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The geography of capital allocation in the euro area

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The geography of capital allocation in the euro area

No 3007

Abstract

We assess Euro Area financial integration correcting for the role of “onshore offshore financial centers” (OOFCs) within the Euro Area. The OOFCs of Luxembourg, Ireland, and the Netherlands serve dual roles as both hubs of investment fund intermediation and centers of securities issuance by foreign firms. We provide new estimates of Euro Area countries’ bilateral portfolio investments which look through both roles, attributing the wealth held via investment funds to the underlying holders and linking securities issuance to the ultimate parent firms. Our new estimates show that the Euro Area is less financially integrated than it appears, both within the currency union and vis-à-vis the rest of the world. While official data suggests a sharp decline in portfolio home bias for Euro Area countries relative to other developed economies following the introduction of the euro, we demonstrate that this pattern only remains true for bond portfolios, while it is artificially generated by OOFC activities for equity portfolios. Further, using new administrative evidence on the identity of non-Euro Area investors in OOFC funds, we document that the bulk of the positions constituting missing wealth in international financial accounts are now accounted for by United Kingdom counterparts.

Keywords: Financial Integration, Capital Markets Union, Home Bias.

JEL Codes: F3, F4, G2, G3, H26.

Non-technical summary

Assessing European financial integration has proved difficult because of complex financial intermediation activities carried out in some European financial centres (Ireland, Luxembourg, and the Netherlands) whose scale has grown enormously over time. We refer to these three countries as “onshore offshore financial centers” (OOFCs), since they are onshore markets within the Euro Area, while at the same time their functioning parallels in some respects that of offshore financial centers.¹ They play dual roles as both hubs of investment fund intermediation and centers for securities issuance by European and global firms.

In this paper, we look through both of these OOFC roles and restate the pattern of Euro Area portfolio investment positions by unwinding fund sector investments —i.e., linking them to the ultimate underlying investors — and by associating securities issuance with the ultimate parent firms. We use our resulting estimates to reassess the bilateral portfolio exposures of Euro Area countries and the extent of European financial integration. Our new estimates of the Euro Area’s investments uncover three facts.

First, the Euro Area as a whole is less financially integrated with the rest of the world than it appears. Its gross assets and liabilities are smaller than reported in official data. This happens because a substantial fraction of the fund holdings in Luxembourg and Ireland are not actually held by Euro Area residents. Overall, rather than the officially reported positions of 6.1 trillion euros in non-EA bonds and 4.2 trillion euros in non-EA equity, we estimate that the Euro Area owns around 3.4 trillion of non-EA bonds and 2.8 trillion of non-EA equity at the end of 2020. Similarly, the amount of bonds held by EA investors denominated in non-euro currencies falls from 4.2 to 2.0 trillion euros, implying roughly a halving of the non-euro share in the overall EA bond portfolio (from 23% to 13%).

Second, financial integration within the Euro Area is lower and it exhibits different historical trends than official data implies. We analyze the level and dynamics of one of the most commonly used measures of financial integration and a key moment in models of international risk sharing: home bias in countries’ portfolio holdings. For both equity and bond portfolios, the home bias of EA countries—as measured from official data—displays a large decline relative to other developed economies following the introduction of the euro in the late 1990s. This pattern, which has been a focus of the literature, is driven by increasing measured cross-border holdings within the Euro Area. After adjusting for the role of OOFC intermediation, our estimates show that the true decline in equity home bias for EA countries post-euro is in fact much smaller, and of a magnitude consistent with declines in other developed countries. On the

¹Our definition of Onshore Offshore Financial Centers is based on the definition and country list in [Coppola et al. \(2021\)](#). The list is originally based on [Hines \(2010\)](#) and follows [Tørsløv et al. \(2023\)](#) in adding the Netherlands. Compared to the list in [Coppola et al. \(2021\)](#) we do not focus on Malta and Cyprus, the only other Euro Area countries on the list, since those are small in the absolute level of positions, with a much less material role in the intermediation of Euro Area portfolio investment. All Euro Area countries on the list of [Coppola et al. \(2021\)](#) are also included in the definition of financial centers in [Di Nino et al. \(2020\)](#) referring to the ten advanced economies with the largest ratios of foreign liabilities to GDP in a large sample of more than 60 countries.

contrary, we show that bond home bias has decreased substantially over the same period and that the decline is driven by a burst of integration of bond markets within the Euro Area in the period following the introduction of the euro. This decline in bond home bias is large relative to the trend in other developed countries.

Third, we document a diminished role for Switzerland and a now dominant role of the United Kingdom in custodying wealth on behalf of non-residents and investing it in Luxembourg and Ireland funds. Uncovering and characterizing this missing wealth has long been recognized as a first-order problem in global statistics that feeds into economic estimates of wealth inequality and countries' international financial positions. The identity of these investors is notoriously difficult to ascertain. For Ireland, we show that both data on the immediate-counterpart owners of the fund shares and the composition of the portfolios point to investors based in the United Kingdom accounting for the bulk of fund investment. In particular, the Irish investment fund sector has large holdings of UK assets and especially UK gilt bonds denominated in pounds. These assets are mostly indirectly held by British investors via fund shares. For Luxembourg, the United Kingdom plays a similarly large role, while custodial accounts in Switzerland (potentially constituting hidden household wealth) can account for at most 800 billion euros of holdings in 2020. Further, the underlying portfolio is very different in composition from that known to be held by EA investors in Luxembourg funds. Our results therefore suggest that the UK is likely intermediating funds largely on behalf of global investors rather than Euro Area residents.

1 Introduction

The creation of the Euro Area (EA) has been one of the most important economic developments of the last century. By moving to a common currency, integrating capital markets, and harmonizing regulation, the EA was expected to generate one of the largest capital markets in the world. Financial integration remains a key policy objective, with the Capital Markets Union initiative an ongoing priority for the European Commission.² Despite these goals, policymakers and researchers have long lamented that assessing European financial integration has proved difficult because of heavily concentrated financial intermediation activities carried out in Ireland, Luxembourg, and the Netherlands, whose scale has grown enormously over time (Kindleberger 1973, Eichengreen 1996, Cassis 2010). By shrouding the underlying pattern of capital allocation, these activities have both prevented an appraisal of the success of the Euro Area project and limited its ability to inform theories of international financial integration.

We refer to these three countries as “onshore offshore financial centers” (OOFCS), since they are onshore markets within the Euro Area, while at the same time their functioning parallels that of offshore financial centers.³ They play dual roles as both hubs of investment fund intermediation and centers for securities issuance by European and global firms. When investment funds domiciled in these countries hold securities on behalf of other Euro Area or global investors, these holdings are recorded in official statistics as belonging to these OOFCS rather than the underlying owners. Similarly, when firms issue bonds or equities through subsidiaries in these jurisdictions, official statistics record these securities as liabilities of the OOFCS rather than the countries of their ultimate corporate parents.

In this paper, we look through both of these OOFCS roles and restate the pattern of Euro Area portfolio investment positions by unwinding fund sector investments—i.e., linking them to the ultimate underlying investors—and by associating securities issuance with the ultimate parent firms. We use our resulting estimates to reassess the bilateral portfolio exposures of Euro Area countries and the extent of European financial integration. We document that, across a range of widely used metrics such as home bias, Euro Area financial integration is more limited in extent, as well as qualitatively and quantitatively different in its historical dynamics, compared to what is known from standard aggregate data. Further, we investigate the disaggregated drivers of these patterns in micro data and present new evidence on the identity of non-Euro Area investors in OOFCS funds. We show a diminished role of Switzerland and a

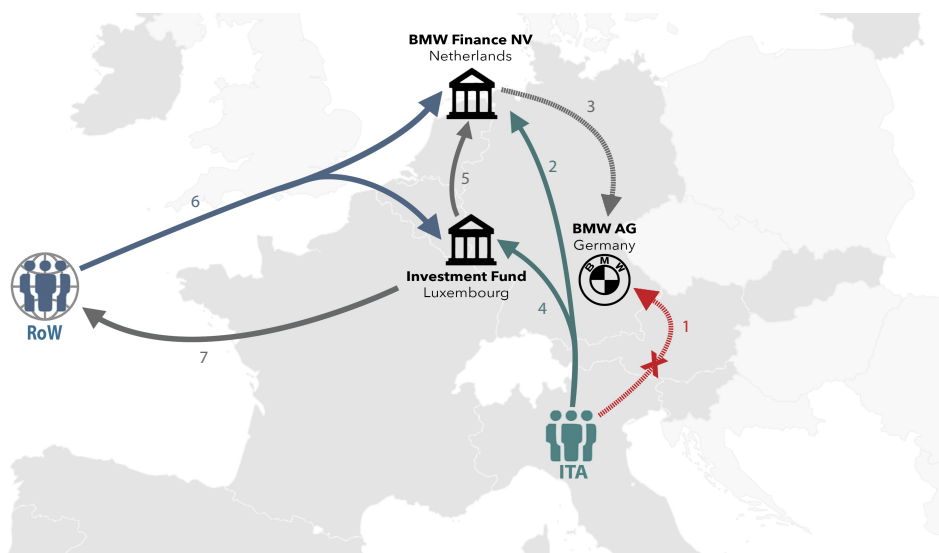
²There were several milestones towards European financial integration, including the European Commission’s Financial Services Action Plan for the harmonization of the EU financial services markets starting in 1999, the Lamfalussy architecture to improve regulatory processes introduced in 2001, the launch of the banking union in 2012, and the two subsequent action plans for the Capital Markets Union in 2015 and 2020.

³Our definition of Onshore Offshore Financial Centers is based on the definition and country list in Coppola et al. (2021). The list is originally based on Hines (2010) and follows Tørslov et al. (2023) in adding the Netherlands. Compared to the list in Coppola et al. (2021) we do not focus on Malta and Cyprus, the only other Euro Area countries on the list, since those are small in the absolute level of positions, with a much less material role in the intermediation of Euro Area portfolio investment. All Euro Area countries on the list of Coppola et al. (2021) are also included in the definition of financial centers in Di Nino et al. (2020) referring to the ten advanced economies with the largest ratios of foreign liabilities to GDP in a large sample of more than 60 countries.

prominent role of the United Kingdom as custodians of offshore wealth invested in OOFc funds.

To understand the challenges of evaluating European financial integration, consider as an example BMW AG, the German automaker. Figure 1 illustrates how BMW raises capital from foreign investors, including from the rest of the Euro Area—for example, Italian investors.⁴ One might imagine that BMW would simply issue bonds in Germany that are then bought by the Italian investors (as in the arrow labeled 1 in the figure), but in fact this is not what happens, as BMW does not issue bonds from any corporate entity resident in Germany. In practice, BMW has established a financing subsidiary domiciled in the Netherlands, BMW Finance NV, through which it issues bonds which are then bought by foreign investors (arrow 2). The capital might then be lent on to the German parent (arrow 3). This is an example of the role of OOFcs as places of securities issuance: this occurs for a variety of reasons, including favorable regulatory and withholding tax regimes in these jurisdictions. International financial statistics are typically assembled on a *residency* basis, and therefore holdings in bonds issued by BMW Finance NV are considered portfolio assets issued in the Netherlands, and correspondingly portfolio liabilities of the Netherlands. For many practical applications such as the fact that the credit risk and decision-making power is in Germany, economists would rather measure these positions under a *nationality* view, which instead associates the positions with Germany by linking them to the ultimate corporate parent, BMW AG (Avdjiev, McCauley and Shin 2016).

Figure 1: The dual roles of European OOFcs: an illustrative example



Notes: This figure provides a schematic representation of the dual roles of European OOFcs, focusing on the example of BMW AG raising bond capital from Italian investors as well as investors outside the Euro Area (labeled Rest of World, or RoW).

Moreover, in this example the Italian investors may not hold these bonds directly, but rather part

⁴No data from the European Central Bank was used in the production of Figure 1, which is an illustrative example constructed from public information.

of these positions are likely to be intermediated through investment funds domiciled in Luxembourg or Ireland. In the example given in the figure, a Luxembourg fund holds the securities on behalf of the Italian investors (arrows 4 and 5). This illustrates the second role of European OOFs, as hubs of fund intermediation. Luxembourg and Ireland are not used just by Euro Area investors, but also by investors in the rest of the world (labeled RoW). RoW investors might buy bonds issued by BMW Finance directly, or they might also go through investment funds in Luxembourg or Ireland (arrow 6). RoW investors also hold securities issued by firms and governments outside the Euro Area: in this case, the intermediation through Luxembourg and Ireland funds simply reflects a form of “round-tripping”, or spurious foreign investment (arrow 7).

In all these cases, Euro Area international investment statistics record large levels of cross-border investment, as each of the arrows shown in the graph is recorded separately in disparate categories of portfolio investment and FDI, leading to double-counting and a murkier picture of capital allocation. Our estimates consolidate all these various positions, leading us—for example—to consider arrows 2 through 5 as a single portfolio debt investment from Italy to Germany.

The issues discussed above are not unique to the EA and are common in other financial centers. However, in the EA they have grown to such proportions, probably due to these centers being onshore and to their role in the overall process of integration of the EA, as to make it nearly impossible to understand Euro Area portfolio investment: for example, 40% of all cross-border securities claims of Euro Area residents in official data are intermediated through investment funds domiciled in Luxembourg and Ireland, while 33% of all cross-border holdings of corporate bonds within the Euro Area are in securities issued in OOF jurisdictions. Beyond their importance for academic research, these magnitudes have prevented policymakers from having an accurate assessment of risk exposures within the EA: it has been difficult to establish which countries and sectors will suffer losses in a possible future crisis—an issue of paramount importance, given the divergent credit risks among EA member countries.

The starting point of our analysis is the European Central Bank’s Securities Holdings Statistics (SHS), which covers the EA countries’ investments in securities. This dataset is the micro data behind the EA aggregate domestic and international portfolio investment statistics. It is collected on a residency basis at the security level, with the holder recorded at the country-sector level (for instance, SHS will record holdings of the French banking sector, but not of individual French banks). We combine this data with estimates on fund-level investment for funds domiciled in Luxembourg and Ireland from commercial sources to unwind fund investment by EA residents. We also combine the resulting data with a mapping algorithm that assigns each security not to its immediate issuer but to the ultimate parent entity and determines its nationality.

Reported holdings of fund shares in Luxembourg and Ireland by Euro Area resident investors only account for a fraction of the total fund shares issued by investment funds resident in these OOFs. Throughout the paper, we refer to fund shares not reported to be held by EA investors as being held

by the Rest of World (“RoW”), a residual category. In Section 6, we provide supporting evidence that this residual category does indeed represent the holdings of investors outside the Euro Area. In addition, we shed light on who these residual RoW investors are likely to be by combining information on the immediate counterpart owners of fund shares in Luxembourg and Ireland with the portfolio composition of the funds. The RoW category comprises both known holdings by RoW investors and unknown holdings. The unknown holdings are in part offshore wealth by Euro Area residents held through jurisdictions such as Switzerland (Zucman 2013), and in part non-Euro Area global investors.

A contribution of this paper is to develop and make publicly available new estimates of bilateral investment positions for the Euro Area—both as a whole and for individual member countries—which account for these issues. Our restatements of Euro Area positions are introduced in the present paper and are freely available at globalcapitalallocation.com.⁵

We collect the new patterns that our estimates of the Euro Area’s investments uncover into three facts. First, the Euro Area as a whole is less financially integrated with the rest of the world than it appears. Its gross assets and liabilities are smaller than reported in official data. This happens because a substantial fraction of the fund holdings in Luxembourg and Ireland are not actually held by Euro Area residents. Using our fund unwind methodology, we document that the underlying portfolio of securities held by EA and RoW investors in these funds is highly heterogeneous, highlighting why it is essential to use micro data on both EA investor holdings and the positions of individual investment funds to derive accurate estimates. Funds held by EA investors are more likely to invest in securities issued by EA entities (exhibiting stronger home and EA bias) and, within bond investment, are more likely to invest in euro-denominated bonds (a home currency bias), as compared to funds held by RoW investors.

Overall, rather than the officially reported positions of 6.1 trillion euros in non-EA bonds and 4.2 trillion euros in non-EA equity, we estimate that the Euro Area owns around 3.4 trillion of non-EA bonds and 2.8 trillion of non-EA equity at the end of 2020. Similarly, the amount of bonds held by EA investors denominated in non-euro currencies falls from 4.2 to 2.0 trillion euros, implying roughly a halving of the non-euro share in the overall EA bond portfolio (from 23% to 13%). Further, we introduce a simple regression framework to document that Euro Area investors are more home-country and home-currency biased in their direct portfolio positions than when they buy securities via the OOFIC funds. However, even relative to EA investors’ positions intermediated via the OOFIC funds, the positions of the rest of the world intermediated via these funds are substantially more globally diversified and tilted away from euro-denominated bonds.

Second, financial integration within the Euro Area is lower and it exhibits different historical trends than official data implies. We analyze the level and dynamics of one of the most commonly used measures of financial integration and a key moment in models of international risk sharing: home bias in countries’

⁵While the estimates are currently available through 2020, we plan to update them consistently going forward to provide a reliable data source for both academic researchers and policymakers.

portfolio holdings. For both equity and bond portfolios, the home bias of EA countries—as measured from official data—displays a large decline relative to other developed economies following the introduction of the euro in the late 1990s. This pattern, which has been a focus of the literature, is driven by increasing measured cross-border holdings within the Euro Area.

After adjusting for the role of OOFIC intermediation, our estimates show that the true decline in equity home bias for EA countries post-euro is in fact much smaller, and of a magnitude consistent with declines in other developed countries. On the contrary, we show that bond home bias has decreased substantially over the same period and that the decline is driven by a burst of integration of bond markets within the Euro Area in the period following the introduction of the euro. This decline in bond home bias is large relative to the trend in other developed countries. The distortion of home bias measures occurs because claims on fund shares in Luxembourg and Ireland, which are often treated as claims on foreign equity in standard estimation methodologies, reflect claims on domestic assets as well as on debt securities and other non-equity assets. In the time series, the increase in importance of OOFICs fund intermediation, which occurs starting in the mid-1990s, overlaps with the creation of the currency union. This new evidence directly informs theories of capital market integration, by providing support for explanations that can generate differential dynamics of EA equity and bond markets—for instance, models in which frictions causing a home currency bias in portfolios act as key barriers to bond market integration.

Third, we document a diminished role for Switzerland and a now dominant role of the United Kingdom in custodying wealth on behalf of non-residents and investing it in Luxembourg and Ireland funds. Uncovering and characterizing this missing wealth has long been recognized as a first-order problem in global statistics that feeds into economic estimates of wealth inequality and countries’ international financial positions (Lane and Milesi-Ferretti 2001; Zucman 2013). The identity of these investors is notoriously difficult to ascertain. The range of possibilities is wide, with assumptions in the literature running the gamut from all of these unrecorded investors being EA-based to none of them being resident in the EA.

We obtained new administrative data from the Central Bank of Ireland and the Commission de Surveillance du Secteur Financier (CSSF) of Luxembourg on the country of residency of the immediate investor in the funds, as well as what the funds own for investors based in various countries. For Ireland, we show that both data on the immediate-counterpart owners of the fund shares and the composition of the portfolios point to investors based in the United Kingdom accounting for the bulk of fund investment. In particular, the Irish investment fund sector has large holdings of UK assets and especially UK gilt bonds denominated in pounds. These assets are mostly indirectly held by British investors via fund shares.⁶ For Luxembourg, the United Kingdom plays a similarly large role, while custodial accounts in

⁶In fact, liability-driven investment (LDI) vehicles of British pension funds are often domiciled in Ireland and to a lesser extent in Luxembourg and have a core investment strategy of buying (levered) gilt bonds. These positions, spuriously considered foreign positions, were central in the turmoil of gilt markets in September 2022 following the Truss government budget proposal.

Switzerland (potentially constituting hidden household wealth) can account for at most 800 billion euros of holdings in 2020. Further, the underlying portfolio is very different in composition from that known to be held by EA investors in Luxembourg funds. Our results suggest that the UK is likely intermediating funds largely on behalf of global investors rather than Euro Area residents.

Related literature. Our paper makes progress on longstanding issues in international macroeconomics and finance, which have implications both within the field and in the areas of public finance and corporate finance. First, a voluminous literature has studied international financial centers, both onshore and offshore, and documented their growing role and how they complicate economic analysis, both generally and in the context of the Euro Area. An early landmark study is [Kindleberger \(1973\)](#) on the history and formation of these centers (see also [Eichengreen 1996](#) and [Cassis 2010](#)). [Hines and Rice \(1994\)](#), [Lane and Milesi-Ferretti \(2001\)](#), and [Zucman \(2013\)](#) all stress the importance of these centers and analyze their impact on global capital flows. Relatedly, there has been a recent interest in macroeconomics in unwinding layers of financial intermediation to provide disaggregated economic accounts ([Piketty, Saez and Zucman 2018](#); [Mian, Straub and Sufi 2020](#); [Andersen, Huber, Johannesen, Straub and Vestergaard 2022](#)).

Second, there is a literature on missing wealth in the fund shares issued by Luxembourg and Ireland. In an important paper, [Zucman \(2013\)](#) points out that many European securities, in particular, have no identifiable owner due to the role of Luxembourg and Ireland as mutual fund centers, and he attributes the missing wealth to hidden savings stashed by wealthy residents of the US and EA in tax havens such as Switzerland. [Alstadsæter et al. \(2018\)](#) estimates who owns the wealth of tax havens around the world.⁷ [Ciccone et al. \(2022\)](#) provide evidence that Luxembourg-based funds are held by investors outside the EA, and that those funds distributed globally pursue more diversified investment strategies.

Third, a literature has focused on the increased financial integration among Euro Area member countries following the creation of the monetary union. [Lane and Milesi-Ferretti \(2005\)](#) and [Lane \(2005\)](#) emphasized that the introduction of the euro was associated with an increase in cross-border bond and equity holdings within the Euro Area, a Euro Area bias. [Coeurdacier and Martin \(2009\)](#), [Kalemli-Ozcan, Papaioannou and Peydró \(2010\)](#), and [Fornaro \(2022\)](#) point to the elimination of exchange rate risk and the legal and administrative harmonization lowering transactions costs within the Euro Area as important drivers of financial integration. [Hale and Obstfeld \(2016\)](#) study how, with the introduction of the euro, the core EA countries levered up to gain exposure to the periphery. [Beck, Georgiadis and Gräb \(2016\)](#) examine the geography of portfolio rebalancing during the European sovereign debt crisis. [Floreani and Habib \(2018\)](#) use gravity models to document asymmetric exposures to high-rated and low-rated economies in the EA and the importance of fund intermediation in Luxembourg and Ireland. [Gopinath et al. \(2015\)](#), [Garcia-Santana et al. \(2016\)](#), and [Dias et al. \(2016\)](#) investigate the negative impact of

⁷See also [Alstadsæter et al. \(2019\)](#), [Johannesen et al. \(2020\)](#), and [Menkhoff and Miethe \(2019\)](#).

financial integration on misallocation of capital in southern Europe.

