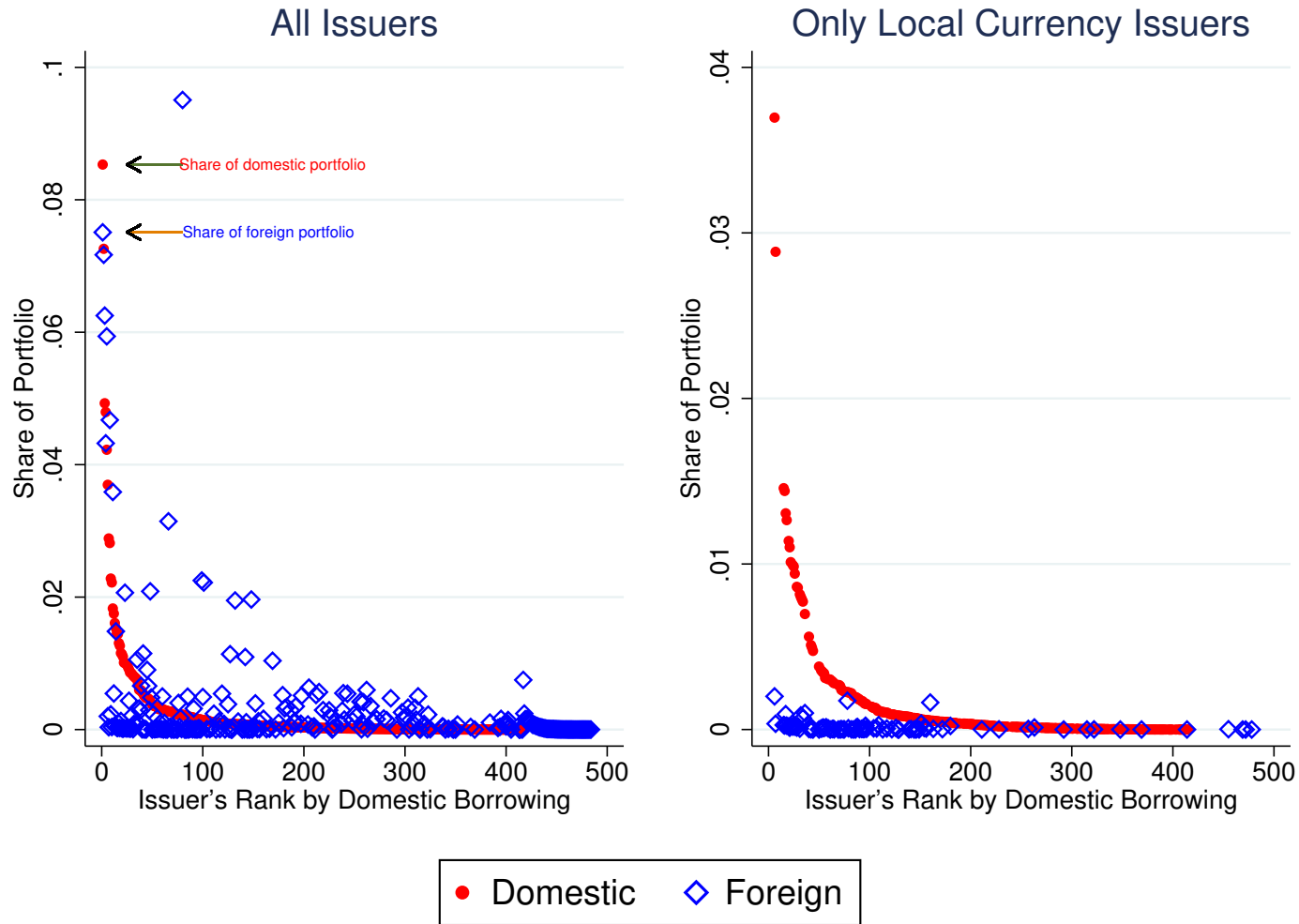
**Note:** In each panel, each bubble corresponds to a single firm based in Canada, the EMU, the United Kingdom, and the United States, respectively. The size of each bubble is proportional to the total value of bonds by that particular firm in our data. The x-axis plots the share of a firm's bonds that is in foreign currency and the y-axis plots the share of that firm's bonds that is owned by foreign investors. Both variables are measured using the positions in the Morningstar data.