Fourth, there is a literature on advances in analyzing portfolio exposure at the security level by residency and nationality and by currency. [Coppola, Maggiori, Neiman and Schreger \(2021\)](#) provide a restatement of portfolio investment from residency to nationality for many countries, but only consider the Euro Area as a block precisely because of the issues addressed by this paper. [Avdjiev et al. \(2016\)](#) pointed out the growing discrepancies of residency data with respect to the true underlying capital allocation, [Fonseca et al. \(2022\)](#) and [Aminadav and Papaioannou \(2020\)](#) analyze global corporate control chains, [Bertaut et al. \(2019\)](#) provide a restatement by nationality for US investors, and [Damgaard et al. \(2019\)](#) focus on FDI and point out the growing role of Luxembourg and Ireland in intermediating FDI.⁸

Fifth, we contribute to the literature examining European capital allocation using micro data. The establishment of the SHS database at the ECB was a major data collection effort for both policy and research. [Boermans \(2022\)](#) provides a survey of the research sparked by this dataset. [Kojen, Koulischer, Nguyen and Yogo \(2018\)](#), [Bergant, Fidora and Schmitz \(2020\)](#), [Papoutsis, Piazzesi and Schneider \(2021\)](#), and [Holm-Hadulla and Leombroni \(2022\)](#) investigate quantitative easing and monetary policy shocks. [Boermans and Vermeulen \(2016\)](#) document a preference of investors for euro-denominated securities. [Darmouni and Papoutsis \(2022\)](#) explore the growth of non-financial corporate bond issuance in the Euro Area. [Bergant et al. \(2023\)](#) investigate capital flows to emerging markets. [Faia et al. \(2022\)](#) study granular investors and bond prices, while [Bonfanti \(2024\)](#) investigates Eurobonds. [Carvalho and Schmitz \(2021\)](#) unwind the fund share holdings by EA members by assuming that investors all own a representative portfolio of all fund holdings. [Vivar et al. \(2020\)](#) perform an unwind at the fund-security level and find the home bias within the mutual fund sector is lower for EA member countries once the unwound positions are included. [Boermans et al. \(2022\)](#) take an intermediate approach for equity funds and perform the unwind at the fund level but estimating the holdings based on funds reported style and benchmark.

Sixth, our new estimates of European capital allocation contribute to a growing literature on understanding the drivers and implications of the patterns of bilateral capital allocations. This recent literature includes [Kojen and Yogo \(2019\)](#), [Coppola \(2022\)](#), [Liu, Redding and Yogo \(2022\)](#), [Pellegrino et al. \(2022\)](#), [Jiang et al. \(2022\)](#), and [Morelli, Ottonello and Perez \(2022\)](#).

2 OOFCS in Global Investment and Our Methodology

In this section, we begin by documenting the scale and rapid growth of OOFCS financial intermediation activities. We then turn to our methodology for restating Euro Area financial accounts to look through these activities.

⁸There is a broader literature on firms' usage of tax haven jurisdiction, including activities in Luxembourg and Ireland: see [Hines and Rice \(1994\)](#), [Desai et al. \(2006\)](#), [Huizinga et al. \(2008\)](#), [Hanlon et al. \(2015\)](#), [Fuertes and Serena \(2016\)](#), [Bilicka \(2019\)](#), [Güvenen et al. \(2018\)](#), [Pacheco \(2022\)](#), and [Altshuler et al. \(2023\)](#).

2.1 OOFEC Exceptionalism and Impact on EA Aggregate Statistics

One of the challenges that OOFECs provide for international macroeconomics is that they make it difficult to understand and measure cross-border integration. In the case of the Euro Area, this is particularly salient as one of the stated goals of the common currency is fostering such financial integration. To provide an illustrative reference point, Figure 2a focuses on the ratio of gross external assets plus liabilities to gross domestic product. This is a common measure of the scale of external finance in a country (see for instance Fornaro 2019). Financial globalization has caused this measure to increase rapidly over the last thirty years for most countries in the world. To illustrate the extent to which the EA has had an extraordinary growth, we scale the EA index by similar measures computed for other large developed countries.⁹ The resulting index (red line) is displayed in Figure 2a. From 1990 to 2005, the Euro Area member countries' cross-border investment positions grew much faster than other developed countries—a structural break that would be consistent with a major shift in financial integration around the time of the introduction of the euro.¹⁰ However, this pattern was largely driven by cross-border holdings into and out of three small Euro Area countries: Luxembourg, Ireland, and the Netherlands. Once those are excluded, even this rough but commonly used proxy points to a more complex story about the dynamics of cross-border investment in the Euro Area.

Figure 2b illustrates just how different the external positions of these OOFEC countries are compared to the rest of Euro Area members. While for most countries, there is an approximately stable relationship between a country's GDP and its external financial position, Luxembourg, Ireland, and the Netherlands stand out as countries with massive financial positions relative to the size of their real economy, along with the smaller Malta and Cyprus. By this metric, they look quite similar to well-known offshore financial centers like the Cayman Islands and Bermuda, jurisdictions where capital is only passing through and not allocated to local economic activity. Given that the rise in aggregate measures of European integration is largely explained by the growth in financial activity in these OOFECs, a natural question is how much one misses about European integration without correcting more deeply for the rise of OOFECs intermediation.

Lastly, looking at the destination of portfolio investments, we can more clearly see the challenge of interpreting Euro Area financial positions. Figure 2c plots the destination of total cross-border portfolio investment in the IMF Coordinated Portfolio Investment Statistics (CPIS) for the Euro Area, excluding

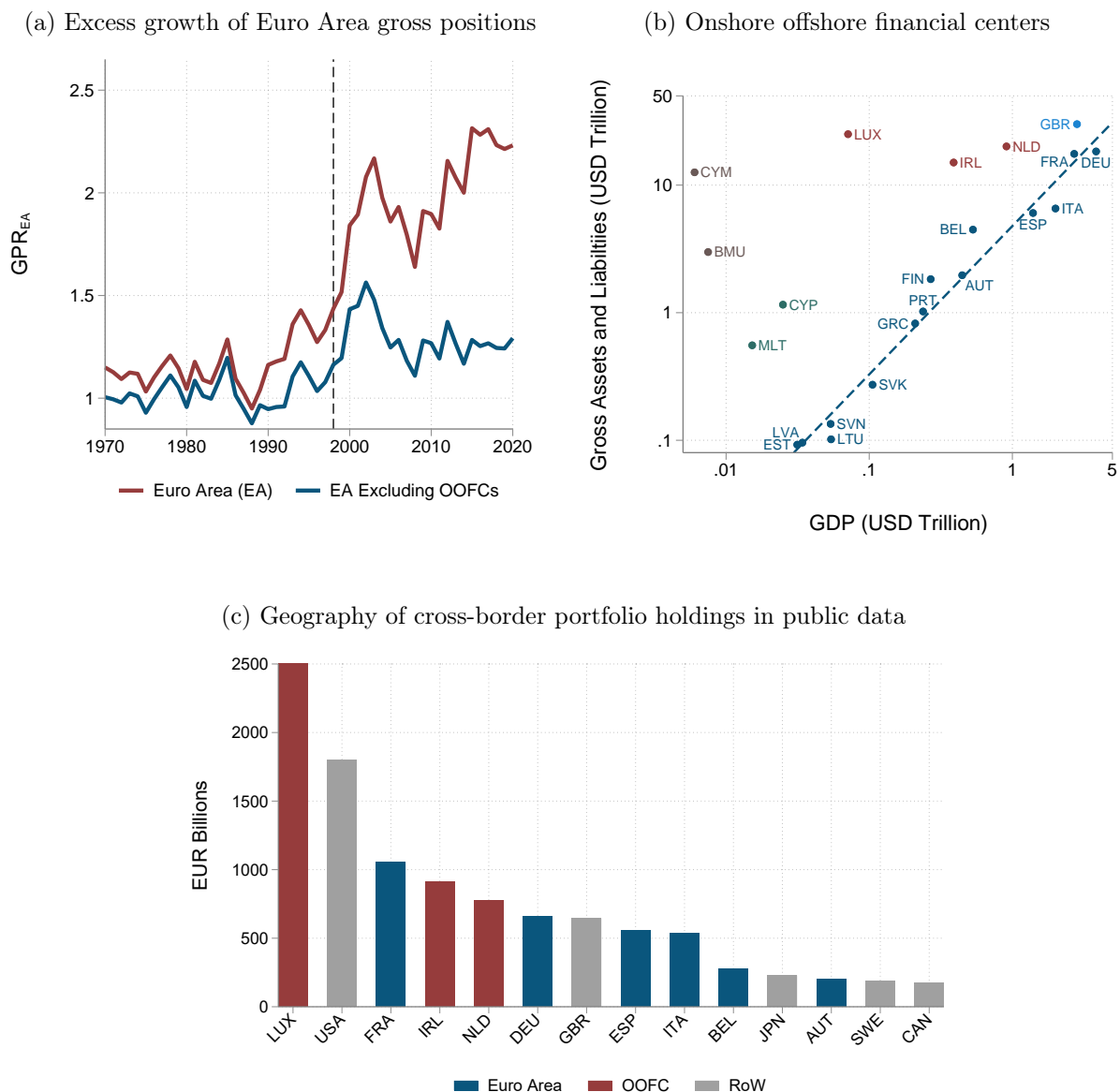
⁹We define GP_{EA} to be the ratio of gross assets (A_j) and gross liabilities (L_j) of all Euro Area countries, relative to the sum of their GDPs. Figure 2a plots a time series for this gross positions index GP_{EA} scaled by the average value of GP_j for a set of other developed economies:

$$GP_j = \frac{A_j + L_j}{GDP_j}, \quad GP_{EA} = \frac{\sum_{j \in \mathcal{J}_{EA}} (A_j + L_j)}{\sum_{j \in \mathcal{J}_{EA}} GDP_j}, \quad GPREA = \frac{GP_{EA}}{\sum_{j \in \mathcal{J}_{DM}} GP_j \frac{GDP_j}{\sum_{j' \in \mathcal{J}_{DM}} GDP_{j'}}},$$

where \mathcal{J}_{EA} is the set of all Euro Area countries and the set of countries \mathcal{J}_{DM} includes the United States, Japan, the United Kingdom, Switzerland, Australia, New Zealand, South Korea, Norway, and Canada.

¹⁰Coeurdacier and Rey (2013) show that aggregate measures of equity home bias also decreased faster for Euro Area countries than other large developed countries around this period and mention this as a possible sign of financial integration within the Euro Area.

Figure 2: Euro Area external positions and *onshore offshore financial centers*



Notes: We define GP_{EA} to be the ratio of gross assets (A_j) and gross liabilities (L_j) of all Euro Area countries, relative to the sum of their GDPs. Panel A plots a time series for this gross positions index GP_{EA} scaled by the average value of GP_j for a set of other developed economies (*red line*) which includes the United States, Japan, the United Kingdom, Switzerland, Australia, New Zealand, South Korea, Norway, and Canada. The *blue line* shows the equivalent series when excluding Luxembourg, Ireland, and the Netherlands from the set of Euro Area members. Panel B plots gross assets and liabilities ($A_j + L_j$) against GDP in the cross-section of countries as of the year 2019, on a log-log scale. The *dashed blue line* shows the OLS best fit for the set of observations in blue. We use data from the IMF, together with data from Lane and Milesi-Ferretti (2007) for the early period. Panel C shows the cross-border portfolio holdings of Euro Area countries excluding Luxembourg and Ireland by destination of investment on a residency basis, as reported in the IMF Coordinated Portfolio Investment Survey (CPIS). The bars are colored according to the type of destination country: OOFCS countries are in red, other EA countries are in blue, and non-EA countries are in gray.

investment originating in the OOFCS themselves. The issue is immediately apparent. The most important investment destination is Luxembourg, with Ireland and the Netherlands coming in at the fourth and fifth positions, ahead of Great Britain, Germany, Spain, and Italy. Because the overwhelming share of investment in Luxembourg and Ireland is in fund shares, this is another way of showing that official statistics do not actually allow us to know where Euro Area portfolio investments are ultimately going to.

It is immediate that the magnitudes of these investments are so large that different assumptions about the underlying composition lead to different conclusions on basic and important facts about Euro Area financial integration. For example, if investment in Luxembourg and Ireland flowed outside of the Euro Area, then each European country would be far more integrated with the rest of the world than the official data shows. Alternatively, if investments in Luxembourg and Ireland flowed evenly through the Euro Area, then the explosion of cross-border investment in Ireland and Luxembourg would be masking remarkable growth in financial integration within the Euro Area. Or finally, if investment into the OOFCS actually flowed back into each investor country, then financial integration—both the Euro Area’s integration with the rest of the world and each Euro Area country’s integration with the Euro Area as a whole—would be significantly overstated. Our methodology, which we turn to next, allows us to disentangle these possibilities. Our results show that while each individual Euro Area country is more integrated with the rest of the Euro Area (other than the OOFCS) and the rest of the world than official statistics suggest, the Euro Area as a whole is less integrated within the currency area and with the rest of the world than otherwise thought.

2.2 Unwinding Holdings Through Luxembourg and Ireland Funds

Our methodology consists of two interlinked steps. The first step attributes the positions held by OOFCS funds to the investors that actually own the funds. Here, we provide further details on this *fund unwind* component of our methodology. The SHS data reports which investment fund shares each sector in each country in the Euro Area owns. Therefore, whenever we observe an amount invested by a given sector in a Luxembourg or Ireland domiciled fund, we want to reclassify that investment as being in the underlying securities that the fund owns according to the securities’ portfolio weight in the fund.¹¹ Because SHS is at the country-sector level, however, it does not have information on the holdings of individual funds in Luxembourg and Ireland. Therefore, the unwind cannot be performed within the SHS data. For this information, we use estimates of security-level holdings of each fund based on the union of Morningstar,

¹¹We focus on unwinding funds in Luxembourg and Ireland, rather than anywhere in the Euro Area (or the world) because these two hubs distribute their funds widely. As illustrated in Figure 4 for Germany, the data in SHS shows only small investments by the rest of the Euro Area in funds domiciled in other EA-member countries. This is typical of other large EA member countries as well.

Lipper, and Factset Ownership data.¹² For each fund, we calculate the portfolio weight of all of its individual holdings, link this fund-security level information with the SHS data, and then reclassify the positions that SHS records as investments in fund shares domiciled in the OOFs into the underlying securities held by the fund.

The ultimate goal of our methodology is to produce restated statistics that are consistent with the most commonly used bilateral external positions dataset, the IMF CPIS. Since SHS does not exactly correspond to the set of positions that enter CPIS because of slight reporting discrepancies, to make our restated data most easily usable by researchers, prior to unwinding the SHS positions we scale them to make them consistent with the CPIS amounts. Specifically, for each investor country in the Euro Area and destination country in CPIS, we scale the position values for that bilateral country pair in raw SHS, before any adjustments, so that the total value matches CPIS. This maintains the relative size of each position within a given bilateral while ensuring the total for each bilateral matches CPIS. The full details of this scaling are reported in Appendix Section B.4. Throughout the rest of the paper, for simplicity we refer to the scaled CPIS-equivalent version of the SHS data simply as “SHS”.

We let the euro value of a position in SHS data be $x_{j,s,c}^f$, where c indexes the specific security (e.g., a specific bond identified by its ISIN code), j is the country of origin of the investment, and s is the investor sector of origin (e.g., the insurance sector or the household sector). The superscript f denotes whether the security is held directly by the investing country-sector, or alternatively via Luxembourg or Ireland funds, so that the index takes the corresponding values $f \in \{\text{Direct}, \text{LUX}, \text{IRL}\}$. We omit time subscripts here since many analyses are cross-sectional: we only include them when time-series clarity is necessary. We also define $x_{j,c}^f$ as the positions aggregated to the investor country level, which we obtain by summing over the set \mathcal{S} of all investor sectors: $x_{j,c}^f = \sum_{s \in \mathcal{S}} x_{j,s,c}^f$.

Investments in Luxembourg and Ireland funds therefore correspond to those positions $x_{j,s,c}^f$ for which $c \in \mathcal{F}_i$, where \mathcal{F}_i is the set of fund shares issued by funds domiciled in country $i \in \{\text{LUX}, \text{IRL}\}$. From the Morningstar, Lipper, and Factset fund holdings estimates, we obtain the portfolio composition for each of the Luxembourg and Ireland funds, which we denote as $\gamma_{c',c}$: this is the share of the portfolio of the fund indexed by c' that is invested in each security c , with $\sum_c \gamma_{c',c} \leq 1$.¹³ The *indirect* positions held

¹²See Appendix Section B for further details on our unwind methodology. The Morningstar fund share estimates are assembled as in Maggiori et al. (2020) and Coppola et al. (2021), which implement various steps to improve the quality of the data, including standardization of security identifiers and characteristics, as well as unwinding of holdings of funds in other funds within the Morningstar data. We merge the fund portfolio holdings estimates to SHS by mapping each fund share’s ISIN to the corresponding fund identifier.

¹³Portfolio shares invested in securities by each fund can sum to less than 1 because a fund may own cash, derivatives, or assets like real estate that are not securities. The value of the reallocated positions in securities after the unwind is weakly below the value of the original fund shares held. This is consistent with the balance of payments statistics methodology (BPM6) that would have excluded cash or real estate from portfolio investment if held directly and not via a fund share.

through Luxembourg and Ireland funds of each sector in each Euro Area country are therefore given by:

$$x_{j,s,c}^{\text{LUX}} = \sum_{c' \in \mathcal{F}_{\text{LUX}}} (x_{j,s,c'}^{\text{Direct}} \cdot \gamma_{c',c}), \quad x_{j,s,c}^{\text{IRL}} = \sum_{c' \in \mathcal{F}_{\text{IRL}}} (x_{j,s,c'}^{\text{Direct}} \cdot \gamma_{c',c}). \quad (1)$$

We then estimate the total holdings of investor country j in a given security as:

$$x_{j,c} = \sum_{s \in \mathcal{S}} (x_{j,s,c}^{\text{Direct}} + x_{j,s,c}^{\text{LUX}} + x_{j,s,c}^{\text{IRL}}). \quad (2)$$

We estimate the Rest of World's (RoW) positions intermediated through OOF funds as the difference between the Luxembourg and Ireland fund sectors' reported investment in an asset and those holdings that we can account for as intermediation of Euro Area investment. In particular, our estimates for the RoW holdings in security c through Luxembourg and Ireland funds are given respectively by:

$$x_{\text{RoW},c}^{\text{LUX}} = x_{\text{LUX,IF},c}^{\text{Direct}} - \sum_{j \in \mathcal{J}_{EA}} x_{j,c}^{\text{LUX}}, \quad x_{\text{RoW},c}^{\text{IRL}} = x_{\text{IRL,IF},c}^{\text{Direct}} - \sum_{j \in \mathcal{J}_{EA}} x_{j,c}^{\text{IRL}}, \quad (3)$$

where \mathcal{J}_{EA} is the set of Euro Area countries, while $x_{\text{LUX,IF},c}^{\text{Direct}}$ and $x_{\text{IRL,IF},c}^{\text{Direct}}$ are the direct holdings in security c of the investment fund sectors ($s = \text{IF}$) of Luxembourg and Ireland in the SHS data. Therefore, the RoW holdings in our paper are computed as the residual of total holdings after accounting for known Euro Area holdings.

Table 1 provides summary statistics for our fund unwind procedure, focusing on the cross-section of data at the end of 2020. The value of all claims on Luxembourg and Ireland funds by all other Euro Area investor sectors in the SHS data is €3,105 billion, of which €2,369 billion are positions in Luxembourg fund shares and €736 billion are positions in Irish fund shares: these constitute the fund share liabilities of Luxembourg and Ireland to Euro Area countries. Our merge of these fund shares with the fund holdings estimates from Morningstar, Lipper, and Factset has a match rate of 81.2%, meaning that we can map €2,521 billion worth of these fund share positions to fund portfolios. These high match rates reflect the high coverage of funds domiciled in global centers like Luxembourg and Ireland in commercial datasets. Since treating the unmatched funds as belonging to the Rest of World would significantly understate the true positions of Euro Area investors, we assume that the portfolio shares of the unmatched funds are the same as for the matched funds within each investor country-sector: the formal details of this procedure are reported in Appendix Section B.3.¹⁴

Overall, our fund unwind procedure maps the Euro Area investors' €3,105 billion claims on fund

¹⁴The match rates are similar for Luxembourg and Ireland fund shares, at 80.2% and 84.5% respectively. We inspected the residual unmatched funds manually and they do not appear to be biased in a particular direction. Appendix Section D provides further discussion of the coverage of fund holdings that we obtain using Morningstar, Lipper, and Factset. We compare the coverage of these commercial datasets to the reported amounts from national regulators, the Securities Holdings Statistics, and the mutual fund industry group Investment Company Institute (ICI).

Table 1: **Fund unwind: summary statistics**

	Attributed to: (€B)		SHS Total (€B)
	EA Investors	RoW Investors	
<i>A. Luxembourg and Ireland</i>			
Total Claims on Fund Shares	3,105	—	—
Equity and Bond Assets	2,368	4,694	7,062
Equity Assets	1,279	1,781	3,061
Bond Assets	1,089	2,913	4,001
Other Assets*	737	—	—
<i>B. Luxembourg</i>			
Total Claims on Fund Shares	2,369	—	—
Equity and Bond Assets	1,768	2,558	4,326
Equity Assets	949	999	1,948
Bond Assets	819	1,559	2,378
Other Assets*	601	—	—
<i>B. Ireland</i>			
Total Claims on Fund Shares	736	—	—
Equity and Bond Assets	600	2,136	2,736
Equity Assets	330	783	1,113
Bond Assets	270	1,354	1,624
Other Assets*	136	—	—

*Includes assets with no ISIN identifiers.

Notes: All values are in billions of euros. The rows labeled “Total Claims on Fund Shares” display the total claims of Euro Area investors in the CPIS-consistent SHS data on shares of funds domiciled in Luxembourg and Ireland: panel A shows the sum of the claims on Luxembourg and Ireland funds combined, while panels B and C separate the two. The rows labeled “Equity and Bond Assets” show the amount of those claims that constitute indirect holdings by Euro Area investors of bonds and equities after our unwind procedure (column “EA Investors”), as well as the total bond and equity assets held by the investment fund sectors of Luxembourg and Ireland in SHS (“SHS Total”) and the portion of these that we attribute to RoW investors (“RoW Investors”). The rows labeled “Equity Assets” and “Bond Assets” report analogous statistics for equities and bonds separately. The rows labeled “Other Assets” show the amount of claims that constitute indirect holdings by Euro Area investors of assets that are not bonds or equities, including assets that have no ISIN identifiers (such as claims on non-security cash instruments). Total claims on fund shares of EA investors exclude claims originating from the Luxembourg and Ireland fund sectors themselves. The “SHS Total” values in panels B and C are reported after unwinding holdings of Luxembourg funds in Irish fund shares, and vice versa. Data shown as of 2020.

shares into claims on the underlying securities, composed of €1,279 billion in claims on equity securities, €1,089 billion in claims on bonds, and €737 in claims on other assets. The claims on other assets include holdings that do not have an ISIN identifier, which consist primarily of positions in cash and cash instruments. The total holdings of equities and bonds of the Luxembourg and Ireland fund sectors in SHS are €7,062 billion: since our procedure attributes €2,368 billion of these positions to Euro Area countries, the residual €4,694 billion in bonds and equity securities are assigned to the rest of the world, with the RoW component being especially prominent for Irish funds. A first result emerges immediately from this summary table: Luxembourg and Ireland funds intermediate a lot on behalf of non-EA residents. In Section 6, we examine the identity of these RoW investors using new administrative data from the regulators in Luxembourg and Ireland, since our main concern is that these RoW positions might substantially include unreported wealth by Euro Area residents.