Figure 6: Number of Currencies and Firm Size, 2017



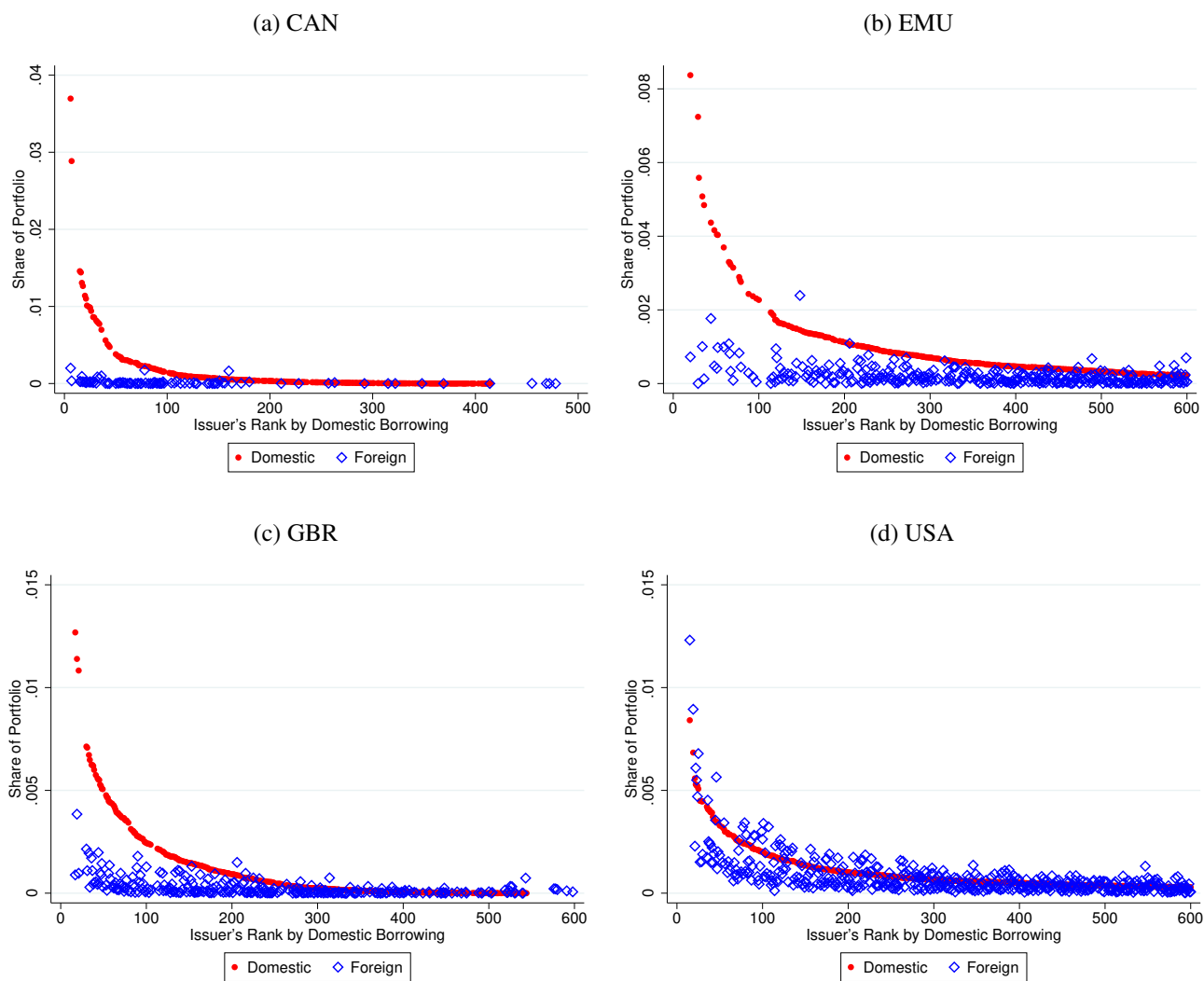
**Note:** In each figure, firms are ranked in order of the total value of bonds in our data with the largest firm ranked first. The y-axis denotes the total number of currencies in which that particular firm has a bond that is owned by a fund in the Morningstar data. Firms are ranked within each of these four economies: Canada (a), EMU (b), United Kingdom (c), and the United States (d).

Figure 7: Canadian Corporate Bonds Held in Domestic and Foreign Portfolios, 2017



**Note:** This figure plots the corporate bond portfolio of domestic and foreign investors in Canada. The portfolio positions in each issuer are ranked according to their size in the domestic portfolio. The left panel considers all issuers and the right panel considers only firms that issue entirely in Canadian dollars, the local currency. Red dots indicate the domestic positions and hollow blue diamonds indicate foreign positions.

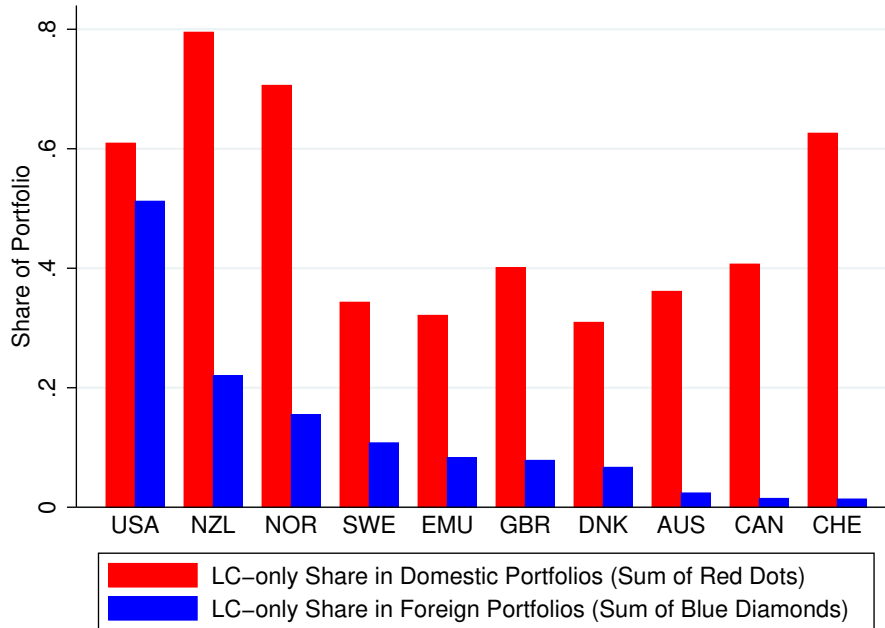
Figure 8: Corporate Bonds from LC-only Issuers in Domestic and Foreign Portfolios, 2017



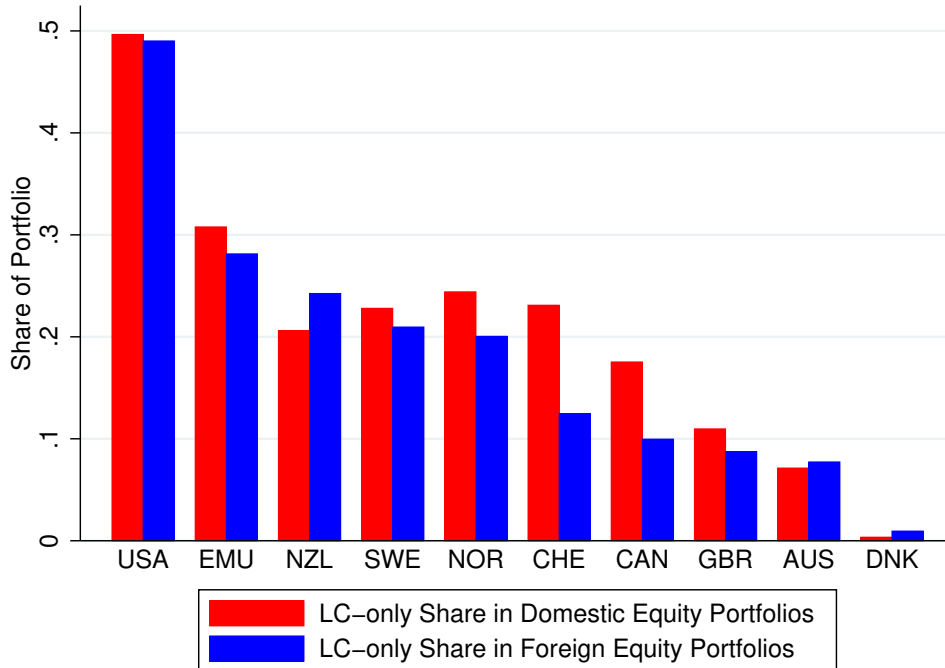
**Note:** This figure plots the corporate bond portfolio of domestic and foreign investors in Canada (a), the EMU (b), the United Kingdom (c), and the United States (d). The portfolio positions in each issuer are ranked according to their size in the domestic portfolio. Each figure plots only those firms that issue entirely in the local currency. Red dots indicate the domestic positions and hollow blue diamonds indicate foreign positions.