Table 2: **Reallocation matrix, EA corporate debt investments**

Destination	Share Reallocated To: (%)									
	Home	CHN	DEU	ESP	FRA	GBR	HKG	ITA	USA	Other
CYM	9.0	38.1	0.3	0.1	0.4	2.4	12.6	0.2	7.5	29.3
DEU	94.4	0.1		0.5	0.4	0.1	0.0	1.7	0.4	2.5
IRL	63.4	0.0	4.7	0.9	1.0	1.4	0.9	5.7	9.0	12.9
LUX	32.2	4.9	3.9	1.1	17.3	2.6	0.9	1.9	8.8	26.4
NLD	52.2	0.5	17.9	4.8	4.8	5.2	0.0	3.0	3.0	8.6

Notes: This table shows the share of Euro Area corporate bond investments into selected destination countries (rows) that are distributed to each other country (columns) on a nationality basis. Values are expressed in percentage points. The first column, Home, shows the share that remains in each country on a residency basis and the last column (“Other”) shows the sum of the shares allocated to all remaining countries. Blank entries are shown in cases in which the Home column reports the value instead. Data shown as of 2020.

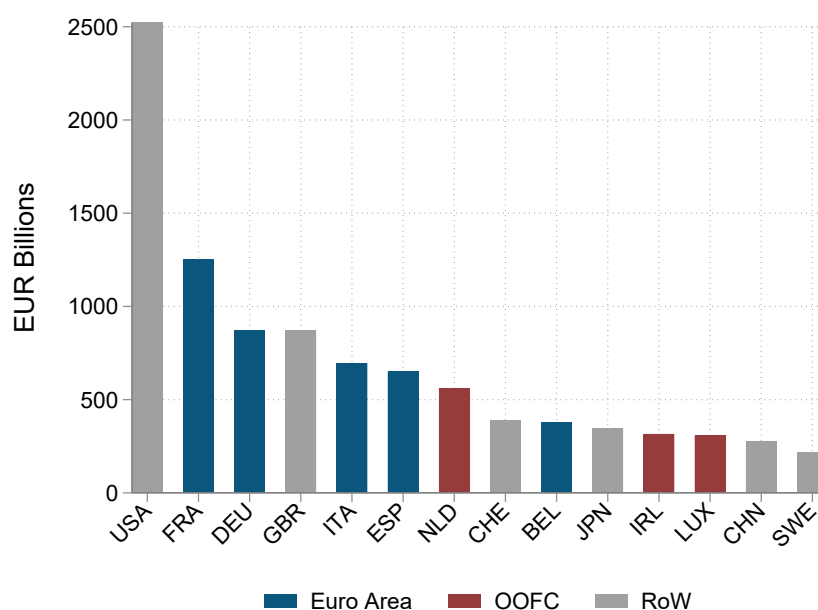
2.3 Aggregating Securities to Ultimate Corporate Parents

We next turn to the *securities aggregation* component of our methodology, exploring how looking through corporate financing affiliates resident in both European OOFs and global offshore financial centers (such as the Cayman Islands or the British Virgin Islands) affects our understanding of the geography of European investment. To link securities to their ultimate corporate parent and hence assign them a country of nationality, we use a version of the algorithm in [Coppola et al. \(2021\)](#), which combines information from various commercial data sources to generate a map linking each bond and equity security traded worldwide (a total of over 27 million securities) to its ultimate parent entity. Using this algorithm, we are able to match 97% of all equity holdings and 89% of all corporate bond holdings in SHS.

Table 2 shows an extract from a “reallocation matrix” for corporate bonds held by Euro Area investors. The rows list the country of residency of the immediate entity issuing the bonds, while the columns show the country of nationality of the corresponding ultimate parent entity obtained by our algorithm. Each entry is expressed in percentage of the total value of holdings in that destination by residency (so that

the rows sum to 1). For Luxembourg, we find that only 32.2% of corporate bonds attributed to this destination on a residency basis remain there on a nationality basis. France, the United States, and Switzerland are the largest destinations of this reallocation to a nationality basis. For the Netherlands, 52.2% of Dutch securities on a residency basis remain classified there on nationality basis, with Germany, Spain, and the United Kingdom the largest destinations of the reallocation. Finally, the majority of Irish-resident corporate bonds (63.4%) remain there on a nationality basis, with the United States, Italy, and Germany the largest reallocations. For comparison with the OOFCs, we also included Germany, a large industrial country of the Euro Area, and the Cayman Islands, a pure offshore financial center. For the Cayman Islands, only 9.0% of corporate bonds by residency remain there by nationality, with major reallocations to China, Hong Kong, and the United States. By contrast, 94.4% of bonds issued by entities that are German by residency remain classified there by nationality. We conclude that the OOFCs mix features of a typical industrial European country, with much of the capital raised being used locally, and features of offshore financial centers which are pure pass-through destinations of global capital allocation.

Figure 3: The geography of cross-border portfolio holdings in restated data



Notes: We provide a restated version of Figure 2c using our nationality adjustment and fund unwind procedures. The bar chart shows the cross-border portfolio holdings of Euro Area countries excluding Luxembourg and Ireland by destination of investment on a restated basis. The bars are colored according to the type of destination country: OOFC countries are in red, other EA countries are in blue, and non-EA countries are in gray.

3 The Restated Investment Portfolios of the Euro Area

We provide comprehensive restated estimates of bilateral portfolio positions of Euro Area countries and show that the restatements are essential to understand the underlying exposures. Figure 3 is analogous

to Figure 2c, but it uses our restated data. That is, we plot the destination of cross-border portfolio investments originating from non-OOFC Euro Area countries, but now looking through both the fund intermediation and security issuance roles of the OOFCs. The difference between the two figures is stark. After our corrections, the United States is the largest bilateral investment destination, with a position of around €2.5 trillion, a nearly €800 billion increase between the values in Figures 2c and 3. The four large Euro Area countries (France, Germany, Italy, and Spain), along with the United Kingdom quickly follow as the top destination of portfolio investments. Correspondingly, the positions in the OOFCs are dramatically reduced.

To further understand the sources of these large changes at the Euro Area level, we focus as an example on Italy as the country of residency of the investors. Table 3 shows both the official data and the restatements for Italy.¹⁵ Consider Italy's portfolio investment in Germany: the official data records an investment position of €75 billion. The second column reflects our adjustment of Italy's portfolio position from a residency to nationality basis. Italy's investment in Germany increases to €83 billion: this reflects Italian holdings of securities issued by entities resident in the OOFCs, primarily the Netherlands, but ultimately controlled by German entities (as in our motivating Figure 1). The next column reflects the restatement due to unwinding Italian investment in funds domiciled in the OOFCs, but keeps the geography of the securities themselves on the original residency basis. This change alone leads us to estimate that Italy owns €116 billion of German assets rather than the original €75 billion. Finally, the fourth column puts the two adjustments together, and we find that Italy's portfolio investment in Germany is €128 billion.

It is evident from this example that the two adjustments interact strongly because funds in the OOFCs disproportionately invest in Germany via securities issued in OOFCs. This compounding effect of the two adjustments is even more striking when considering Italian investment in Chinese securities. In the official data, Italy only reports owning €2 billion in China. However, the nationality adjustment almost quadruples that exposure: this effect is largely driven by the fact that major Chinese technology firms incorporate as variable interest entities (VIEs) through shell entities domiciled in the Cayman Islands to evade Chinese regulation forbidding foreign equity ownership (see Coppola et al. 2021). The fund unwind alone raises Italian investment in Chinese securities to €12 billion, while the joint procedure increases the observed positions to €36 billion, a strikingly large increase of more than 1,600% relative to the official position. This emphasizes the importance of carrying out the two procedures jointly. While the security unwind and the fund unwind are individually important, the joint interaction effect is crucial to accurately measure exposures, as the vast majority of Italy's holdings of Chinese securities occurs through funds domiciled in the OOFCs buying Chinese securities that are themselves resident in tax havens.

¹⁵Appendix Tables A.II through A.IX report analogous results broken down by asset class (bonds and equities) as well as for Germany and France. Moreover, the complete set of restatements for all Euro Area investor countries, years, asset classes, and destinations is available at globalcapitalallocation.com.

Table 3: Restated bilateral external statistics: Italy's portfolio investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
France	162	175	222	232	+43%
Germany	75	83	116	128	+70%
Greece	3	3	4	4	+38%
Spain	110	115	132	139	+26%
Italy (Domestic)	1990	1998	2049	2056	+3%
B. Non-EA					
Argentina	2	2	2	3	+59%
Australia	6	7	10	12	+112%
Brazil	1	2	4	6	+470%
Canada	4	5	11	12	+188%
China	2	7	12	36	+1,617%
India	0	1	6	7	+2,246%
Indonesia	2	2	5	5	+201%
Japan	15	17	35	39	+158%
Mexico	6	6	11	11	+95%
Russia	1	2	3	5	+408%
Saudi Arabia	1	1	2	2	+106%
South Africa	1	2	4	5	+351%
South Korea	2	2	7	8	+373%
Turkey	2	2	3	3	+123%
United Kingdom	44	44	79	83	+88%
United States	134	138	317	324	+141%
C. Non-OOFC tax havens					
Bermuda	0	0	2	1	+101%
Cayman Islands	4	1	25	1	-70%
Curacao	0	0	0	0	+0%
Guernsey	1	0	1	0	-33%
Hong Kong	1	1	4	6	+817%
Jersey	4	1	6	2	-48%
Panama	0	0	1	1	+127%
British Virgin Islands	1	0	3	0	-37%
D. OOFCs					
Ireland	173	169	50	45	-74%
Luxembourg	686	674	66	47	-93%
Netherlands	72	36	98	55	-23%

Notes: This table shows estimates of the restated total portfolio investments across all assets classes of Italian investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “*Nationality Adj.*” shows the positions after adjusting securities from a residency to a nationality basis. The column “*Funds Adj.*” shows the positions after unwinding the holdings of Italian investors through Luxembourg and Ireland funds. The column “*Both*” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Similarly, the percentage increases in the portfolio exposures to other large emerging markets—like Brazil and Russia—are also large, much like in the case of China. The sheer size of the increase in positions in other developed economies, like the United States, is also important. Instead of the reported €134 billion of investment in the official data, we estimate that Italy owns €324 billion of US securities, more than doubling the Italian portfolio exposure to the United States. Of course, these large increases need to come from somewhere, as the total wealth in each country’s external portfolio cannot increase. In panel C of Table 3, we show that the positions are coming out of large reductions in the estimated holdings of Italy in the OOFCS themselves—Ireland, Luxembourg, the Netherlands—as well as global tax havens like the Cayman Islands and Bermuda. Overall, the examples discussed in this section highlight that our restated bilateral portfolios estimates are quantitatively crucial to properly assess global risk exposures and financial linkages among countries.

4 Understanding the Nature of OOFCS Activities

Having described our restatement procedure and its significant effect on the aggregate portfolios of Euro Area countries, we now investigate—using the underlying micro data—the nature of financial intermediation activities in the OOFCS.

4.1 A Decomposition of the Observed Euro Area Portfolio

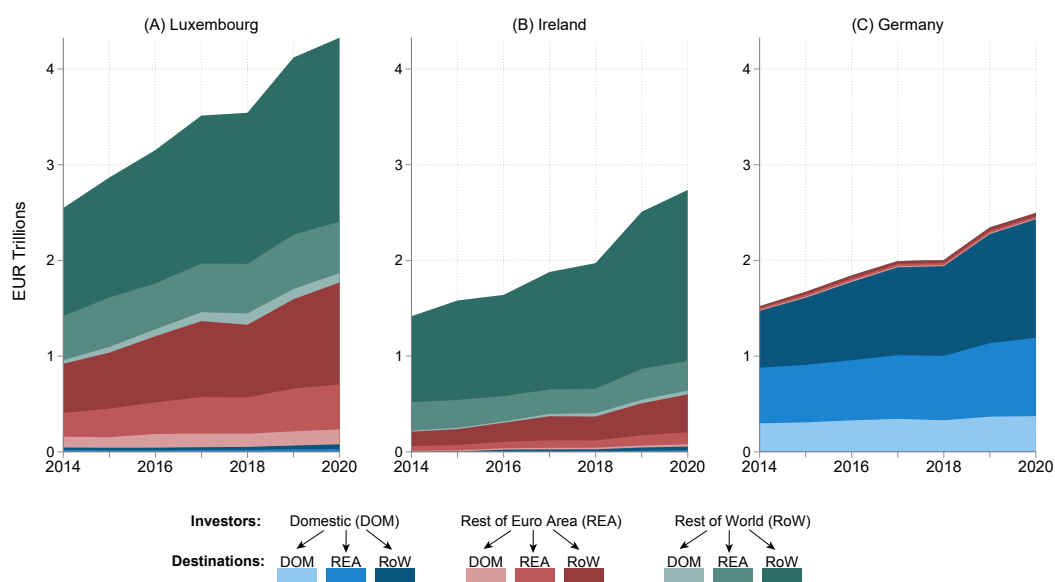
We decompose the portfolios of Euro Area countries into three mutually exclusive components, which we show are highly heterogeneous. This three-component decomposition is a useful framework that we will keep referring back to when discussing the rest of the results in the paper. Specifically, we consider the following three components:

1. Component 1 consists of the *direct holdings of Euro Area investors*: that is, the securities held by each EA country directly, without intermediation through OOFCS funds.
2. Component 2 consists of the *indirect holdings of Euro Area investors*: these are the securities held by EA investors indirectly, through OOFCS funds.¹⁶
3. Component 3 consists of the *indirect holdings of Rest of World (RoW) investors*: these are securities held by non-EA investors through OOFCS funds. They are part of the observed EA portfolio in official data since they are counted as assets of the OOFCS, although economically they do not correspond to EA assets.

Figure 4 decomposes the assets of investment funds domiciled in Luxembourg, Ireland, and Germany—where Germany is included as a point of comparison, being the largest non-OOFCS country. The assets are

¹⁶For the OOFCS themselves, we consider investments in domestic funds part of portfolio component 1, and investments through foreign OOFCS funds part of portfolio component 2. This is a purely expositional distinction.

Figure 4: **Heterogeneity in holdings through Luxembourg and Ireland funds: geography**



Notes: This figure uses our methodology to decompose the bond and equity assets of investment funds domiciled in Luxembourg, Ireland, and Germany in SHS according to who the ultimate investors are and which countries' securities (by nationality) the investments are in. Blue areas correspond to domestic investors, red areas to investors in the rest of the Euro Area (REA), and green areas to unaccounted-for investors, potentially in the rest of the world (RoW). Light shades correspond to investment in domestic securities, medium shades to investment in REA securities, and dark shades to investment in RoW securities.

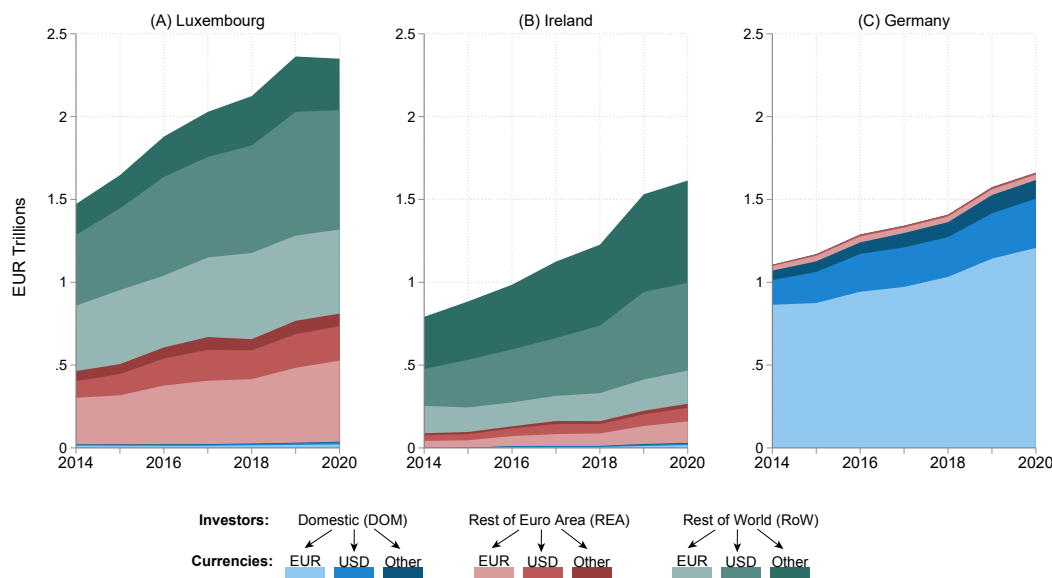
split according to who the owner is, and which countries' securities these portfolios are invested in. The blue areas represent portfolio component 1 (direct EA holdings): these correspond to domestic owners—that is, owners resident in the same country as the investment fund. The red areas represent portfolio component 2 (indirect EA holdings): they correspond to owners in the rest of the Euro Area. Lastly, the green areas represent portfolio component 3 (indirect RoW holdings): these correspond to owners that do not report through the Euro Area's SHS administrative data (labeled RoW). Each of these blue, red, and green areas is then decomposed further into three shades, which correspond to the destination of the investments. The lightest shades are for investment into domestic securities (i.e., those whose country corresponds to the fund's domicile, on a residency basis), the medium shades are for investments into securities issued in the rest of the Euro Area, and the darkest shades are for securities issued outside of the EA.

This graph allows us to examine both the relative size of these three portfolio components and their heterogeneity, as it shows how different investors sort into buying different assets when investing through funds domiciled in these three countries. It is immediately clear that virtually only German investors hold assets through German funds. However, for Luxembourg and Ireland the pattern is starkly different: holdings by domestic investors are very small, and less than half of the positions are accounted for by reported positions of investors resident in the Euro Area. For Ireland, the composition is even more skewed, with Irish and other Euro Area reported positions accounting for less than a third of the holdings of Irish funds. Instead, we see that a large portion of the positions are not accounted for by SHS, indicating that they are potentially held by investors outside of the Euro Area. Furthermore, it is evident that the portfolios held by different investors through Luxembourg and Ireland funds are highly heterogeneous, with particularly large differences between EA and RoW investors. RoW investors are much more tilted towards non-EA assets than EA investors are when investing through these funds. Correspondingly, portfolio component 3 is more globally diversified than portfolio component 2, which in turn is more globally diversified than component 1.

We document a similar pattern when analyzing the currency composition of these investments. Figure 5 repeats the same decomposition exercise, but it focuses on the currency composition rather than geographic destination of the investments. Since currency of denomination is most meaningful as a security attribute for bonds, the figure restricts the assets to be only the bonds held by these funds. The lightest shades now correspond to euro-denominated bonds, the medium shades are for US dollar denominated bonds, and the darkest shades are for assets in other currencies. While Euro Area investors have the bulk of their bond portfolios invested in euro-denominated bonds, the holdings of RoW investors are more heavily biased towards the dollar and other non-Euro currencies.

Figure 6 expands on this finding by further disaggregating the set of currencies for the period of end of year 2020. We examine the denomination of bonds held by Euro Area and RoW investors via Luxembourg and Ireland funds, separating the British pound from other foreign currencies. Panel A plots

Figure 5: **Heterogeneity in holdings through Luxembourg and Ireland funds: currency**



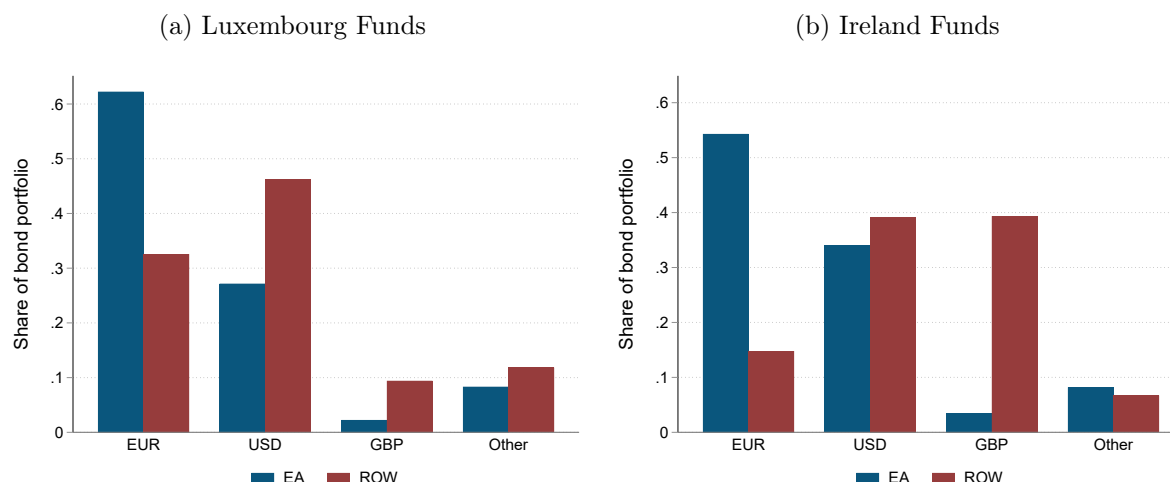
Notes: This figure decomposes the bond assets of investment funds domiciled in Luxembourg, Ireland, and Germany according to our estimates of who the ultimate investors are and which currencies the bond holdings are denominated in. Blue areas correspond to domestic investors, red areas to investors in the rest of the Euro Area (REA), and green areas to unaccounted-for investors, potentially in the rest of the world (RoW). Light shades correspond to investment in euro-denominated bonds, medium shades to investment in US dollar-denominated bonds, and dark shades to investments in other denominations.

the currency composition for bonds held via Luxembourg funds, while panel B plots the composition via Ireland funds. We find that more than 60% of the bonds owned by Euro Area investors via Luxembourg funds are denominated in euros, but only around 30% of the holdings of the Rest of World are. Instead, nearly half of RoW holdings are denominated in US dollars, with less than 30% of the holdings of the Euro Area in the US dollar. It is also apparent that the British pound plays an especially prominent role for RoW holdings via Ireland funds, accounting for 40% of the positions, as compared to 10% for RoW positions held via Luxembourg funds.¹⁷

The strong tilt of RoW holdings via Ireland funds towards the British pound is partially accounted for by British liability-driven investment (LDI) funds that are resident in Ireland. These LDI vehicles channel the assets of British pension funds and are authorized by the Central Bank of Ireland. In recent years, they have held in the aggregate upwards of €300 billion in British gilts (Rowland 2022). These

¹⁷The quantitative importance and heterogeneity in OOFIC intermediation activities is also evident when inspecting their role as domiciles of securities issuance. As shown in Appendix Figure A.V, corporate bonds issued in OOFICs have accounted for a remarkably high share of cross-border holdings inside the Euro Area: about 33% of all cross-border holdings of corporate bonds within the EA (that is, bonds issued by European firms and held by Euro Area investors outside of their country of issuance) are in bonds issued in OOFICs, with Luxembourg and the Netherlands accounting for most of this phenomenon. The majority of these bonds are reallocated away from the OOFICs on a nationality basis. In more recent years, a large part of corporate bond holdings within the EA has also been accounted for by the Eurosystem of central banks itself: these holdings have grown from virtually zero in 2015 to more than €300 billion in 2023.

Figure 6: **Currency composition of holdings via funds**



Notes: This figure plots the share of bonds denominated in the euro, the US dollar, the British pound, and other currencies held by Euro Area (EA) and Rest of World (RoW) investors via funds domiciled in Luxembourg and Ireland. All data is as of 2020.

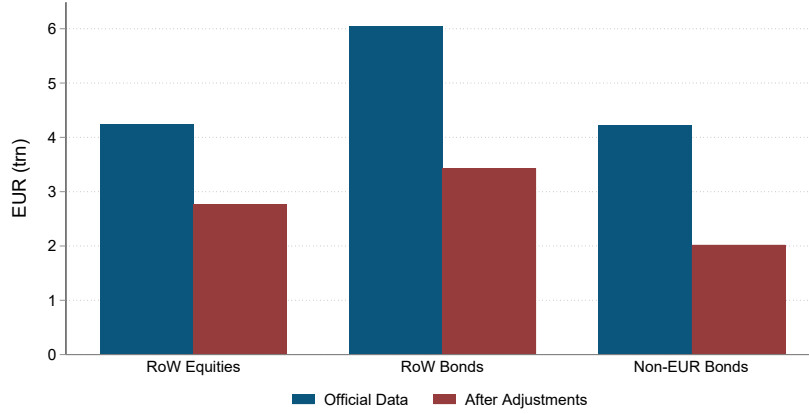
positions are included in the Irish fund sector holdings as reported in SHS, but they do not enter the commercial fund holdings data that we use given their organizational structure, which differs from that of open-end mutual funds. Correspondingly, our fund unwind procedure attributes these LDI holdings to RoW investors. Since these gilt holdings are virtually all denominated in British pounds, the presence of the LDI funds contributes to the tilt towards the British pound that we observe in the RoW holdings.

4.2 Aggregate Consequences for the Euro Area's External Position

The heterogeneity in portfolios held through OOF funds that we have documented—both in terms of destination country and of currency—has important consequences for our understanding of the Euro Area's external financial positions. In Figure 7, we focus on 2020 and examine the consequences of our fund unwind for the Euro Area as a whole. We find that instead of the €4.2 trillion of RoW equities in the portfolio according to official data, the Euro Area actually only owns €2.8 trillion. Similarly, for RoW bonds only €3.4 trillion of the €6.1 trillion in the official data is actually owned by the Euro Area. The effect is even more stark when we turn to currency, as we find that only €2.0 trillion of the €4.2 trillion of foreign currency denominated bonds reported as owned by the Euro Area in official statistics is actually owned by the Euro Area.

Hence, taken together, these results show that the Euro Area as a whole has a much smaller external position vis-à-vis the Rest of World than official data suggests. This fact is an aggregate indication that the financial intermediation activities taking place in the OOFs artificially overstate the extent of financial integration occurring in the Euro Area vis-à-vis the rest of the world, something that we return to in Section 5.

Figure 7: Reassessing the Euro Area’s aggregate external position



Notes: This figure shows the size of the external assets of the Euro Area in official data (blue bars) and after our restatements (red bars). We show the position of the Euro Area as a whole in RoW equities, RoW bonds, and non-euro denominated bonds.

4.3 An Analytical Framework for Examining the Portfolios

We analyze the heterogeneity in the various EA portfolio components more formally, using an econometric approach that exploits the richness of the micro data. We begin with a simple benchmark, based on the international CAPM, in which full financial integration corresponds to each country owning every security in proportion to that security’s weight in the global market portfolio (French and Poterba 1991, Lewis 1999). This simple benchmark is both the subject of a large literature in international finance and of policy relevance since it can be used as a metric to measure progress towards the Capital Markets Union in the Euro Area.¹⁸ We quantify deviations from this benchmark along various dimensions of interest. For each portfolio component f of each investing country j , we define portfolio weights within an asset class a as:

$$\omega_{j,c}^{a,f} = \frac{x_{j,c}^f}{\sum_{c' \in \mathcal{C}_a} x_{j,c'}^f} \quad \text{for } c \in \mathcal{C}_a, \quad (4)$$

where \mathcal{C}_a is the set of all securities outstanding worldwide in asset class a at a point in time, irrespective of whether country j holds any. We let \bar{x}_c^a be the outstanding value of a security c in asset class a . Hence, CAPM weights within each asset class a are given by:¹⁹

$$m_c^a = \frac{\bar{x}_c^a}{\sum_{c' \in \mathcal{C}_a} \bar{x}_{c'}^a}. \quad (5)$$

¹⁸See also Solnik (1974), Adler and Dumas (1983), Dumas and Solnik (1995), Coval and Moskowitz (1999), Fidora et al. (2007), Engel and Matsumoto (2009), Coeurdacier and Gourinchas (2016), and De Marco et al. (2022) for related work.

¹⁹CAPM weights are defined over the universe of world securities in each asset class. We obtain the market value outstanding of each security worldwide from the ECB Centralised Securities Database (CSDB) and Worldscope. The securities covered by CSDB and Worldscope are not limited to those held only by Euro Area investors. Appendix Section B.6 discusses how we build this global outstanding amounts file.

We measure deviations from this benchmark using the following regression specification:

$$\omega_{j,c}^{a,f} = \alpha^{a,f} + m_c^a \sum_{k \in \mathcal{K}} \beta_k^{a,f} \mathbf{1}_{c,k} + \varepsilon_{j,c}^{a,f}, \quad (6)$$

where $k \in \mathcal{K}$ indexes a set of mutually exclusive and collectively exhaustive characteristics of interest. In these regressions, $\mathbf{1}_{c,k}$ is a dummy variable indicating whether security c possesses characteristic k , and the coefficient $\beta_k^{a,f}$ captures the tilt towards that characteristic (relative to the CAPM benchmark) of the relevant portfolio in the estimation sample. The simplest version does not split securities according to any characteristics, corresponding to the following specification:

$$\omega_{j,c}^{a,f} = \alpha^{a,f} + m_c^a \beta_{\text{CAPM}}^{a,f} + \varepsilon_{j,c}^{a,f}. \quad (7)$$

If the international CAPM held perfectly, this regression would have an R^2 of 1, with $\hat{\alpha}^{a,f} = 0$ and $\hat{\beta}_{\text{CAPM}}^{a,f} = 1$, meaning that every investor holds every security precisely in proportion to its share of the world market portfolio. We show dimensions along which various investors in the Euro Area deviate from this benchmark by focusing on two sets of characteristics: the residence of the issuing entity and the currency of a bond.

4.4 Home Bias and Home Currency Bias at the Micro Level

Our first specification uses the regression framework of Section 4.3 to explore how home bias differs in the various components of the observed EA portfolio, as introduced in Section 4.1—i.e., depending on the path through which investors purchase securities, as well as on whether the end investor is a Euro Area resident or not. In particular, we estimate the following regression:

$$\omega_{j,c}^{a,f} = \alpha^{a,f} + m_c^a \left[\beta_{\text{RoW}}^{a,f} \mathbf{1}_{c,\text{RoW}} + \beta_{\text{REA}}^{a,f} \mathbf{1}_{c,\text{EA}-j} + \beta_{\text{Home}}^{a,f} \mathbf{1}_{c,\text{Home}(j)} \right] + \varepsilon_{j,c}^{a,f}, \quad (8)$$

where $\mathbf{1}_{c,\text{Home}(j)}$ is an indicator for whether security c is issued by an entity from country j , $\mathbf{1}_{c,\text{EA}-j}$ indicates whether it is issued by an entity from a Euro Area country other than country j , and $\mathbf{1}_{c,\text{RoW}}$ indicates whether the security is issued by an entity not from the Euro Area. Table 4 presents the estimates from this specification, in panel A for equity portfolios and in panel B for bond portfolios. We separately run the security-level regressions for the following: (a) portfolio component 1, consisting of the direct holdings of Euro Area investors outside of OOFc funds (labeled “*EA Direct*”); (b) portfolio component 2, consisting of the holdings of EA investors channeled through investment funds domiciled in Luxembourg and Ireland (“*EA Indirect*”); (c) the sum of portfolio components 1 and 2, corresponding to our estimates of total EA investors’ positions that combine direct holdings with the indirect holdings via the OOFcs (“*EA Total*”); and (d) portfolio component 3, consisting of the positions held by RoW

investors via OOFc funds (“*RoW Indirect*”).²⁰

The estimates in panel A for equities show a strong but heterogeneous degree of home bias in each specification for Euro Area investors. In particular, in the direct EA holdings, we find that investors place on average a portfolio weight on domestic securities that is 25.6 times higher than their global market weight. This striking pattern is the classic home bias that has been documented consistently in the literature. Interestingly, in the indirect investments of EA investors via the OOFcs, we find that investors are 3.4 times overweight domestic securities relative to the market benchmark. This means that even when Euro Area investors buy Irish and Luxembourg funds, they still disproportionately purchase domestic assets, albeit not nearly with the same degree of home bias than they exhibit in their direct holdings. Our estimates for the total position of EA countries act as a weighted average between these two home bias levels, with a coefficient estimate of 23.1.

Comparing across the direct and indirect portfolios of EA investors, we find that despite the home bias, investment through the OOFc funds is the key channel for international diversification for EA investors. In particular, while EA investors own only 33% of the market weight of RoW securities in their direct holdings, this number increases to 74% when investing through the OOFcs. Compared to the RoW portfolio invested via the OOFcs, however, we document that EA investors remain overweight in domestic and other EA securities. The RoW portfolio has a loading of 0.79 on RoW equities and 1.24 on EA securities, meaning that while RoW investors do slightly tilt their holdings via the European OOFcs towards the Euro Area equities, they continue to buy a globally diversified portfolio.

Panel B in Table 4 performs an equivalent analysis for bond portfolios and finds similar results. In particular, we find that EA investors are more home-biased in their direct portfolios than they are via the OOFc funds, but they continue to display a strong degree of home bias even in their indirect holdings. In the case of bond investment, investors are even more underweight RoW debt securities than they are for equities while the Rest of World’s portfolio via the OOFcs is actually more tilted towards RoW bonds than it is towards Euro Area bonds. Looking at the massive difference between the EA and RoW indirect portfolio once again makes clear the important error one would make by trying to adjust for Luxembourg and Irish fund shares by proportionally reallocating them rather than on the basis of the match between investors and funds.²¹

Figures 5 and 6 provided evidence that one major characteristic in which the unadjusted Euro Area

²⁰The regressions using our estimates for Euro Area countries’ total portfolio take the analogous form:

$$\omega_{j,c}^a = \alpha^a + m_c^a \sum_{k \in \mathcal{K}} \beta_k^a \mathbf{1}_{c,k} + \varepsilon_{j,c}^a,$$

where $\omega_{j,c}^a = \frac{x_{j,c}}{\sum_{c' \in \mathcal{C}_a} x_{j,c'}}$ defined for $c \in \mathcal{C}_a$, is the share of the total portfolio of country j in asset class a (inclusive of both direct and indirect holdings) that is invested in security c .

²¹There is no guarantee that each regression will have some betas above one and some below, since the constant in the regression also impacts predicted shares. For the RoW, both coefficients are below one in panel B, since holdings have a low correlation with market weights.

Table 4: Quantifying home bias across portfolios

(a) Equity investments

	EA Direct	EA Indirect	EA Total	RoW Indirect
$\hat{\beta}_{\text{RoW}}$	0.33*** (0.09)	0.74*** (0.06)	0.40*** (0.08)	0.79*** (0.14)
$\hat{\beta}_{\text{REA}}$	1.69*** (0.14)	2.17*** (0.12)	1.78*** (0.13)	1.24*** (0.26)
$\hat{\beta}_{\text{Home}}$	25.63*** (2.48)	3.36*** (0.27)	23.10*** (2.52)	
Obs.	522,002	522,002	522,002	30,706
R^2	0.62	0.66	0.66	0.66

(b) Bond investments

	EA Direct	EA Indirect	EA Total	RoW Indirect
$\hat{\beta}_{\text{RoW}}$	0.09*** (0.01)	0.21*** (0.02)	0.10*** (0.01)	0.61** (0.24)
$\hat{\beta}_{\text{REA}}$	1.50*** (0.22)	1.56*** (0.08)	1.50*** (0.20)	0.52*** (0.04)
$\hat{\beta}_{\text{Home}}$	13.52*** (2.71)	2.52*** (0.48)	12.83*** (2.47)	
Obs.	8,138,410	8,138,410	8,138,410	478,730
R^2	0.39	0.21	0.40	0.09

Notes: We present the estimates from the regression specification in equation (8), which quantifies the tilt corresponding to the geography of securities in various portfolios. Panel A considers equity portfolios, while panel B considers bond portfolios. The columns “EA Direct” estimate the specification for the direct holdings of EA investors. The columns “EA Indirect” correspond to the indirect holdings of EA investors via Luxembourg and Ireland funds. The columns “EA Total” correspond to the total holdings of EA investors, summing over the previous two components. The columns “RoW Indirect” correspond to the holdings of RoW investors via Luxembourg and Ireland funds. All estimates use the 2020 cross-section of the data. The observations for the first three columns are 17 times those of the final column since we pool observations from each of 17 Euro Area countries.

Table 5: Quantifying home currency bias across portfolios

(a) Total bond investments

	EA Direct	EA Indirect	EA Total	RoW Indirect
$\hat{\beta}_{\text{EUR}}$	3.79*** (1.08)	1.77*** (0.13)	3.64*** (1.00)	0.52*** (0.05)
$\hat{\beta}_{\text{Non-EUR}}$	0.08*** (0.01)	0.20*** (0.02)	0.09*** (0.01)	0.61** (0.24)
Obs.	8,138,410	8,138,410	8,138,410	478,730
R^2	0.16	0.21	0.16	0.09

(b) Corporate bond investments, with firm fixed effects

	EA Direct	EA Indirect	EA Total	RoW Indirect
$\hat{\beta}_{\text{EUR}}$	2.98*** (0.76)	1.80*** (0.47)	2.90*** (0.73)	0.63*** (0.17)
$\hat{\beta}_{\text{Non-EUR}}$	0.13* (0.07)	0.39*** (0.09)	0.15** (0.07)	0.68*** (0.22)
Obs.	2,789,734	2,789,734	2,789,734	157,391
R^2	0.06	0.17	0.07	0.34
Firm FE	Yes	Yes	Yes	Yes

Notes: We present the estimates from the regression specification in equations (9) and (10), which quantify the tilt attached to the currency of denomination of securities in various portfolios. Panel A considers total bond portfolios (including all types of bonds), while panel B restricts attention to corporate bonds and adds firm fixed effects at the ultimate corporate parent level. The columns “EA Direct” estimate the specification for the direct holdings of EA investors. The columns “EA Indirect” correspond to the indirect holdings of EA investors via Luxembourg and Ireland funds. The columns “EA Total” correspond to the total holdings of EA investors, summing over the previous two components. The columns “RoW Indirect” correspond to the holdings of RoW investors via Luxembourg and Ireland funds. All estimates use the 2020 cross-section of the data. The observations for the first three columns are 17 times those of the final column since we pool observations from each of 17 Euro Area countries (exactly in panel A, and approximately in panel B due to the fixed effects).

statistics are potentially misleading is the currency of denomination of the securities held by investors. In particular, the difference between the currency composition of the assets purchased by Euro Area investors and Rest of World investors via Luxembourg and Ireland funds is quite striking. This does, however, raise the question of whether this difference is actually driven by the currency of denomination of the assets, or whether there is a compositional difference between the types of firms and governments that EA and RoW investors choose to lend to (i.e., a selection bias). We first estimate a regression in which the only characteristic included is the currency of denomination of a bond:

$$\omega_{j,c}^{a,f} = \alpha^{a,f} + \beta_{\text{EUR}}^{a,f} \mathbf{1}_{c,\text{EUR}} \times m_c^a + \beta_{\text{Non-EUR}}^{a,f} \mathbf{1}_{c,\text{Non-EUR}} \times m_c^a + \varepsilon_{j,c}^{a,f}, \quad (9)$$

where the dummy $\mathbf{1}_{c,\text{EUR}}$ indicates whether security c is denominated in euros or not, and correspondingly $\mathbf{1}_{c,\text{Non-EUR}}$ indicates whether security c is denominated in a non-euro currency or not.

The results from this specification are reported in panel A of Table 5. We find that EA investors are 3.8 times overweight euro-denominated bonds when investing directly, and 1.8 times overweight when investing via Luxembourg and Ireland. This stands in stark contrast with the behavior of RoW investors when investing in bonds via the OOFIC funds: in the final column, we find the coefficients on euro and non-euro denominated bonds are not statistically different from each other. However, it could be possible that these results are driven by compositional differences rather than the currency of denomination. To rule out such compositional differences, we extend the previous regression specification to include issuer-level fixed effects at the ultimate parent entity level, and correspondingly we restrict the set of bonds in the sample to be corporate bonds:

$$\omega_{j,c}^{a,f} = \gamma_{k(c)}^{a,f} + \beta_{\text{EUR}}^{a,f} \mathbf{1}_{c,\text{EUR}} \times m_c^a + \beta_{\text{Non-EUR}}^{a,f} \mathbf{1}_{c,\text{Non-EUR}} \times m_c^a + \varepsilon_{j,c}^{a,f}, \quad (10)$$

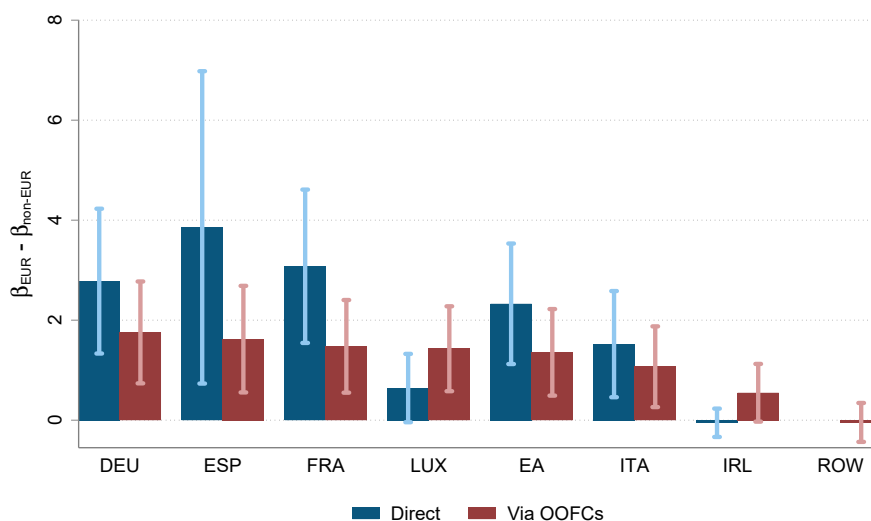
where $\gamma_{k(c)}^{a,f}$ is an ultimate parent fixed effect, indicating that security c was issued by firm k or one of firm k 's subsidiaries. With firm fixed effects, the partial effect of the currency of denomination on the issuing share is identified only from multi-currency issuers, as in [Maggiori et al. \(2020\)](#).

Panel B of Table 5 reports the estimates including the parent entity fixed effects and shows that, while the coefficient on euro-denominated bonds for EA investors is smaller, the heterogeneity between the investment patterns of EA and RoW investors is present even in this specification. This suggests that the portfolio differences between EA investors and RoW investors are in fact driven by the currency of denomination of the bonds, rather than by compositional differences.²²

Figure 8 reports the difference between the euro bias coefficients $\hat{\beta}_{\text{EUR}}$ and $\hat{\beta}_{\text{Non-EUR}}$ estimated in the direct and indirect portfolios of individual EA countries and for the EA as a whole. This allows us

²²One important advantage of our security-level aggregation discussed in Section 2.3 is that it makes it possible to include these firm fixed effects at the ultimate parent level. Prior to our aggregation procedure, the SHS data was at the security level with no firm identifiers, hence an auxiliary benefit of our residency-to-nationality aggregation is that it introduces a firm identifier for the entire corporate group.

Figure 8: Country heterogeneity in home currency bias



Notes: This figure plots the difference between the coefficients $\hat{\beta}_{\text{EUR}}$ and $\hat{\beta}_{\text{non-EUR}}$ from regression specification (10), in the direct and indirect portfolios of individual EA countries as well as the EA as a whole. The error bars correspond to 95% confidence intervals. All estimates use the 2020 cross-section of the data.

to examine heterogeneity in our results across investor countries. We find that for the major Euro Area economies of Spain, France, Germany, and Italy, home currency bias is consistently much stronger in direct holdings relative to the indirect portfolio, mirroring the result for the Euro Area as a whole. By contrast, there is little difference between home bias in the direct and indirect holdings of Luxembourg and Ireland themselves.²³ In the next section, we move beyond these cross-sectional patterns and show how these results affect the dynamics of European financial integration in the time series.

5 Reassessing Aggregate Home Bias in the Euro Area

We now use our new methodology and estimates to assess the evolution of home bias—a canonical way to measure financial integration and an important moment in international macro-finance models—following the introduction of the euro.

5.1 Equity Home Bias Revisited

Definitions and methodology. Home bias measures the extent to which investors hold domestic securities in excess of these securities' share of world market capitalization. As first documented by French and Poterba (1991) in the context of equity markets, it constitutes a very prominent feature of global portfolios. The most common measure of home bias adopted in the literature (see Coeurdacier and Rey 2013 for a literature review) compares the share of a country's holdings that is invested in foreign

²³Non-EA investment via Luxembourg and Ireland funds therefore leads to an underestimate of the degree of European home currency bias in mutual funds as discussed in Maggiori et al. (2020).

securities to a world market weight benchmark. For equity portfolios, this *equity home bias index* is defined as

$$\text{EHB}_{j,t} = 1 - \frac{\omega_{j,-j,t}^E}{m_{-j,t}^E}, \quad (11)$$

where $\omega_{j,-j,t}^E$ is the share of country j 's equity portfolio invested in foreign securities, and $m_{-j,t}^E$ is the market weight of all equity securities worldwide except those issued by country j firms. If $\text{EHB}_{j,t} = 0$, country j has no equity home bias as it holds exactly the market weight. If $\text{EHB}_{j,t} = 1$, then home bias is complete as the country does not hold any foreign equities. We compute the average degree of equity home bias for the Euro Area (asset-weighted) as:

$$\text{EHB}_{\text{EA},t} = \sum_{j \in \mathcal{J}_{\text{EA}}} s_{j,t}^E \text{EHB}_{j,t}, \quad s_{j,t}^E = \frac{x_{j,t}^E}{\sum_{j' \in \mathcal{J}_{\text{EA}}} x_{j',t}^E}, \quad (12)$$

where $s_{j,t}^E$ are weights given by the share of a country j 's equity holdings ($x_{j,t}^E$) in the total equity holdings of the Euro Area.