Figure 9: Shares of LC-only Firms in Domestic and Foreign Portfolios, 2017

(a) Shares of LC-only Firms in Bond Portfolios

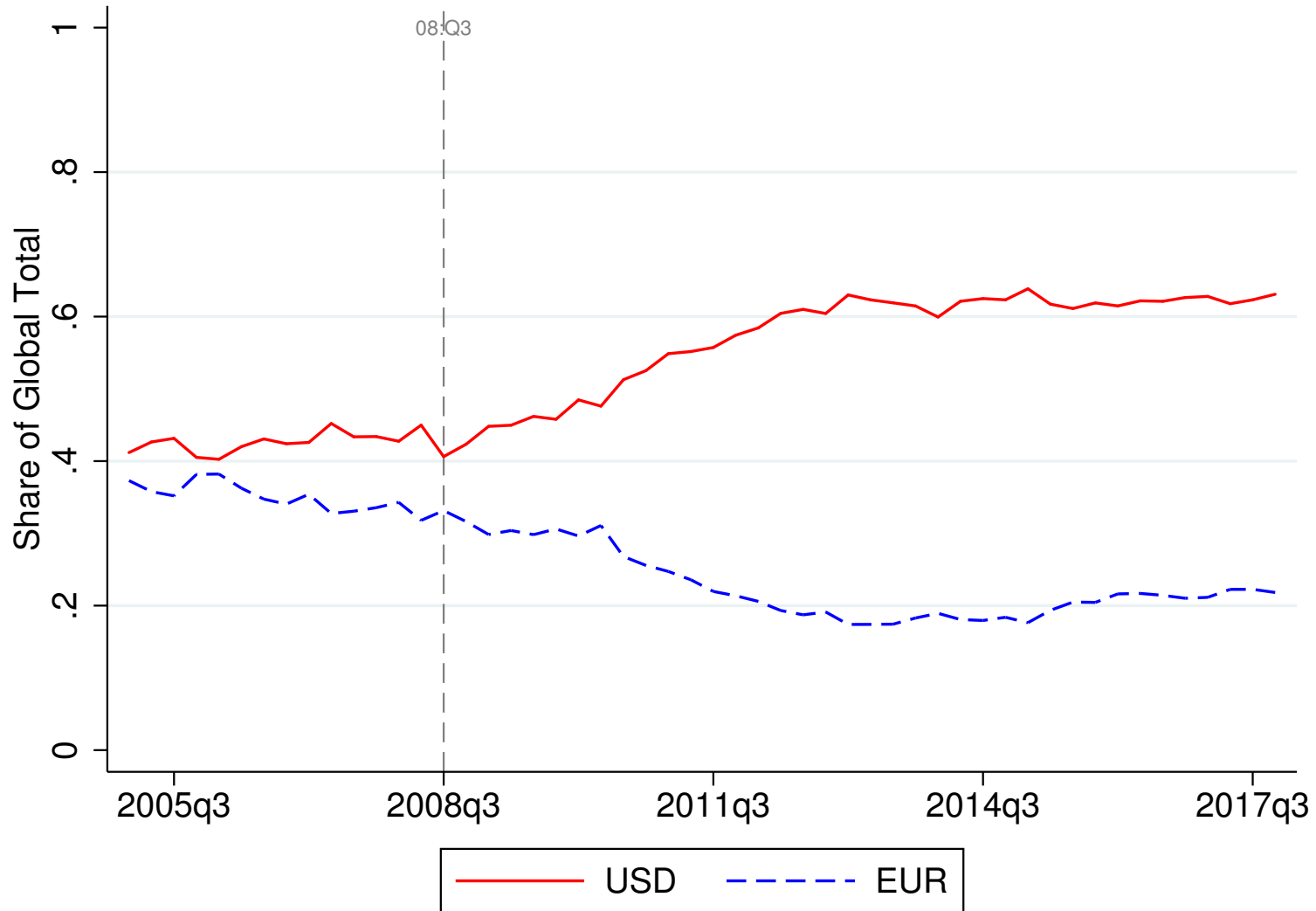


(b) Shares of LC-only Firms in Equity Portfolios



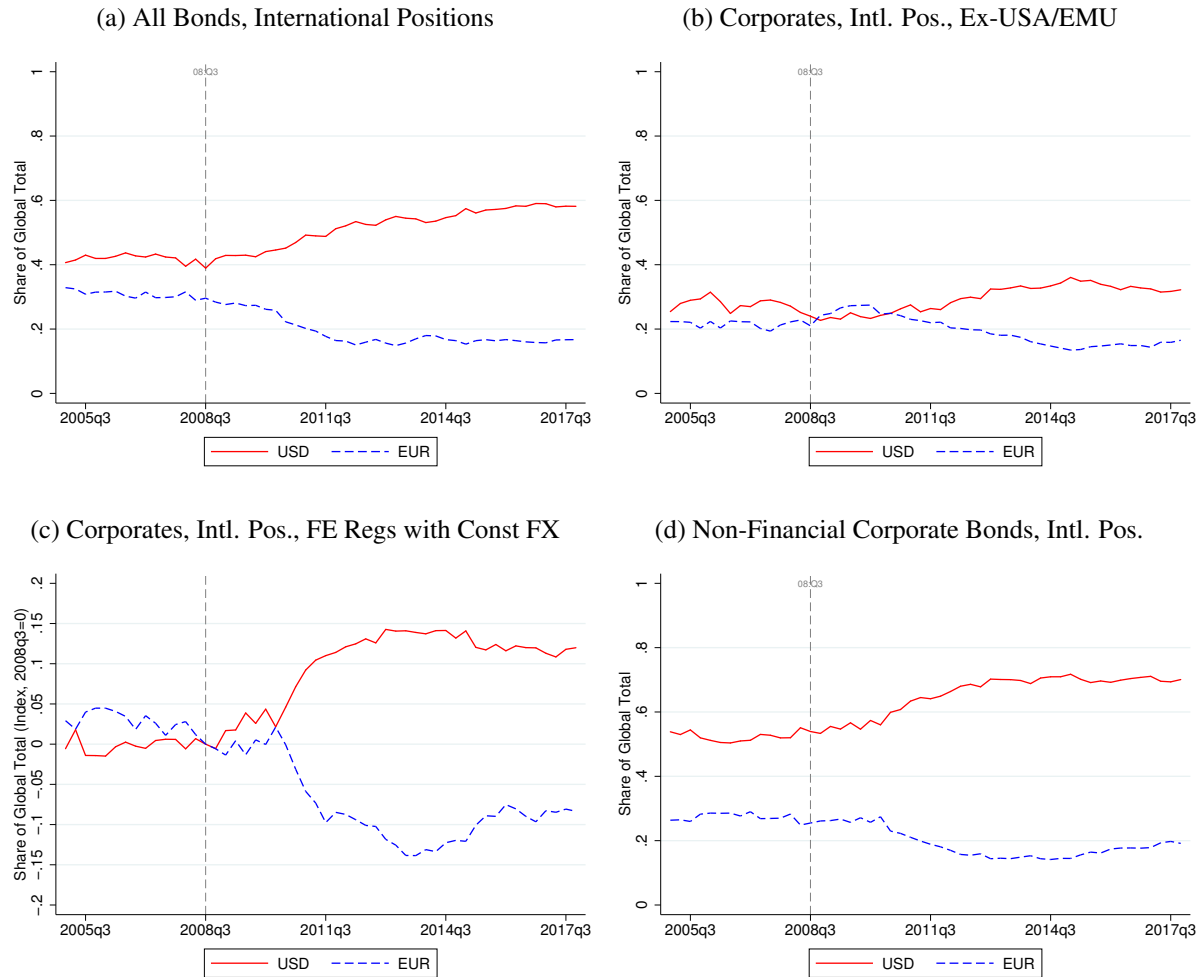
**Note:** The top panel reports the share of all bonds that is issued by firms that borrow only in local currency in domestic investors' domestic bond portfolios (red) and in foreign investors' bond portfolios in that particular country (blue). These bars are equal to the sum of the value of the red dots and blue diamonds, respectively, in Figure 8. The bottom panel reports the same statistics but for equity.

Figure 10: Rising Dollar and Falling Euro Shares of Cross-Border Corporate Bond Positions



**Note:** This figure plots the share of dollar- and euro-denominated corporate bonds in total cross-border holdings.

Figure 11: Rising Dollar and Falling Euro Shares of Cross-Border Bond Positions: Robustness



**Note:** Panel (a) plots the share of dollar- and euro-denominated bonds in total cross-border holdings. Panel (b) plots the analogous shares but only for corporate bonds and further excludes positions for which either the US or the EMU are either the borrower or the lender. Panel (c) plots the currency shares estimated using bilateral country fixed effects on the dataset constructed with fixed exchange rates at 2005 levels and with weights reflecting the position sizes in the first quarter of 2009. Finally, Panel (d) shows that these trends hold also for non-financial borrowers.