While an estimate of $m_{-j,t}^E$ can be built from information on the amounts outstanding of equity securities by country of issuer, measuring the portfolio shares $\omega_{j,-j,t}^E$ requires an assessment of various components of each country's portfolio holdings. In particular, to construct equity home bias measures for Euro Area countries, the literature has had to form an estimate of the indirect component of the portfolio holdings of each individual EA member country—that is, of the portfolio component 2 in the decomposition of Section 4.1. In practice, the standard method for doing this has been to assume that all holdings of foreign fund shares (the vast majority of which are holdings in Luxembourg and Ireland fund shares) represent claims on foreign equities.

This assumption, although common in both research and practice, introduces several issues. First, holdings of fund shares also include claims on domestic equity securities: for instance, if Italian investors hold stocks in Italian firms through Luxembourg funds, these would erroneously be accounted for as positions in foreign equity markets. Second, holdings of fund shares also include claims on assets that are not equities in the first place, including bonds, cash, and other non-equity asset classes. Our methodology corrects for both of these issues, which impacts the estimates of home bias for all Euro Area countries.

When estimating home bias under these standard assumptions, prior to our adjustments, the overall equity portfolio size $x_{j,t}^E$ (which pins down the weight $s_{j,t}^E$ in the weighted index $\text{EHB}_{\text{EA},t}$) and the foreign equity share $\omega_{j,-j,t}^E$ for each country j is given by:

$$\begin{aligned} \text{Standard (non-adjusted)} \\ \text{estimates, all } j: \end{aligned} \quad \begin{cases} x_{j,t}^E = x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{F,\text{Direct}} + x_{j,j,t}^{E,\text{Direct}}, \\ \omega_{j,-j,t}^E = \frac{x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{F,\text{Direct}}}{x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{F,\text{Direct}} + x_{j,j,t}^{E,\text{Direct}}}, \end{cases} \quad (13)$$

where $x_{j,-j,t}^{E,Direct}$ corresponds to the country's direct holdings of foreign equities, $x_{j,-j,t}^{F,Direct}$ to their direct holdings of foreign fund shares, and $x_{j,j,t}^{E,Direct}$ to their direct holdings of domestic equities. While these positions can all be directly observed for the most recent years in the SHS data, this micro data sample only starts in 2014. Therefore, to adopt a consistent methodology throughout the sample period—going back to the mid-1990s, prior to the introduction of the euro—and for comparability with the equity home-bias literature, we estimate these positions from countries' multilateral international investment positions (IIP) accounts and data on securities' amounts outstanding.²⁴ We measure direct holdings of foreign equities and foreign fund shares using each country's foreign common equity and foreign fund share assets in the official IIP accounts:

$$x_{j,-j,t}^{E,Direct} = \text{IIP Common Equity Assets}_{j,t}, \quad x_{j,-j,t}^{F,Direct} = \text{IIP Fund Share Assets}_{j,t}. \quad (14)$$

Holdings of domestic equities are then estimated as the difference between country j 's total equities outstanding and IIP common equity liabilities:

$$x_{j,j,t}^{E,Direct} = \text{Equities Outstanding}_{j,t} - \text{IIP Common Equity Liabilities}_{j,t}. \quad (15)$$

We obtain data on equity outstanding amounts by aggregating the issuance micro data to the country-year level, as detailed in Appendix Section C. We also use these issuance series to compute the market portfolio shares $m_{-j,t}^E$.²⁵

Our adjustments to portfolio component 2, which account for the presence of claims on domestic equities and non-equity assets in foreign fund holdings, result in the following corrected equity portfolio holdings terms and corresponding foreign portfolio shares for EA countries other than Luxembourg and

²⁴This was standard practice before the advent of more granular micro data and is still the benchmark when using historical data. For the recent sample from 2014 onwards, the positions estimated with the IIP methodology align well with those directly measured in the SHS data (see Appendix Section C).

²⁵The IIP accounts of EA countries are provided by the ECB and in the earliest years of the sample they do not separate common equities and fund shares. The modal year in which the split between common equity and fund shares becomes available is 1999, although this varies by country, and hence we do not provide adjusted series prior to 1999. The split on the asset side of the IIP is not required for the non-adjusted home bias estimates, since only the sum of common equity and fund share assets enters the relevant expressions. The split on the liabilities side is relevant as it is required to compute $x_{j,j,t}^{E,Direct}$, however the fraction of each country's IIP equity liabilities that is in common equities is generally very stable over time (see Appendix Figure A.X), so that we can estimate the components separately in the early years by assuming that this fraction also displays no trend prior to the inception of each country's separate reporting. We take the same approach to estimate the common equity and fund share components of IIP equity assets for those EA countries for which these are only available later than 1999, notably Luxembourg and Ireland themselves: as shown in Appendix Figure A.XI, this is reasonable since the fraction of these countries' IIP equity assets that is in common equities is also stable over time. Figure 10 also provides results showing robustness of our adjusted estimates to excluding Luxembourg and Ireland.

Ireland themselves:

$$\text{Fully adjusted estimates, } \begin{cases} x_{j,t}^E = x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{E,\text{Indirect}} + x_{j,j,t}^{E,\text{Indirect}} + x_{j,j,t}^{E,\text{Direct}}, \\ \omega_{j,-j,t}^E = \frac{x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{E,\text{Indirect}}}{x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{E,\text{Indirect}} + x_{j,j,t}^{E,\text{Indirect}} + x_{j,j,t}^{E,\text{Direct}}}, \end{cases} \quad j \neq \text{LUX, IRL:} \quad (16)$$

where $x_{j,-j,t}^{E,\text{Indirect}}$ and $x_{j,j,t}^{E,\text{Indirect}}$ correspond, respectively, to indirect equity holdings through OOFI funds of foreign and domestic equity securities. Compared to the standard methodology in equation (13), this approach replaces the foreign fund shares holdings term in the numerator ($x_{j,-j,t}^{F,\text{Direct}}$) with its sub-component comprising only claims on foreign equities. It also replaces the same term in the denominator with the sub-components reflecting claims on any equity assets, thus subtracting any indirect non-equity positions.²⁶

The key assumption that we make to estimate the indirect holdings historically is that for each country, the share of the fund share holdings $x_{j,-j,t}^{F,\text{Direct}}$ that is invested in domestic and non-domestic equities is constant over time. We denote these shares $\phi_{j,j,t}^E$ and $\phi_{j,-j,t}^E$, respectively, and we estimate the indirect positions as

$$x_{j,-j,t}^{E,\text{Indirect}} = \phi_{j,-j,t}^E \cdot x_{j,-j,t}^{F,\text{Direct}}, \quad x_{j,j,t}^{E,\text{Indirect}} = \phi_{j,j,t}^E \cdot x_{j,-j,t}^{F,\text{Direct}}, \quad (17)$$

We can directly measure the shares $\phi_{j,-j,t}^E$ and $\phi_{j,j,t}^E$ using our unwinding of the SHS micro data starting in 2014, and these empirical estimates are shown in Appendix Figure A.VIII, alongside the fractions of fund holdings that are invested in other asset classes (e.g., domestic and foreign bonds, which are used later in the analysis). Prior to 2014, we cannot use the micro data to measure the shares $\phi_{j,-j,t}^E$ and $\phi_{j,j,t}^E$, and hence we estimate them by back-filling with the average value estimated over the 2014-2020 period. This approach naturally would generate a bias in our estimates if the shares exhibited a time trend: however, as seen in Appendix Figure A.VIII, the shares are flat over time in the periods in which we directly observe them, which supports our assumption.

For Luxembourg and Ireland, our adjustment additionally needs to remove the holdings that are actually attributed to foreign investors—both investors in the rest of the Euro Area and RoW investors (the latter constituting portfolio component 3 in the decomposition of Section 4.1). We let $\gamma_{j,t}^{\text{Domestic}}$ be the fraction of the overall assets of investment funds domiciled in country $j = \text{LUX, IRL}$ that are owned by domestic investors: these shares can be measured directly in the SHS micro data and are shown in Appendix Figure A.IX; they exhibit little variation over time and are very small in magnitude, being consistently lower than 3% for both Luxembourg and Ireland. The adjusted estimates for the magnitude

²⁶The positions $x_{j,-j,t}^{F,\text{Direct}}$ measure multilateral foreign fund share holdings, however for Euro Area countries these constitute primarily claims on Luxembourg and Ireland, as discussed in Appendix Section C.

and composition of these countries' equities portfolios are then:

$$\text{Fully adjusted estimates, } \begin{cases} x_{j,t}^E = \left[x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{E,\text{Indirect}} + x_{j,j,t}^{E,\text{Indirect}} \right] \gamma_{j,t}^{\text{Domestic}} + x_{j,j,t}^{E,\text{Direct}}, \\ \omega_{j,-j,t}^E = \frac{\left[x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{E,\text{Indirect}} \right] \gamma_{j,t}^{\text{Domestic}}}{\left[x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{E,\text{Indirect}} + x_{j,j,t}^{E,\text{Indirect}} \right] \gamma_{j,t}^{\text{Domestic}} + x_{j,j,t}^{E,\text{Direct}}}. \end{cases} \quad (18)$$

$j = \text{LUX, IRL:}$

The expressions above attribute to Luxembourg and Ireland only a fraction $\gamma_{j,t}^{\text{Domestic}}$ of the assets held by their respective fund sectors. The component $x_{j,j,t}^{E,\text{Direct}}$, representing claims on domestic equities by domestic investors, is not multiplied by the factor $\gamma_{j,t}^{\text{Domestic}}$ since we assume that only a negligible part of it constitutes positions held by domestic funds that are ultimately owned by foreign investors, consistent with the results of Section 4. Additionally, since the fraction $\gamma_{j,t}^{\text{Domestic}}$ cannot be directly measured prior to the inception of the SHS sample in 2014, we again back-fill it with the average values in the 2014-2020 sample. We emphasize that while the adjustments for Luxembourg and Ireland use these additional assumptions on the absence of a trend in $\gamma_{j,t}^{\text{Domestic}}$ and of foreign ownership in the $x_{j,j,t}^{E,\text{Direct}}$ component, our estimates of EA aggregate home bias are largely insensitive to them, as we discuss formally below (in the subsection titled “*Robustness*”). On net, these adjustments for Luxembourg and Ireland both increase their measured home bias by lowering the estimated $\omega_{j,-j,t}^E$ and sharply decrease their weight (proportional to $x_{j,t}^E$) since we now only count the assets that these countries hold on behalf of investors actually resident there—whereas in the baseline approach, these countries have a very large weight due to counting the assets held on behalf of foreign investors, and a correspondingly very low measured degree of home bias, which artificially lowers EA weighted average home bias.

Lastly, to separate the effects coming from the corrections to portfolio component 2 and the removal of portfolio component 3 (RoW holdings), it is also helpful to construct a set of partially adjusted estimates for the home bias and equity portfolio sizes of Luxembourg and Ireland which isolate the latter force. Letting $\gamma_{j,t}^{\text{RoW}}$ be the fraction of the assets of investment funds domiciled in country $j = \text{LUX, IRL}$ that are owned by RoW investors, the partially adjusted estimates are given by:

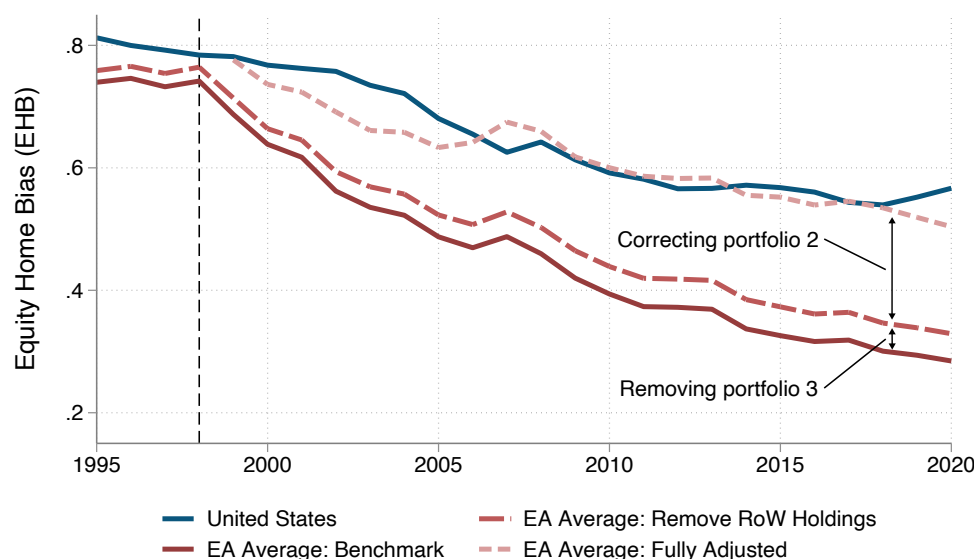
$$\text{Partially adjusted estimates, } \begin{cases} x_{j,t}^E = \left[x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{F,\text{Direct}} \right] (1 - \gamma_{j,t}^{\text{RoW}}) + x_{j,j,t}^{E,\text{Direct}}, \\ \omega_{j,-j,t}^E = \frac{\left[x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{F,\text{Direct}} \right] (1 - \gamma_{j,t}^{\text{RoW}})}{\left[x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{F,\text{Direct}} \right] (1 - \gamma_{j,t}^{\text{RoW}}) + x_{j,j,t}^{E,\text{Direct}}}. \end{cases} \quad (19)$$

$j = \text{LUX, IRL:}$

Hence, a version of the Euro Area equity home bias index $\text{EHB}_{\text{EA},t}$ that uses the adjustments in equation (19) for Luxembourg and Ireland, while keeping all other EA countries to their benchmark (non-adjusted) values as in equation (13), singles out the changes brought about by removing the component of the Luxembourg and Ireland portfolios that is in fact owned by non-EA residents.²⁷

²⁷We do not need to make assumptions on the share $\gamma_{j,t}^{\text{RoW}}$ for the early sample, since we are able to measure

Figure 9: The dynamics of equity home bias in the Euro Area



Notes: The red lines display the time series for average equity home bias for Euro Area countries, $EHB_{EA,t}$. The *solid red line* shows the baseline estimate without corrections, as in equation (13). The *long-dashed red line* adjusts for the presence of RoW investors' holdings in Luxembourg and Ireland funds, using the methodology in equation (19). The *short-dashed red line* additionally adjusts the indirect equity portfolios held by Euro Area investor countries, using the methodology in equations (16) and (18). The *solid blue line* shows equity home bias for the United States, for comparison.

Estimation results. The solid lines in Figure 9 show the picture that emerges when estimating equity home bias using the standard methodology, with foreign portfolio shares computed as in equation (13), and without adjusting for RoW investors' holdings in OOFIC funds. The solid red line displays $EHB_{EA,t}$, the average degree of home bias for Euro Area countries. The solid blue line displays equity home bias for the United States, estimated using an analogous IIP methodology, which serves as a simple visual benchmark and point of comparison. Home bias trended down in the United States over the past three decades, as it also did in many other developed economies, which followed a similar trend (see Appendix Figure A.VI for an average for non-EA developed economies).

The Euro Area, however, even in the context of this broad-based decline in home bias, displayed extraordinary dynamics, which have been often noted in the literature. After the introduction of the euro, Euro Area home bias falls exceptionally rapidly: while it started at levels comparable to those of the United States around 1995, a widening gap grows rapidly starting in the late 1990s, which constitutes an excess decline in home bias for the Euro Area. Standard calculations point to a remarkable change in financial integration in the Euro Area once the currency union was in place. As discussed in Appendix Section C, the bulk of this apparent excess decline in home bias—for equity markets and bond markets

it throughout the entire sample period using new administrative data from the Central Bank of Ireland and the Commission de Surveillance du Secteur Financier (CSSF), which we introduce and describe in detail in Section 6. We cannot use this same administrative data to estimate the domestically owned share $\gamma_{j,t}^{\text{Domestic}}$ since, unlike SHS, it does not allow us to look through the component of the domestic holdings of fund shares by Luxembourg and Ireland that are held custodially on behalf of residents in other Euro Area countries: this and related points are discussed in Section 6.

alike—occurs because of increasing measured integration within the Euro Area, rather than vis-à-vis the rest of the world.

The dashed lines in Figure 9 implement our adjustments, which we do in progressive steps to highlight the relative quantitative importance of the various corrections. The long-dashed red line adjusts the series by only removing portfolio component 3—i.e., the holdings of RoW investors that are otherwise spuriously accounted for as belonging to Luxembourg and Ireland. This follows the partial adjustment methodology given in equation (19). Most prominently, this reduces the weight attached to Luxembourg and Ireland in the weighted average $\text{EHB}_{\text{EA},t}$ by reducing the size of their portfolios. While this adjustment increases home bias, it is quantitatively small compared to our adjustment to portfolio component 2. Incorporating the additional adjustment from restating portfolio component 2, such that portfolio shares are now calculated according to equations (16) and (18), leads to the gap between the long-dashed and short-dashed red lines, so that the latter line represents our estimate of EA home bias net of all corrections.

It is evident that the adjustment to portfolio component 2 is quantitatively the most important, increasing the equity home bias index by roughly 20 percentage points by the end of the sample. The bulk of this adjustment comes from accounting for the presence of non-equity assets, and a smaller component from domestic equities: this occurs because, on average across EA countries, for each euro invested in fund shares, 61 cents constitute claims on non-equities, and 3 cents constitute claims on domestic equities (as shown in Appendix Figure A.VIII). Once all adjustments are accounted for, Euro Area home bias is not exceptionally different from other developed countries like the United States in its trend. These results, therefore, do not support the notion that the Euro Area experienced an excess decline in equity home bias after the introduction of the euro.²⁸ Rather, the presumed decline in equity home bias is an artifact of the consolidation and growth of the Euro Area mutual fund industry in Luxembourg and Ireland.

Robustness. The magnitude of our adjustment to the Euro Area’s equity home bias is robust to the key assumptions that we make, which we assess in several ways. First, part of each country’s fund share holdings constitute claims on assets that do not have an ISIN code, which we refer to as unidentified assets.²⁹ Most of these unidentified positions constitute claims on cash instruments. Nonetheless, a more conservative approach is to assume that these unidentified assets have the same composition (in terms of being claims on foreign equities, domestic equities, or non-equity assets) as the identified ones. This amounts to using a different set of foreign and domestic equity shares in the estimating equations (17),

²⁸In Appendix Table A.X, we explore these home bias results in our analytical regression framework. We mirror the standard calculation of home bias and include foreign fund shares in the calculation of equity holdings. Because we do not have the market weight of all global funds, this regression is run at the aggregate country-pair level rather than the country-security level. We find that home bias estimated in this way is biased down from the results in Table 4a.

²⁹These unidentified assets also additionally include a small number of securities that have an ISIN but no identifiable asset class when using the classification algorithm outlined in Appendix Section B.2.

$\tilde{\phi}_{j,-j,t}^{E,\text{Gross-Up}}$ and $\tilde{\phi}_{j,j,t}^{E,\text{Gross-Up}}$, which gross up the composition of the identified holdings by the amount of unidentified securities:

$$\tilde{\phi}_{j,-j,t}^{E,\text{Gross-Up}} = \frac{\phi_{j,-j,t}^E}{1 - \phi_{j,t}^U}, \quad \tilde{\phi}_{j,j,t}^{E,\text{Gross-Up}} = \frac{\phi_{j,j,t}^E}{1 - \phi_{j,t}^U}, \quad (20)$$

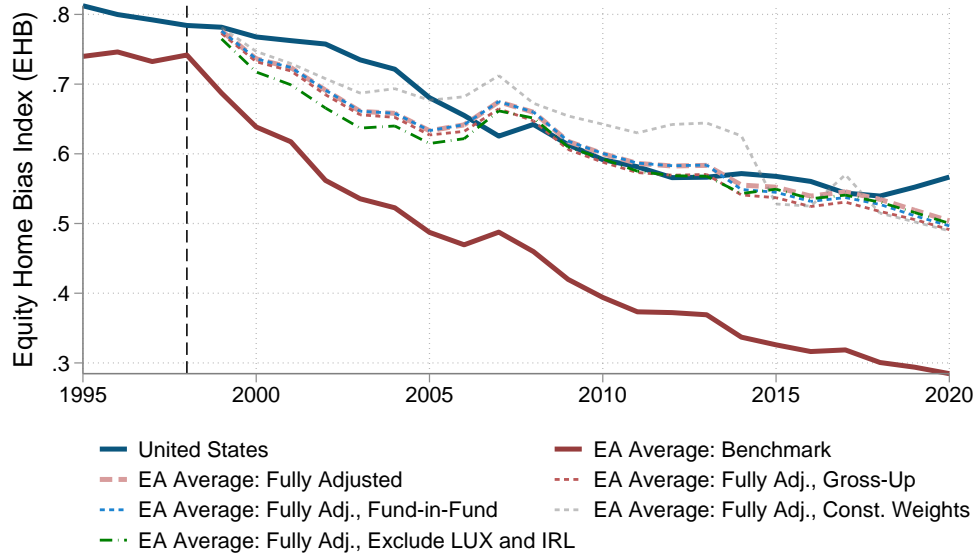
where $\phi_{j,t}^U$ is the share of country j 's foreign fund share holdings that constitute claims on unidentified assets. Estimates using these grossed-up shares are shown in the short-dashed red line in Figure 10.

Second, part of the fund holdings constitutes claims on other fund shares. We can account for this by assuming that the holdings of these “second-level” funds have the same composition as that of the first-level funds, and so on iteratively, leading to the following adjusted shares of assets invested in foreign and domestic equities:

$$\tilde{\phi}_{j,-j,t}^{E,\text{Fund-in-Fund}} = \sum_{s=0}^{\infty} \phi_{j,-j,t}^E (\phi_{j,t}^F)^s = \frac{\phi_{j,-j,t}^E}{1 - \phi_{j,t}^F}, \quad \tilde{\phi}_{j,j,t}^{E,\text{Fund-in-Fund}} = \sum_{s=0}^{\infty} \phi_{j,j,t}^E (\phi_{j,t}^F)^s = \frac{\phi_{j,j,t}^E}{1 - \phi_{j,t}^F}, \quad (21)$$

where $\phi_{j,t}^F$ is the share of country j 's foreign fund share holdings that constitute claims on other fund shares. The short-dashed blue line in Figure 10 shows estimates using these corrected shares.

Figure 10: **Equity home bias in the Euro Area: robustness of estimates**



Notes: This figure provides alternative estimates of the adjusted Euro Area equity home bias, $\text{EHB}_{\text{EA},t}$. The line labeled “EA Average: Fully Adjusted” shows our benchmark fully-adjusted estimate, as in Figure 9. The line labeled “Gross-Up” grosses up the share of fund claims that are in foreign and domestic equities by the amount of fund holdings that are in securities with no ISIN identifiers or identifiable asset class, as in equation (20). The line labeled “Fund-in-Fund” accounts for fund holdings that are claims on other fund shares, as in equation (21). The line labeled “Const. Weights” constructs the index $\text{EHB}_{\text{EA},t}$ using each country’s fully adjusted home bias series $\text{EHB}_{j,t}$ while keeping their weights $s_{j,t}^E$ in the index to their pre-adjustment values. The line labeled “Exclude LUX and IRL” excludes Luxembourg and Ireland, averaging only over the set of other Euro Area countries. The solid lines show the unadjusted series for the Euro Area and the United States, for comparison.

Third, if the changes to the overall Euro Area equity home bias $\text{EHB}_{\text{EA},t}$ were driven by our adjustments to the weight terms $s_{j,t}^E$ rather than the home bias of each country $\text{EHB}_{j,t}$, that would make the interpretation of our results more nuanced. We show that this is not the case by providing a version of our estimates that uses the fully-adjusted home bias series $\text{EHB}_{j,t}$ for each country j (as given by the terms $\omega_{j,-j,t}^E$ in equations 16 and 18), but keeps the weights $s_{j,t}^E$ to their standard non-adjusted values (as given by the terms $x_{j,t}^E$ in equation 13). This *constant-weights* version of our estimates is shown in the short-dashed gray line of Figure 10.

Lastly, we show that our results are not driven by the additional assumptions used in equation (18) to provide adjustments for Luxembourg and Ireland themselves (such as the absence of a trend in the parameter $\gamma_{j,t}^{\text{Domestic}}$). To do this, we construct a version of our fully-adjusted aggregate home bias index $\text{EHB}_{\text{EA},t}$ that entirely excludes Luxembourg and Ireland, averaging only over the set of other Euro Area countries: this is shown in the dot-dashed green line in Figure 10. In all these various cases, the alternative estimates are qualitatively and quantitatively consistent with the baseline fully-adjusted ones.

5.2 Bond Home Bias Revisited

Definitions and methodology. We next apply the same methodology to reassess Euro Area home bias in bond markets. We define the *bond home bias index* analogously:

$$\text{BHB}_{j,t} = 1 - \frac{\omega_{j,-j,t}^B}{m_{-j,t}^B}, \quad \text{BHB}_{\text{EA},t} = \sum_{j \in \mathcal{J}_{\text{EA}}} s_{j,t}^B \text{BHB}_{j,t}, \quad s_{j,t}^B = \frac{x_{j,t}^B}{\sum_{j' \in \mathcal{J}_{\text{EA}}} x_{j',t}^B}, \quad (22)$$

where all the relevant quantities are defined analogously as in Section 5.1, but in the context of countries' bond portfolios. Prior to any corrections, the total bond portfolio holdings $x_{j,t}^B$ and the foreign bonds portfolio share $\omega_{j,-j,t}^B$ for each country j are given by:

$$x_{j,t}^B = x_{j,-j,t}^{B,\text{Direct}} + x_{j,j,t}^{B,\text{Direct}}, \quad \omega_{j,-j,t}^B = \frac{x_{j,-j,t}^{B,\text{Direct}}}{x_{j,-j,t}^{B,\text{Direct}} + x_{j,j,t}^{B,\text{Direct}}}, \quad (23)$$

which only accounts for countries' direct holdings of domestic and foreign bonds. Relative to the baseline expression for equity markets (equation 13), there are no terms corresponding to holdings of foreign fund shares here because these are treated as claims on foreign equities (and not foreign bonds) in the standard approach.

Our adjustments imply different foreign portfolio shares and total bond portfolio holdings for EA

countries other than Luxembourg and Ireland, now given by:

$$\text{Fully adjusted estimates, } j \neq \text{LUX, IRL:} \quad \begin{cases} x_{j,t}^B = x_{j,-j,t}^{B,\text{Direct}} + x_{j,-j,t}^{B,\text{Indirect}} + x_{j,j,t}^{B,\text{Indirect}} + x_{j,j,t}^{B,\text{Direct}}, \\ \omega_{j,-j,t}^B = \frac{x_{j,-j,t}^{B,\text{Direct}} + x_{j,-j,t}^{B,\text{Indirect}}}{x_{j,-j,t}^{B,\text{Direct}} + x_{j,-j,t}^{B,\text{Indirect}} + x_{j,j,t}^{B,\text{Indirect}} + x_{j,j,t}^{B,\text{Direct}}}, \end{cases} \quad (24)$$

which accounts for indirect holdings of domestic and foreign bonds via foreign-domiciled funds. Correspondingly, the adjustments for Luxembourg and Ireland are:

$$\text{Fully adjusted estimates, } j = \text{LUX, IRL:} \quad \begin{cases} x_{j,t}^B = \left[x_{j,-j,t}^{B,\text{Direct}} + x_{j,-j,t}^{B,\text{Indirect}} + x_{j,j,t}^{B,\text{Indirect}} \right] \gamma_{j,t}^{\text{Domestic}} + x_{j,j,t}^{B,\text{Direct}}, \\ \omega_{j,-j,t}^B = \frac{\left[x_{j,-j,t}^{B,\text{Direct}} + x_{j,-j,t}^{B,\text{Indirect}} \right] \gamma_{j,t}^{\text{Domestic}}}{\left[x_{j,-j,t}^{B,\text{Direct}} + x_{j,-j,t}^{B,\text{Indirect}} + x_{j,j,t}^{B,\text{Indirect}} \right] \gamma_{j,t}^{\text{Domestic}} + x_{j,j,t}^{B,\text{Direct}}}. \end{cases} \quad (25)$$

As in the previous subsection on equities, we follow the literature in using an IIP-based methodology to estimate the direct positions in a consistent manner over time. We measure direct holdings of foreign bonds using each country's multilateral IIP portfolio debt asset claims, and we estimate direct holdings of domestic bonds by subtracting IIP bond liabilities from the overall stock of bonds outstanding:

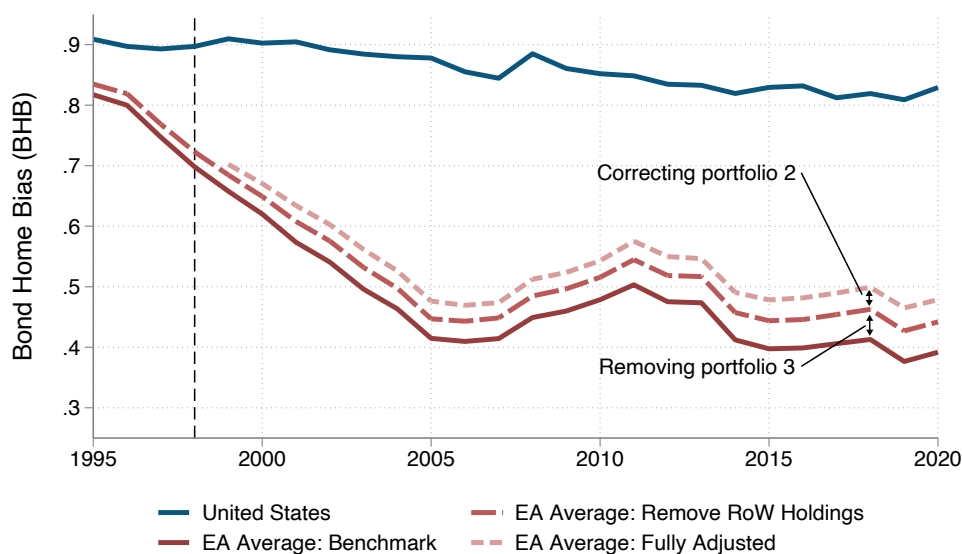
$$x_{j,-j,t}^{B,\text{Direct}} = \text{IIP Bond Assets}_{j,t}, \quad x_{j,j,t}^{B,\text{Direct}} = \text{Bonds Outstanding}_{j,t} - \text{IIP Bond Liabilities}_{j,t}. \quad (26)$$

We obtain data on bond amounts outstanding from the Bank of International Settlements (BIS) debt securities statistics, which we supplement with debt securities data from the IMF and national statistical sources (see Appendix Section C for details). We use the same data to compute market capitalization weights $m_{-j,t}^B$. Like for equities, we estimate indirect positions by measuring (with our unwind procedure) the shares of foreign fund share investments that are claims on domestic and foreign bonds ($\phi_{j,j,t}^B$ and $\phi_{j,-j,t}^B$, respectively). We then back-fill the estimates prior to 2014 using the average values for the 2014-2020 period. We thus obtain estimates given by:

$$x_{j,-j,t}^{B,\text{Indirect}} = \phi_{j,-j,t}^B \cdot x_{j,-j,t}^{F,\text{Direct}}, \quad x_{j,j,t}^{B,\text{Indirect}} = \phi_{j,j,t}^B \cdot x_{j,-j,t}^{F,\text{Direct}}. \quad (27)$$

Estimation results. Figure 11 shows our results for bond home bias. The solid blue line plots home bias for the United States for comparison (other non-EA developed economies followed a similar trend, as shown in Appendix Figure A.VII). The solid red line shows average Euro Area bond home bias, $\text{BHB}_{\text{EA},t}$, before our adjustments. The short-dashed red line shows $\text{BHB}_{\text{EA},t}$ after removing RoW investors' holdings in Luxembourg and Ireland (using a methodology analogous to that in equation 19), while the long-dashed red line additionally incorporates our correction to EA countries' indirect holdings.

Figure 11: The dynamics of bond home bias in the Euro Area



Notes: The red lines display the time series for average bond home bias for Euro Area countries, $BHB_{EA,t}$. The *solid red line* shows the baseline estimate without corrections, the *short-dashed red line* adjusts for the presence of RoW investors' holdings in Luxembourg and Ireland funds, and the *long-dashed red line* additionally adjusts the indirect equity portfolios held by Euro Area investor countries. The *solid blue line* shows bond home bias for the United States, for comparison.

Like in the equities case, the estimates without any corrections are too low: in reality, bond home bias is higher than one would have ascertained without accounting for the role of the OOFs. The removal of RoW holdings (portfolio component 3) naturally leads to an increase in measured EA home bias since these are highly globally diversified, as discussed in Section 4. More subtly, the adjustment to EA countries' indirect holdings (portfolio component 2) also leads to an increase in aggregate EA bond home bias—despite the fact that, from the perspective of each individual EA country other than Luxembourg and Ireland, indirect holdings are more diversified than direct ones. This occurs because of the offsetting effect coming from the adjustments to Luxembourg and Ireland themselves: each euro in the EA countries' indirect portfolios is measured as having higher home bias on average when attributed to Luxembourg and Ireland as compared to when it is correctly reassigned to the ultimate investors.

Unlike for equities, however, the upwards adjustments to the home bias series are not in this case quantitatively large enough to change the qualitative conclusion that the Euro Area experienced a rapid excess decline in bond home bias—relative to other developed countries like the United States—following the introduction of the common currency. For bond markets, the standard methodology is closer to truth since the external fund share assets ($x_{j,-j,t}^{F,Direct}$) do not enter the numerator of the foreign portfolio share $\omega_{j,-j,t}^B$: in contrast, the assumption that these are all claims on foreign equities generates an especially large distortion for equity home bias. While bond home bias for the United States declined from 90% to roughly 80% between 1995 and 2020, a 10 percentage point fall, Euro Area countries experienced a much larger decline which unadjusted data would place at 40 percentage points, but in reality is closer to 30

percentage points.

In Appendix Section C, we decompose the measured fall in home bias into integration of the EA countries with each other (“intra-EA”) or with the rest of the world (“extra-EA”). We demonstrate that for both equities and bonds, the measured drop in home bias comes from a rise in EA integration, with the rise in measured intra-EA equity market integration being an artefact of the OOFc activities as discussed above.

5.3 Interpreting the Facts

The facts about Euro Area home bias documented here have important implications for theories of financial integration and currency unions. Prior to our adjustments, the data would have been consistent with models whereby introducing a common currency led to a marked increase in cross-border financial integration in both equity and bond markets within the Euro Area (but not vis-à-vis the rest of the world, as established in Section C). For instance, it might have been reasonable to theorize that both bond home bias and equity home bias ultimately come down to currency risk, given the exceptional dynamics demonstrated by both once the euro was in place. Or alternatively, one might have hypothesized that factors introduced concurrently with the common currency—for instance, regulatory harmonization across EA countries—might have been responsible for spurring integration across these different markets.

Once we account for the role of the OOFcs, however, these explanations become less satisfactory. The asymmetry that we uncover across asset classes suggests that it is crucial to adopt models which can generate the newly observed heterogeneity between equity markets and bond markets. This rules out certain classes of explanations, such as those described above, and points towards different models which can make sense of the data. Prominently, a class of theories which can generate the requisite heterogeneity is that in which bond investors have a strong *home currency bias* (Maggiori et al. 2020), whether because of preference primitives or because of frictions, while at the same time international investment in equities is less affected by the currency of denomination of the assets, as equities are primarily claims to real (rather than nominal) cash flow streams. In these models, a common currency (rather than a peg or low volatility of floating exchange rates) is therefore necessary to induce investors to purchase foreign bonds in large quantities. This class of explanations can reconcile the observed dynamics of home bias, while at the same time making sense of several exchange rate puzzles (Jiang et al. 2023).

6 The Rest of the World in Luxembourg and Ireland

We have shown that less than half of the fund shares issued in Luxembourg and Ireland are owned by EA investors, while the remaining portion is not accounted for in SHS. We have ascribed these unaccounted-for holdings to the Rest of World as a residual, and in this section we investigate who these RoW investors are. One potential concern is whether Euro Area resident investors could appear in this residual when

holding positions, unrecorded, via other countries. This is a notoriously difficult task since a large part of the claims on Luxembourg and Ireland go unrecorded in international financial statistics—which constitutes the missing global wealth phenomenon analyzed by [Zucman \(2013\)](#). To make progress, we use new regulatory data on the immediate counterparties holding shares in Luxembourg and Ireland funds and show that the bulk of non-EA positions are accounted for by the holdings of the United Kingdom on a custodial basis.

In principle, the missing wealth phenomenon should not occur since for every country that records an asset somewhere else in the world, another country should correspondingly record a liability of offsetting value. In practice, international financial statistics differ in the criteria used for recording the asset and liability sides of the external balance sheet of countries due to the different information available to a country about its assets and liabilities. Consider, for instance, the case of a bank in London holding a fund share issued by a fund domiciled in Ireland. The Irish statisticians register a fund share liability in portfolio investment for Ireland toward the UK. Indeed, all that the Irish statisticians may know is that the immediate counterpart is based in the UK. British statisticians, however, have more information on who the actual holder of the fund share is. They record the position differently depending on whether the holder of the security is a UK resident or a non-resident. If the holder is a UK resident, such as if a British household owns an account at the bank which purchased the fund share on her behalf, then the UK statisticians record a UK asset in the form of a portfolio investment in fund shares in Ireland. If the holder is determined to be a non-resident, then the UK statisticians record no asset at all: in principle, the country of ultimate residency of that investor records the asset. Principle and practice are however very different: the country of residency of the investor might never know that she has a bank account in London in which she holds fund shares in Ireland. More generally, many countries do not have information-sharing agreements, so that this information often goes unrecorded.³⁰

6.1 The Countries Behind the €3.2 Trillion Missing Wealth

The scale of the missing wealth in Luxembourg and Irish funds is enormous. As of December 2020, Ireland and Luxembourg report portfolio investment fund-share and equity liabilities to foreign investors of €3.6 trillion and €4.9 trillion, respectively.³¹ All other countries combined, however, report owning only €2.0 trillion and €3.3 trillion of portfolio equity and fund shares in Ireland and Luxembourg, respectively.³²

³⁰A prominent exception are countries with automatic information sharing, such as is the case in constructing the SHS database itself. Within the Euro Area, each national central bank provides information about assets held by its domestic financial institutions (mainly custodians) on behalf of residents of other EA countries, and the assets are then recorded by the appropriate country of residency. In order to avoid double reporting, only assets held in custody for non-financial investors (mainly households and non-financial corporations) are included in SHS.

³¹Of this total, Ireland and Luxembourg report foreign portfolio equity liabilities of €624 billion and €47 billion, as in the ECB's Statistical Data Warehouse for Ireland and Luxembourg (retrieved March 1, 2023).

³²According to BPM6 criteria, fund shares are classified as equity since they are a claim to the equity (net asset value) of the funds. Consequently, international investment statistics often report holdings of equity and fund

This means that at the end of 2020 there are holdings of approximately €1.6 trillion of fund shares and equity unaccounted in each of Ireland and Luxembourg.

To better understand who accounts for the missing wealth of Luxembourg and Ireland, we bring to bear several pieces of information. First, we use information from SHS on the exact amount that each EA country owns of each fund share issued by funds domiciled in Luxembourg and Ireland. Second, we use information from CPIS on country-level holdings of the sum of fund shares and equities in Luxembourg and Ireland. Third, we use information from Morningstar, Lipper, and Factset about the securities held by each Luxembourg and Ireland fund, as well as information on the fund shares issued by these funds (by amount and base reporting currency). Fourth, we use novel administrative data provided by the Central Bank of Ireland and Luxembourg's Commission de Surveillance du Secteur Financier (CSSF) on the country of the immediate counterparts of the fund shares.³³ These entities are often financial intermediaries (e.g., custodians) and hence different from the ultimate owner of the fund shares.

In Figure 12, we compare the geography of immediate counterparty holdings from the Bank of Ireland and CSSF data to the positions that each country itself reports owning in Ireland and Luxembourg in CPIS.³⁴ We do not expect these positions to match, as countries' asset-side reports only contain the holdings of their own residents, whereas the regulatory data reveals the ownership by the immediate holders, regardless of the ultimate investors' residency. In the scenario in which the residents all held securities directly and their national governments reported the national positions accurately, these two sets of positions would coincide. Therefore, we shed light on the nature of the true owners by examining the difference between these two measures.

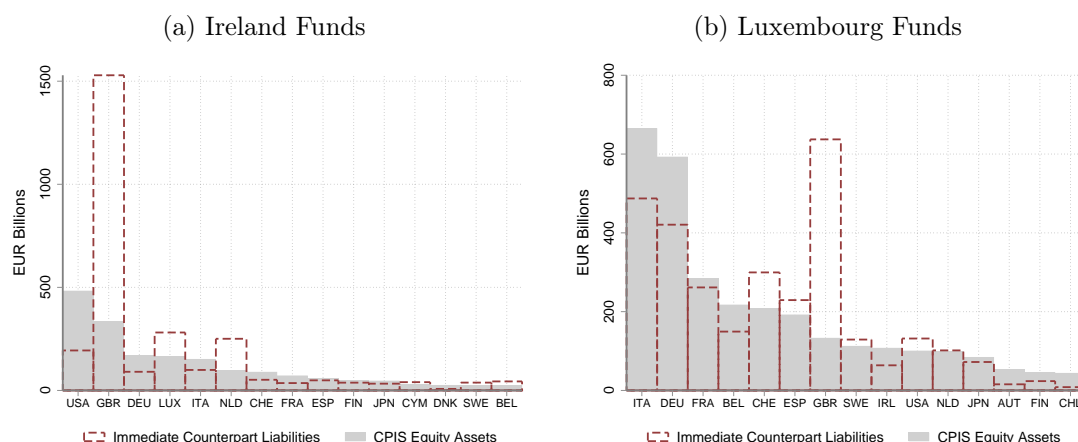
The role of the United Kingdom. In both panels of Figure 12, the United Kingdom is an outlier in being a much larger immediate owner of Irish and Luxembourg funds than what it itself reports owning. We document a huge discrepancy in the position, with the recorded liabilities by Ireland vastly exceeding (at €1,529 billion) the assets recorded by the UK. The UK does not separately report fund shares and

shares in a single category. The numbers provided here are from the IMF's CPIS, a bilateral portfolio investment dataset that indeed does not split equity and fund shares (Felettigh et al. 2008).

³³We thank the Central Bank of Ireland and the Commission de Surveillance du Secteur Financier for providing this data, and for their generous assistance in working with it. For both Ireland and Luxembourg, the data covers the universe of investment funds, including non-UCITS funds.

³⁴Due to confidentiality restrictions in the SHS data, we report each country's claims on Ireland and Luxembourg based on the positions in CPIS. However, the CPIS data pools together equity claims (common equities as well as preferred equities) and fund shares. For Luxembourg, this is unlikely to be a major concern as there is very little common equity relative to the size of the fund sector, but it is more likely to be a concern for the larger Irish economy, particularly given that investment in US firms that tax-inverted to Ireland is also included since these firms are Irish on a residency basis. This latter bias is of particular concern for US bilateral holdings in Ireland, and hence for the US we use the reported investment in Irish (and Luxembourg) fund shares from the Treasury International Capital (TIC) data, which excludes positions in common equity and preferred shares. Unfortunately, this split between fund shares and equity is not available for other countries. Despite the drawbacks of pooling equity and fund shares by using CPIS rather than SHS, one important benefit is that we can consider the positions of non-EA countries. Appendix Figure A.XII plots the time series of ownership on an immediate counterparty basis.

Figure 12: Immediate owners of funds vs. residency-basis claims



Notes: This figure compares the amount of funds the regulatory authorities (Central Bank of Ireland and CSSF) report to be owned by each foreign country on an immediate counterparty basis (dashed red bars) to the amount of fund shares and equity that each country reports owning in CPIS (solid gray bars). For the United States, instead of CPIS, the amount of fund shares owned from TIC are used instead. All data shown are as of the end of 2020.

equity portfolio investment in Ireland, but the total of the two is only €336 billion in CPIS. The difference at €1.2 trillion is extremely large, and likely a lower bound since it assumes all the positions in CPIS to be in fund shares. While smaller than for Ireland, the discrepancy is also large for Luxembourg, with immediate liabilities reported by Luxembourg at €637 billion but the UK only reporting assets of €134 billion in fund shares and equities combined. The source of this discrepancy could be under-reporting of assets by the UK statisticians or holdings custodied in the UK on behalf of non residents. For the latter, our main concern is whether the ultimate investors could in fact be Euro Area residents.

Beginning with the possibility of incomplete reporting, in the CPIS metadata, the UK acknowledges that it does not directly collect data for the holdings of the household or the non-profit sector. While households are likely to have small direct holdings of foreign bonds and equities, they are likely important holders of foreign investment funds.³⁵ However, given the magnitude of the overall discrepancy, it is likely that a significant portion of this UK investment is on behalf of non-UK residents.³⁶ While at present there is no definitive evidence on who the UK is intermediating on behalf of, it is unlikely that EA investors would be using the UK to custody wealth that is unreported to the authorities in the EA. First, the UK has substantial transparency and exchanges of information agreements with the EA, making it a less likely destination for wealth reporting avoidance of this massive scale. Second, as we have shown in Section 4, the portfolio of securities held by RoW investors via Irish mutual funds is very different on

³⁵For instance, in December 2020, in the Enhanced CPIS Table 3.A, Italian households account for 46% (\$86 billion out of \$186 billion) of Italy's equity and fund share investment in Ireland and for 53% (\$433 billion out of \$816 billion) of Italy's investment in Luxembourg.

³⁶The sheer magnitude of the positions implies that if all of the securities recorded as belonging to the UK in the immediate counterparty data were actually owned by British residents, the UK net foreign asset position would be massively under-reported. In Appendix Figure A.XIII, we note that a similar discrepancy occurs in the UK cross-border claims towards the United States in CPIS, relative to the estimates of US liabilities towards the UK in the Treasury International Capital Data.

observables such as currency and country of the issuer from the portfolio that EA residents are known to hold via the Irish funds.

As shown in Figure 6, less than 5% of the bond investments of Euro Area investors through Irish funds are denominated in British pounds, while 40% of the bond positions of Irish funds not accounted for by EA holders are pound-denominated. While British investors invest a very high share of their bond portfolio in pounds, other investors globally generally hold very little of their bond portfolio in pounds (Maggiori et al. 2020). In 2020, there are €1.2 trillion in unaccounted bond positions in Ireland, of which €474 billion are in pound-denominated bonds. If these positions are largely owned by British investors, then this would point to under-reporting of UK positions, in addition to the other assets that UK investors are likely to own. If the RoW holdings were actually masking hidden wealth by EA investors via the UK, then one would have to explain such marked differences in investment preferences for these two investment routes by the same investors. We turn to this point in more depth in Section 6.2.

The Euro Area. The positions towards Ireland and Luxembourg reported in CPIS by Euro Area countries tend to exceed the corresponding immediate counterparty liabilities: this occurs because a large share of the Euro Area total position is actually accounted for in the latter data by Luxembourg and Ireland themselves, as these are large custodial centers as well (see Appendix Figure A.XII). Germany, Italy, and France all report owning more fund shares and equity than the issuer country reports them owning on an immediate basis. The overall pattern is consistent with exchanges of information within the Euro Area on security holdings. For instance, shares issued by Irish funds and held on an immediate counterparty basis by a custodian in Luxembourg (hence constituting an Irish immediate counterparty liability toward Luxembourg) appear on the asset side of the EA country where the ultimate owner of the share resides. Of course, we cannot rule out under-reporting as another source of the discrepancy.³⁷

Switzerland, tax havens, and other countries. We find that Switzerland and global tax havens (e.g., the Cayman Islands) account for a relatively small share of ownership of the Luxembourg and Irish funds on an immediate counterparty basis.³⁸ To better understand the potential role of Switzerland, we update the results of Zucman (2013) using Switzerland's data on investments held on behalf of non-residents. If we assume all shares held in custody in Switzerland are shares of funds in Luxembourg, this channel would account for 48% of the missing wealth (€802 billion out of the overall €1,641 billion discrepancy).³⁹ On the one hand, this assumption is likely to overestimate the amount invested by

³⁷Similarly, the large positions held by Luxembourg and Ireland themselves on an immediate counterparty basis (as in Appendix Figure A.XII) also encompass any fund shares held by custodians in these countries on behalf of non-EA investors.

³⁸Our findings for ownership of Luxembourg funds is consistent with Ciccone et al. (2022), who find, for the period of June 2019, that countries that are part of the EU and EFTA, but not the EA, accounted for 29.4% of Luxembourg UCITS fund holdings on an immediate counterparty basis.

³⁹The data is provided by the Swiss National Bank in both the “Annual Banking Statistics” and “Monthly Banking Statistics”, series “Securities holdings in bank custody accounts – by category of security, investment

Swiss non-resident accounts in Luxembourg because some of these fund shares are probably in other destinations. More importantly, if this were the pattern of investment, we would have expected the CSSF administrative data to report a much higher amount of Luxembourg fund shares to be owned by Switzerland on an immediate counterparty basis. On the other hand, we do find the time series correlation (of first differences) between the Luxembourg discrepancy and the Swiss custody holdings to be high at 80%, supporting the view that the two series are indeed related.

In the 1990s and early 2000s, Switzerland was one of the largest international owners of these funds, accounting for 27.0% of the ownership in 1998, consistent with the findings of [Zucman \(2013\)](#). However, the Swiss ownership share has fallen to 6.0% by 2021, while the UK ownership share has increased from 2.9% to 12.7% over the same time period.⁴⁰ The decline in the importance of Switzerland in accounting for unreported ownership of Luxembourg funds is consistent with the finding in the 2024 Global Tax Evasion Report that Switzerland went from managing more than 50% of global offshore wealth prior to the global financial crisis to managing less than 20% today ([Alstadsæter et al. 2024](#)).

The United States reports significantly less ownership of Luxembourg and Irish fund shares in its official Treasury International Capital data than the two issuer countries report US residents owning on an immediate basis, which may be due to the custodial role of US financial institutions for non-US resident investors.

6.2 A Revealed Preference Approach to Ultimate Ownership

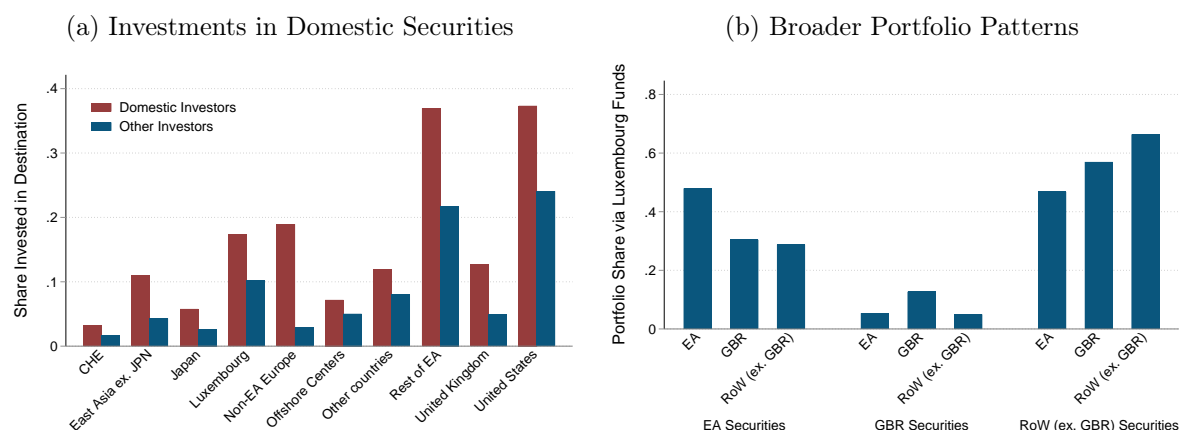
While there is often no information about the ultimate owner of a fund share, much can be learned by observing the characteristics of the investment itself. Intuitively, investors exhibit different investment patterns depending on their country of origin (such as home bias, home currency bias, or gravity), and these effects are present even conditionally on investing in or via an offshore financial center ([Coppola et al. 2021](#)). Therefore we take a *revealed preference* approach: we examine the characteristics of the investments to shed light on the likely origin of the investor. We investigate two characteristics: the geography of the investments that the fund makes, and the currency in which the fund decides to report its net asset value (i.e., the base reporting currency).

In the first analysis, we combine the geography of who owns the funds on an immediate counterparty basis with the geography of investment destinations by the funds, and we examine how funds owned by different investor countries allocate their portfolios. To do this, we use an additional new dataset provided by CSSF which allows us to observe the geography of funds' holdings interacted with the geography of

currency and domicile of issuer – monthly”. The data provides holdings in Swiss custody on behalf of non-residents of units in collective investment schemes (i.e., fund shares). The number reported is based on the more comprehensive annual dataset; the monthly survey shows a value of €790 billion. We subtract from the total holdings the part held in “Swiss collective investment schemes pursuant to CISA”, to obtain the investments from these custody accounts in fund shares worldwide outside of Switzerland.

⁴⁰This longer time series for Luxembourg is plotted in Appendix Figure [A.XIV](#). No comparable data with this length of the time series is available for Ireland.

Figure 13: Portfolio heterogeneity via Luxembourg funds: immediate counterparty data



Notes: We use the CSSF administrative data to examine characteristics of the portfolios held by each immediate counterparty via Luxembourg funds. Panel A plots the share of each counterparty country or region's holdings that is invested back into securities issued by that investor country or region ("Domestic Investors") in the red bars. The blue bars plot the share of all other investors' holdings that flows back to the particular country or region ("Other Investors"). Panel B examines the broader geography of investments depending on whether they are held by Euro Area (EA), United Kingdom (GBR) or Rest of World (RoW, excluding the UK) investors on an immediate counterparty basis. The first set of three bars from the left shows the share of holdings by each counterparty investor region that is invested in EA securities, the second shows the same for UK securities, and the last set for RoW (excluding UK) securities. Data from end of year 2020.

the immediate holder.⁴¹ Hence, if for example funds held by the UK on an immediate counterparty basis disproportionately invested back in UK securities—thus behaving more similarly to funds known to be held by UK residents—then we would increase our confidence that the UK investors on an immediate counterparty basis are also UK investors on an ultimate counterparty basis.

Figure 13a shows how much each immediate counterparty country (or region) invests in itself via the funds it owns in Luxembourg and compares that with how much all *other* counterparties allocate to this same destination. For all ten investor groups, we find evidence of round-tripping, or home bias in holdings through Luxembourg funds. These results extend to all jurisdictions our earlier (and more detailed) results that the Euro Area excluding Luxembourg invests disproportionately back into the Euro Area. For those jurisdictions where we would expect direct holdings rather than custodial positions, such as Asia, Japan, the Euro Area, the rest of Europe, and the United States, we find that home investment shares are often twice or more what the rest of the investors allocate.

Of particular interest for our purposes, the United Kingdom investments display the same pattern, with the UK-owned component of Luxembourg funds investing around 13% of its portfolio back in the UK compared with under 5% for all other investors. This provides supportive evidence that a substantial share of UK immediate holdings are actually on behalf of British residents. For the UK to be investing solely on behalf of non-residents, it would need to be that foreigners investing through the UK choose to

⁴¹This data is available at a more coarse level of geographical aggregation. We observe investment to and from Switzerland, the UK, Japan, Luxembourg, and the United States, and then aggregated version of East Asia (excluding Japan), the rest of the Euro Area, small offshore financial centers, the rest of Europe, and then all other countries.

invest disproportionately back in the UK. Why a custodial route would lead to such a dramatic change in investment preferences is unclear and, in our view, less likely.

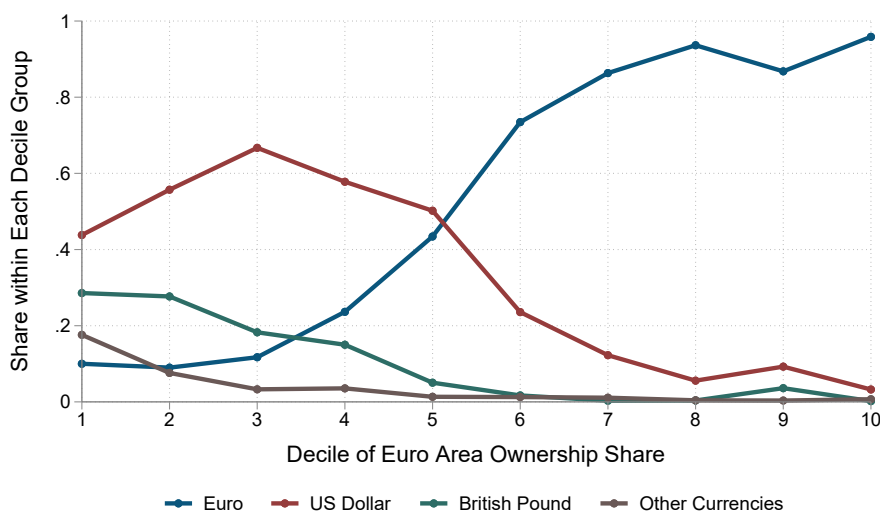
We can provide even stronger evidence on the nature of the ultimate investors in Luxembourg by examining the broader portfolios, rather than focusing only on domestic round-tripping. To do this, we group our source and destination regions of investment into three broad categories: the Euro Area, the United Kingdom, and the Rest of World (which in this context excludes the UK). Figure 13b reports the share of the portfolios held by each counterparty via Luxembourg that is invested in each of these three regions. The key takeaway is that investments by UK counterparties behave more like the investments by RoW counterparties than those by EA counterparties, other than being overweight the UK itself. In particular, the UK and RoW place similar portfolio weights on EA securities, and both UK and RoW investors put relatively more of their portfolio into RoW securities (with the UK having a slightly lower weight on RoW given its home bias). If the UK were intermediating funds on behalf of Euro Area investors, and Euro Area investors funneling money through London had the same preferences as they do when buying Luxembourg funds directly, then we would expect a large tilt towards the Euro Area for the UK.⁴²

Our second analysis explores the extent to which EA and RoW investors differ in the types of funds they buy. We categorize the share classes of funds (at the individual ISIN level) according to their base reporting currency. Importantly, the base currency of a share class is not the currency of the assets the funds hold, but it is instead the currency in which the fund chooses to report its net asset value and returns to the investors holding that share class. Generally, we believe that if investors think in terms of their home currency, then a fund targeting particular investors will report its profit and losses in the clients' currency. We also classify each Luxembourg and Ireland fund share class based on what percentage of its assets under management is owned by Euro Area investors in the SHS data. We then split share classes by their decile of the EA ownership percentage.

Figure 14 shows the fraction of fund share classes in each EA ownership decile which have a base currency corresponding to the euro, the US dollar, the British pound, and all other currencies. We find that for the top decile of EA ownership (funds entirely owned by EA investors), 95.9% of the share classes are denominated in euros and 3.3% in US dollars, with only a negligible amount in other currencies. In

⁴²In Appendix Figure A.XV, we provide a more disaggregated version of the same analysis, comparing the portfolios held by each counterparty through Luxembourg funds relative to the positions of all other counterparties. Panel A shows that the UK is overweight itself and the RoW and slightly underweight the EA. In panel B, by contrast, we show that when the EA invests via Luxembourg it is massively overweight itself, while being underweight all other destinations but Luxembourg. Panel C shows that Luxembourg's investment in itself has a lot of its positions invested in the EA, consistent with the idea that its holdings largely represent custodial holdings of the rest of the EA. Importantly, we also observe the way in which Switzerland's investments in Luxembourg on an immediate counterparty basis behave. As Zucman (2013) demonstrated, the holdings of Switzerland on a custodial basis are largely on behalf of EA investors. We show that indeed Switzerland has a portfolio tilted towards the EA. We observe a much smaller tilt of the Swiss portfolio towards Swiss assets, consistent with the idea that it is largely intermediating funds on behalf of the EA rather than investing for itself or on behalf of non-Europeans.

Figure 14: Base reporting currency of fund shares: heterogeneity by EA ownership



Notes: This figure sorts all Luxembourg and Ireland fund share classes (at the individual ISIN level) into their decile of Euro Area ownership. The tenth decile is the one with highest ownership by EA investors, while the first decile is the one with the least. For each decile, we show the fraction of share classes that use each currency as their base reporting currency: the euro (*blue dots*), the US dollar (*red dots*), the British pound (*green dots*), and all other currencies (*gray dots*).

other words, the funds that are owned entirely by EA investors are nearly all denominated in euros. In contrast, when we consider the share classes that EA investors report owning the least of, we find that over 40% use the US dollar as their base currency, nearly 30% use the British pound, followed by other currencies and finally the euro. In between these extreme deciles, we find a nearly monotonic relationship between Euro Area ownership and whether the fund itself uses the euro as its base currency. This provides further support for the conclusion that the RoW investors are in fact not Euro Area residents. Otherwise, one would need a reason explaining why Euro Area investors holding assets via Luxembourg or Irish funds overwhelmingly prefer these funds to report in euros, while at the same time preferring funds with a different base currency when routing their investment through custodians in the UK or other jurisdictions.⁴³

7 Conclusion

We assess European financial integration, looking through the financial activities taking place in three *onshore offshore financial centers* within the Euro Area: Luxembourg, Ireland, and the Netherlands. Using extensive micro data on security-level portfolio holdings, we document the large impact on Euro Area financial statistics generated by the dual roles of OOFs, as hubs of financial intermediation and

⁴³While one key takeaway of this paper is the need to have both fund-level holdings and data on who owns the funds in order to accurately look through them, Figure 14 makes clear that in the absence of micro data on who owns the funds, one is much better off ascribing ownership using the base currency of the fund than by naively assuming the holding of the underlying assets is proportional to total ownership shares.

as places of securities issuance. We look through both of these roles by attributing fund investments to their ultimate underlying owners, and by linking securities issued in these jurisdictions to their ultimate corporate parents. We provide new estimates of Euro Area countries' portfolio investments, which reveal a number of salient patterns. The Euro Area is less financially integrated than it appears in official data, both vis-à-vis the rest of the world and within the currency union. While official data suggests a sharp decline in portfolio home bias for Euro Area countries relative to other developed economies following the introduction of the euro, we demonstrate that this pattern only remains true for bond portfolios, while it is artificially generated by OOFI activities for equity portfolios. Further, using new administrative evidence on the identity of non-Euro Area investors in OOFI funds, we provide a new perspective on the long-standing issue of missing wealth in international financial accounts, documenting that the bulk of the missing wealth is now accounted for by United Kingdom counterparts.

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ONLINE APPENDIX FOR
“THE GEOGRAPHY OF CAPITAL ALLOCATION IN THE EURO AREA”

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This appendix contains the following sections:

1. Section [A](#) provides additional details on the various data sources used in the paper.
2. Section [B](#) provides additional details on our methodology.
3. Section [C](#) provides further details on our aggregate home bias analysis.
4. Section [D](#) provides a more detailed discussion of coverage rates in our fund holdings data.
5. Section [E](#) examines allocative consequences of OOF use in the cross-section of EA firms.

A Additional Details on Data Sources

Securities Holdings Statistics (SHS). The Securities Holdings Statistics (SHS) are security-level holdings data assembled by the European Central Bank (ECB). The underlying data is collected by national statistical offices in the Euro Area (EA) as well as the ECB itself. Holdings are included at the country-sector-security level for each quarter. The data covers all 19 EA countries. The sectors breakdown includes 16 sectors. Securities are identified by unique security codes, most commonly ISIN codes. From the raw SHS data, we are able to observe how much of each unique security—identified by its ISIN code—each sector in a given country holds.

The raw SHS data also includes security-level information from the ECB’s Centralised Securities Database (CSDB). CSDB contains information on the asset class of each security (e.g., equity or bond), as well as other characteristics like country of issuance. We describe the CSDB below. In our analysis, we primarily use SHS to obtain the value of holdings in each security. Other security-level information from SHS and CSDB is one of many inputs into our algorithm for classifying securities according to asset class, as described in Section [B.2](#).

Centralised Securities Database (CSDB). The Centralised Securities Database (CSDB) is a panel dataset of security-level information. We use this data for three purposes. First, we use the fields corresponding to country as the basis of our residency classification. This concept of residency is consistent with the production of national statistics (international investment positions) by the ECB and EA member countries’ statistical agencies. Second, we use fields that contain permanent characteristics of securities (e.g., asset class) as an input to our asset classification algorithm, as described in Section [B.2](#). Third, we use amount outstanding fields to construct a dataset of global bond and equity issuance (amounts outstanding), as described in Section [B.6](#).

In processing the fields we consider permanent characteristics of a security, like residency and asset class. CSDB infrequently has different values for a single uniquely identified security; wherever this is the case, we take the modal value of a variable and assign it to the security for all quarters. We thus construct a cross-sectional dataset of permanent security characteristics.

The CSDB data contains a time series of amount outstanding for each security. For debt securities, this corresponds to the amount of the debt security that is outstanding in a given quarter. For equity securities, it corresponds to total market capitalization in a given quarter. We use Worldscope data on market capitalization for equities due to issues such as double-counting market capitalization in CSDB. For debt, we use CSDB and apply a cleaning algorithm which looks for erroneous price jumps and reversals. More details on our issuance master are in Section [B.6](#).

Other data sources. We additionally use a number of other data sources throughout the analysis in the paper:

- *Factset Data Management Solutions (DMS)*: This data provides security-level information like asset class, as well as information on the entity issuing a security, such as its residency, the ultimate parent entity, and the headquarters location of the issuing entity. We use this information in both the asset classification and nationality aggregation algorithms.
- *Capital IQ*: We access information on security issuing entities from Capital IQ to use in our aggregation algorithm. In particular, we use the ultimate parent information from Capital IQ as well as the country associated with the ultimate parent.
- *Financial Instrument Global Identifier (FIGI)*: FIGI is an open standard identification system for global securities, originally developed by Bloomberg. We use FIGI data on the asset class of securities in our asset classification algorithm.
- *Morningstar*: We use Morningstar data on the security-level holdings of mutual funds. For details on the processing of the Morningstar fund holdings data, see [Maggiori et al. \(2020\)](#) and [Coppola et al. \(2021\)](#).
- *Factset Ownership Database*: We supplement the Morningstar fund holdings data with additional fund holdings data from Factset Ownership. The Factset Ownership data contains the security-level holdings of mutual funds. We process this data equivalently to how we process the Morningstar fund holdings data.
- *Thomson Reuters Lipper*: We supplement the Morningstar fund holdings data with additional fund holdings data from Thomson Reuters Lipper. The Thomson Reuters Lipper also contains security level holdings of mutual funds. We process this data equivalently to how we process the Morningstar fund holdings data.
- *Thomson Reuters Worldscope*: Thomson Reuters Worldscope is a dataset which collects financial and other data on public firms globally. We use this data in constructing the equity portion of our issuance master file.

B Details on Methodology

In this section we provide additional methodological details. We discuss our algorithm for aggregating securities to their ultimate corporate parent and the corresponding country of nationality, our algorithm for asset classification, our fund unwind procedure, our methodology for constructing restatements of CPIS and providing comprehensive publicly available estimates, and our construction of a comprehensive panel of securities' amounts outstanding.

B.1 Aggregating Securities to Their Ultimate Parent Nationality

Our aggregation algorithm follows closely the procedure in [Coppola et al. \(2021\)](#), henceforth CMNS), with a few minor differences. We first summarize the process (more information is available in CMNS), before detailing the differences. We first map all securities in SHS and CSDB to their issuing entity. Using data from Factset DMS and other data sources, we can connect the issuing entity to the corporate entity which is the ultimate owner of the issuer. Factset contains information about the ultimate owner, including the location of their headquarters and the country of risk. We use this data to estimate the issuer's nationality. We thus assign individual securities to countries on a nationality basis.

The primary difference with CMNS is that our algorithm uses information from Factset, Capital IQ, SHS, and CSDB, whereas CMNS uses Factset, Capital IQ, and a collection of other commercial data sources. Our algorithm in this paper relies more heavily on Factset. We treat the Factset data very similarly to how it is treated in CMNS. The only noteworthy difference is that we cross-check the Factset country of risk variables against Capital IQ, whereas CMNS cross-checks the same variables against information from Morningstar and SDC Platinum.

If Factset and Capital IQ do not have information we can use to assign a nationality to a security, we default to the residency information in SHS and CSDB. We have to populate the nationality assignment using the SHS and CSDB residency for only a small number of securities. Both in aggregate and at the security level, we do not find substantial differences between the aggregation algorithm used in this paper and the aggregation used in CMNS.

B.2 Asset Classification Algorithm

Our asset classification algorithm uses as an input the asset class variables in Factset, FIGI, SHS, and CSDB. As discussed above, our aggregation algorithm follows closely the procedure in [Coppola et al. \(2021\)](#), with the addition of the SHS and CSDB variables. We rely primarily on Factset and FIGI data in the algorithm. For securities that we cannot classify with Factset or FIGI, we use the asset class as originally reported in the SHS and CSDB data. Since coverage of securities in both Factset and FIGI is very high, we only use SHS and CSDB for a very small share of the observations. All three datasets agree on asset classification for the vast majority of securities.

We classify securities according to broad categories like bonds, equity, and fund shares. Some of those have further subdivisions, for example debt is subdivided into categories like corporate debt and sovereign debt. While in general we use the asset classification described here, for some of our applications we want to match exactly the asset classification used in CPIS. In principle, the SHS data is the micro data underlying Euro Area international statistics like the positions of Euro Area countries reported to CPIS. As such, when we want our estimates to be comparable to CPIS, we use the asset class variables in SHS and CSDB rather than the output from our asset classification algorithm (see Sections [B.4](#) and [B.5](#)). This ensures that the data we use as an input to our CPIS restatements is as close as possible to the raw data used to construct CPIS. The methodology for our CPIS restatements is described in detail in Sections [B.4](#) and [B.5](#).

B.3 Fund Unwind Methodology: Additional Details

Our fund unwind maps holdings by EA investors in fund shares issued by funds domiciled in Luxembourg and Ireland into the underlying securities held by those funds. Here we provide additional details on the fund unwind methodology, which complement the discussion in Section [2.2](#).

Merge implementation. Recall that the positions in SHS that correspond to investments in Luxembourg and Ireland fund shares are those for which $c \in \mathcal{F}_i$, with \mathcal{F}_i the set of fund shares issued by funds domiciled in country $i \in \{\text{LUX}, \text{IRL}\}$. We identify these positions using the asset classification algorithm of Section B.2 and their residency: i.e., we construct the sets \mathcal{F}_i by including securities that are classified as fund shares and have residency corresponding to Luxembourg or Ireland. For each position in a fund share, we then perform the merge by mapping the ISIN of the fund share to the corresponding fund holdings estimates from Morningstar, Lipper, and Factset. We carry out this merge using data for the fourth quarter of each year for which both SHS and the fund holdings estimates are available.

Treatment of unmatched funds. As discussed in Section 2.2, since our fund holdings data does not cover the universe of all Ireland and Luxembourg funds, we have to make an assumption about the assets of the funds we observe EA investors owning in SHS that we cannot match to their underlying assets in the fund holdings data. This is necessary since if we treated the unmatched funds as belonging to the Rest of the World, we would significantly understate the true positions of Euro Area investors, and conversely overstate RoW investors' holdings. We assume that, for each holder country and sector in SHS, the positions via Luxembourg and Ireland funds that we are able to match directly are representative of the unobserved (unmatched) positions.

Formally, this assumption corresponds to using the matched funds to make an inference about the portfolio shares $\gamma_{c',c}$ of the unmatched funds. We let $\mathcal{F}_{i,j,s}$ be the set of all observed positions in funds domiciled in country $i \in \{\text{LUX}, \text{IRL}\}$ by a given investor country-sector pair (j, s) . We then partition this set into two components: a first component $\mathcal{M}_{i,j,s}$ corresponds to the set of funds that we match to the security-level fund holdings estimates, and a second component $\mathcal{U}_{i,j,s}$ corresponds to the unmatched funds.¹ We define $\tilde{\gamma}_c^{i,j,s}$ to be the average portfolio share in security c by funds in the matched set $\mathcal{M}_{i,j,s}$, where the average is weighted by the size of the positions in each fund in the set:

$$\tilde{\gamma}_c^{\text{LUX},j,s} = \sum_{c' \in \mathcal{M}_{\text{LUX},j,s}} \gamma_{c',c} \cdot \frac{x_{j,s,c'}^{\text{Direct}}}{\sum_{k' \in \mathcal{M}_{\text{LUX},j,s}} x_{j,s,k'}^{\text{Direct}}}, \quad (\text{A.1})$$

$$\tilde{\gamma}_c^{\text{IRL},j,s} = \sum_{c' \in \mathcal{M}_{\text{IRL},j,s}} \gamma_{c',c} \cdot \frac{x_{j,s,c'}^{\text{Direct}}}{\sum_{k' \in \mathcal{M}_{\text{IRL},j,s}} x_{j,s,k'}^{\text{Direct}}}, \quad (\text{A.2})$$

We finally assume that the unmatched funds in each set $\mathcal{U}_{i,j,s}$ have portfolio composition $\gamma_{c',c}$ given (on average over the set $\mathcal{U}_{i,j,s}$) by $\tilde{\gamma}_c^{i,j,s}$, and we apply these estimated portfolio shares in the estimating equations (1). Hence, the estimating equations for indirect positions under this assumption can be more explicitly written as follows:

$$x_{j,s,c}^{\text{LUX}} = \sum_{c' \in \mathcal{M}_{\text{LUX},j,s}} (x_{j,s,c'}^{\text{Direct}} \cdot \gamma_{c',c}) + \tilde{\gamma}_c^{\text{LUX},j,s} \cdot \sum_{c' \in \mathcal{U}_{\text{LUX},j,s}} x_{j,s,c'}^{\text{Direct}}, \quad (\text{A.3})$$

$$x_{j,s,c}^{\text{IRL}} = \underbrace{\sum_{c' \in \mathcal{M}_{\text{IRL},j,s}} (x_{j,s,c'}^{\text{Direct}} \cdot \gamma_{c',c})}_{\text{Matched funds contribution}} + \underbrace{\tilde{\gamma}_c^{\text{IRL},j,s} \cdot \sum_{c' \in \mathcal{U}_{\text{IRL},j,s}} x_{j,s,c'}^{\text{Direct}}}_{\text{Unmatched funds contribution}}. \quad (\text{A.4})$$

A potential issue with our treatment of unmatched funds is that it might in principle violate market clearing, since it is possible for this methodology to impute indirect positions held by EA countries in a

¹Therefore, by construction, it holds that $\mathcal{M}_{i,j,s} \cup \mathcal{U}_{i,j,s} = \mathcal{F}_{i,j,s}$ and that $\mathcal{F}_i = \bigcup_{j \in \mathcal{J}_{\text{EA}}, s \in \mathcal{S}} \mathcal{F}_{i,j,s}$.

given security that are larger than the holdings of that security by the fund sectors of Luxembourg and Ireland—and hence assign negative residual positions to the Rest of the World. We can however assess whether this is occurring to a quantitatively meaningful degree by inspecting the residual positions. We find that while the fund unwind indeed assigns some negative residual positions to RoW investors, their magnitude is small: across bonds and equities, the value of negative estimated RoW positions equals 0.73% of the value of positive estimated RoW positions. Moreover, most of these negative positions are not actually generated because of our assumption on unmatched fund holdings: if we exclude the unmatched funds contribution terms in equations (A.3) and (A.4) from the calculation of the EA indirect holdings, the corresponding number is 0.43%, reflecting simple measurement noise. Hence our treatment of unmatched funds does not worsen the issue of negative residuals significantly beyond its baseline occurrence due to pure measurement error. We treat these negative estimated positions as random noise, and we include them as we would any other position when calculating aggregates like those used in the CPIS restatements.

B.4 Constructing CPIS-Consistent Positions From SHS

As discussed in Section 2.2, a goal of our methodology is to produce restated statistics that are consistent with the most commonly used bilateral external positions dataset, the IMF Coordinated Portfolio Investment Survey (CPIS). While SHS forms the basis of the positions reported to CPIS by Euro Area countries, each EA country may adjust or supplement the SHS data in producing their international portfolio investment positions and CPIS data, and so the raw SHS data does not correspond exactly to the amounts reported in CPIS.² In order to make our data comparable to CPIS, we transform the raw SHS data so that it exactly matches CPIS on a residency basis. In particular, we scale positions at the level of holder country, issuer country, and asset class so that the SHS data matches CPIS exactly at this level. Our restated estimates of the investment portfolios of EA countries, whose construction is outlined in Section B.5, then apply our nationality and fund unwind adjustments to these CPIS-consistent positions.

For the purposes of both our scaling procedure and for the construction of our CPIS restatements, we use the residency variable for each security as reported directly in SHS. This variable corresponds to the residency of the entity issuing a given security. In principle, the SHS data represents the micro data underlying the Euro Area’s officially reported international portfolio investment positions. By using the SHS residency variable we ensure that the starting point for our restatements is as close to possible to the input individual EA countries use in creating their portfolio data included in CPIS.³

Domestic positions (i.e., holdings of domestic securities) are not available in CPIS. We add those domestic, residency-based positions to CPIS using publicly available data from the quarterly sector accounts (QSA) statistics as reported in the ECB Data Portal. We create a series for each country and asset class which corresponds to the total domestic holdings of a country less the domestic holdings of the respective national central bank. Since central bank holdings are not included in the version of SHS that we use, this series corresponds to the information available in SHS. We use this series to scale the raw SHS data to the level found in the QSA data, exactly as we do with CPIS for cross-border positions. Since the methodology for the CPIS and QSA data are the same, we treat them identically from this point forward and refer simply to CPIS.

²In particular, the SHS version used in this paper does not include the portfolio investment positions of the Euro Area national central banks which are included in CPIS.

³The SHS issuer residency variable has a very high correlation with other issuer residency variables, such as those from Factset.

We now detail how we calculate the scaling factors that we apply to the raw SHS positions to make them consistent with CPIS. The positions in euros in the raw CPIS data are $\hat{x}_{j,s,c}^{\text{Direct}}$: these are counterparts of the CPIS-consistent positions $x_{j,s,c}^{\text{Direct}}$ defined in Section 2.2, but prior to the scaling. We let $\mathcal{C}_{i,a}$ be the set of all securities in asset class a issued by country i on a residency basis. For each investor country j , destination country i , and asset class a , we then calculate the scaling factor $\rho_{j,i,a}$ given by:

$$\rho_{j,i,a} = \frac{\text{CPIS}_{j,i,a}}{\sum_{c \in \mathcal{C}_{i,a}} \sum_{s \in \mathcal{S}} \hat{x}_{j,s,c}^{\text{Direct}}}, \quad (\text{A.5})$$

where $\text{CPIS}_{j,i,a}$ is the amount reported in CPIS for the bilateral position of investor country j in country i 's securities in asset class a .⁴

There are some bilateral positions for which CPIS is censored and amounts are not publicly available, so we cannot calculate the scaling factor using the bilateral position. However, CPIS includes the value of all the censored positions for each investor country j and asset class a , summed across all censored destinations. We label this amounts as $\text{CPIS}_{j,\text{Censored},a}$. To scale positions corresponding to the bilaterals that are censored, we calculate a single scaling for all of the censored positions. Denote by $\mathcal{N}_{j,a}$ the set of censored destination countries in country j 's CPIS reporting in asset class a . Then $\mathcal{C}_{j,a}^{\text{Censored}} = \cup_{i \in \mathcal{N}_{j,a}} \mathcal{C}_{i,a}$ is the set of securities in asset class a issued by countries which are censored in the CPIS data for j . We calculate the scaling factor $\rho_{j,\text{Censored},a}$ given by:

$$\rho_{j,\text{Censored},a} = \frac{\text{CPIS}_{j,\text{Censored},a}}{\sum_{c \in \mathcal{C}_{j,a}^{\text{Censored}}} \sum_{s \in \mathcal{S}} \hat{x}_{j,s,c}^{\text{Direct}}}. \quad (\text{A.6})$$

This procedure maintains the relative size of the censored positions we observe in SHS, while ensuring that total wealth for the censored positions is the same as in CPIS. Having defined $\rho_{j,\text{Censored},a}$, we set $\rho_{j,i,a} = \rho_{j,\text{Censored},a}$ for those observations where $i \in \mathcal{N}_{j,a}$.

Finally, we multiply the raw security-level SHS positions by the scaling factors we calculate to create a security-level dataset of positions which is consistent with CPIS. We label the CPIS-consistent positions by $x_{j,s,c}^{\text{Direct}}$, and we calculate them as

$$x_{j,s,c}^{\text{Direct}} = \rho_{j,i(c),a(c)} \cdot \hat{x}_{j,s,c}^{\text{Direct}}, \quad (\text{A.7})$$

where the notation $i(c)$ and $a(c)$ indicates the country of residency and asset class associated with security c . This procedure produces a version of the SHS micro data that, if collapsed to the investor-issuer-asset class level found in CPIS, corresponds exactly to CPIS values. Having reconstructed an estimate of the starting point for the CPIS data, we apply our nationality and fund unwind algorithms, using the CPIS-equivalent positions $x_{j,s,c}^{\text{Direct}}$ in lieu of the raw SHS data $\hat{x}_{j,s,c}^{\text{Direct}}$.

⁴CPIS data is split into two asset classes: debt (both short-term and long-term) and equity (including fund shares). The asset class assignment used for the purposes of the scaling and of the CPIS restatement construction (as in Section B.5) uses the asset class variables in SHS and CSDB, aggregated to the categories available in CPIS. As with our residency assignment, using the SHS and CSDB variables ensures that the starting point for our restatements is as close as possible to the input individual countries use in creating CPIS. The vast majority of SHS positions are classified as belonging to CPIS categories. We do not scale the small share that are not (for instance, derivatives).

B.5 Constructing Our Publicly Available Estimates

Our paper provides a restatement of Euro Area countries portfolio investment holdings including our nationality and fund-unwind adjustments. Examples of these estimates are shown in Table 3 and in Appendix Tables A.II through A.IX, and we have made the full set of restatements (for all investor countries, destinations, years, and asset classes) available publicly at globalcapitalallocation.com. These restated estimates include data aggregated to the same level as that of CPIS Table 1. There are three steps to producing our CPIS restatements. First, we transform the raw SHS data so that it corresponds exactly to the publicly available CPIS at the country-bilateral level, as detailed in Section B.4. Second, we apply our nationality and fund unwind adjustments to these CPIS-consistent positions. Third, we aggregate the adjusted micro data to the same level of aggregation as CPIS. The rest of this section explains the latter two steps in detail.

Data in CPIS is provided for two coarse asset classes: debt (inclusive of both short-term and long-term securities) and equity. Under the CPIS methodology, fund shares are included in equity. We categorize each security that we observe in SHS as belonging to the set of debt securities, the set of equity securities (including fund shares), or neither according to the CPIS asset class definitions. For our CPIS restatements, we exclude the securities which are in neither set (such as derivatives).⁵ To generate the public version of our estimates, we create three versions of our security-level CPIS equivalent data. The first only applies our nationality adjustment, the second only applies the fund-unwind adjustment, and the third applies both adjustments. We aggregate each version of the dataset to the level at which the CPIS raw data is available. In the publicly available estimates we also include the raw, residency-based CPIS data that we scale our initial data to match. We maintain any censoring that is present in the raw CPIS data.

In our public estimates, we only report issuer countries pre- and post-adjustment that are in the raw CPIS data. As such, if our nationality adjustment allocates wealth to or from a country that is not in the list of CPIS issuers, total wealth for a given country may change. Any differences resulting from this are small. In addition, when we implement the fund unwind, we observe positions in mutual funds which do not fall into the asset classes included in CPIS. We do not include those positions in our restated CPIS statistics to maintain consistency with CPIS. More details on the variables included in our public data are available in the README accompanying the public estimates.

B.6 Details on Issuance Data

We construct a dataset of the amount outstanding of every security in the world over time, and we refer to this as the “issuance” dataset. This issuance dataset is based on a combination of the issuance data in CSDB and Worldscope. For debt securities we rely on CSDB. For equity securities we combine CSDB, Thomson Reuters Worldscope, and Datastream. We use Factset to link security identifiers in the data which correspond to a single security.

We access end of quarter data on the total amount outstanding for debt securities in CSDB. The primary improvement we make to the CSDB data is to adjust for large outliers and other erroneous observations. We filter the errors by running the data through an algorithm which looks for large single- or two-quarter jumps in the amount of a security outstanding. The algorithm focuses on jumps which appear to be due to common errors in financial data. In particular, we look for jumps that are of a round

⁵As for the scaling procedure of Section B.4, for the purposes of creating our CPIS restatements we use the asset class variables in SHS and CSDB, which ensures maximum consistency with CPIS.

multiple of a thousand, a million, the exchange rate with the euro for the currency of denomination of the security, and the same exchange rate squared. These correspond to incorrect unit conversions and incorrect exchange rate conversion, and also cases in which the inverse conversion was mistakenly applied (i.e., multiplied rather than divided by the exchange rate). To reduce the number of incorrect changes we introduce, we only look for exchange rate driven errors when the exchange rate conversion to the euro is a large or small number (so we do not check dollar-denominated securities for this issue, but we do check Japanese yen denominated securities). Where the algorithm finds jumps and reversals which meet these characteristics, we undo the jumps using the correct exchange rate conversion. We only apply this algorithm to debt, where we can be more confident that large jumps and reversals are data errors given the limited volatility of the underlying securities valuation compared to equity.

We generate a dataset of global equity issuance and market capitalization using Thomson Reuters Worldscope and Datastream. We construct this data using the version of Worldscope and Datastream available from the Wharton Research Data Services (WRDS). The construction of this dataset builds on the procedure used to create the equity issuance dataset used in [Coppola et al. \(2021\)](#). This data is thoroughly cleaned for double-counting introduced by depository receipts and cross-listings. We use Worldscope and Datastream instead of the CSDB for equity to avoid a number of potential challenges in using the equity portion of the CSDB data. The CSDB data often contains a very large number of security identifiers for a single equity security. These different identifiers are most often depository receipts or cross-listings. The large number of authorized and unauthorized depository receipts and cross-listings makes it difficult to select a single, accurate observation for each equity issuance. Sometimes depository receipts or cross-listings have as their market capitalization only the total value of the individual depository receipt or listing. Other times these observations have as their market capitalization the total market capitalization of the company which issues the equity underlying the depository receipt or the cross-listing.

As part of our analysis, we connect holdings of equity securities to the total market capitalization of equity securities. We do this analysis at the security level. To ensure that all of the many security identifiers that map to a single equity are correctly mapped in both our issuance and holdings datasets, we use Factset and CSDB to connect all of the depository receipts and cross-listings of an equity to a single security identifier corresponding to the main equity of the firm. We apply this mapping to the SHS holdings data whenever we combine it with issuance data. This ensures we accurately estimate the share of each equity security globally that is held by Euro Area countries.

C Aggregate Home Bias Analysis: Additional Details

In this section we provide additional details on the aggregate home bias analysis of Section 5. We first discuss a decomposition of the observed trend in home bias into a component accounting for intra-EA integration and a component reflecting an extra-EA contribution. We then provide additional validation of our IIP-based methodology, and we discuss our construction of an aggregate country-level panel of amounts outstanding for equities and bonds.

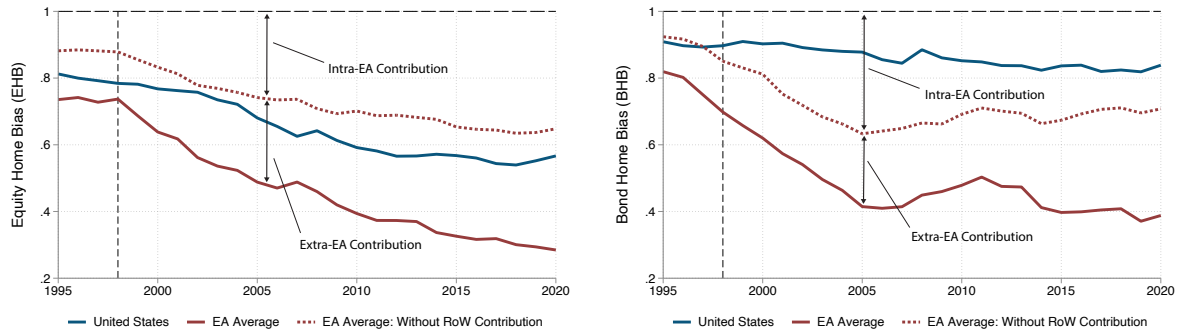
Decomposition: intra-EA and extra-EA components. To interpret the implications of the results documented in the present section, it is helpful to formally assess whether the observed dynamics of home bias are accounted for by an intra-EA component or by increasing measured integration with the rest of the world. To do this, we consider the following decomposition. Generalizing our notation, we

let $HB_{j,t}^a$ be a home bias index for asset class a , such that $HB_{j,t}^B = BHB_{j,t}$, and $HB_{j,t}^E = EHB_{j,t}$. We can decompose the index as follows:

$$HB_{j,t} = 1 - \frac{\omega_{j,-j,t}^a}{m_{-j,t}^a} = 1 - \underbrace{\frac{\omega_{j,EA-j,t}^a}{m_{EA-j,t}^a}}_{\text{Intra-EA Bias}} \cdot \underbrace{\frac{m_{EA-j,t}^a}{m_{-j,t}^a}}_{\text{Intra-EA Weight}} - \underbrace{\frac{\omega_{j,RoW,t}^a}{m_{RoW,t}^a}}_{\text{Extra-EA Bias}} \cdot \underbrace{\frac{m_{RoW-j,t}^a}{m_{-j,t}^a}}_{\text{Extra-EA Weight}}, \quad (\text{A.8})$$

where $\omega_{j,EA-j,t}^a$ is the share of country j 's portfolio in asset class a allocated to other (non-domestic) EA securities, $\omega_{j,RoW,t}^a$ is the share allocated to non-EA securities, and $m_{EA-j,t}^a$ and $m_{RoW,t}^a$ are the corresponding market portfolio shares.

Figure A.I: Decomposing the observed drop in home bias



(a) Equity home bias

(b) Bond home bias

Notes: We decompose the time series of average Euro Area equity (panel A) and bond (panel B) home bias, $EHB_{EA,t}$ and $BHB_{EA,t}$, using the methodology of Section C. The decomposition, which splits the series into components reflecting the intra-EA and extra-EA contributions to home bias, is applied to the series prior to our adjustments.

This decomposition clarifies that home bias is generated by two distinct sources. The first one comes from the term labeled “intra-EA bias” in the expression above, which represents the degree to which the country tilts its portfolio away from foreign securities, conditionally on remaining within the Euro Area. The second source corresponds to the term labeled “extra-EA bias”, which represents the bias away from non-EA securities. These two bias terms enter linearly into the overall home bias index, weighted by the respective shares of EA and non-EA assets in the portfolio of non-domestic securities (which sum to one). While this decomposition highlights the two distinct sources of home bias, its empirical implementation does not require us to know each of the objects in equation (A.8), since the weighted bias terms simplify as such:

$$\frac{\omega_{j,EA-j,t}^a}{m_{EA-j,t}^a} \cdot \frac{m_{EA-j,t}^a}{m_{-j,t}^a} = \frac{\omega_{j,-j,t}^a}{m_{-j,t}^a} \cdot \omega_{j,EA-j|-j,t}^a, \quad \frac{\omega_{j,RoW,t}^a}{m_{RoW,t}^a} \cdot \frac{m_{RoW,t}^a}{m_{-j,t}^a} = \frac{\omega_{j,-j,t}^a}{m_{-j,t}^a} \cdot (1 - \omega_{j,EA-j|-j,t}^a), \quad (\text{A.9})$$

where $\omega_{j,EA-j|-j,t}^a$ is the share of country j 's *foreign* portfolio that is invested in other EA securities within asset class a . All the other terms in the expressions above are objects that we have already estimated in the process of assessing home bias, hence the composition of the foreign portfolio, $\omega_{j,EA-j|-j,t}^a$, is the only additional *sufficient statistic* that is necessary for implementing the desired decomposition. Naturally, these terms add back to the original home bias index $HB_{j,t}^a$, so that the overall decomposition is of the

following form:

$$HB_{j,t} = 1 - \underbrace{\frac{\omega_{j,-j,t}^a}{m_{-j,t}^a} \cdot \omega_{j,EA-j|-j,t}^a}_{\text{Intra-EA Contribution}} - \underbrace{\frac{\omega_{j,-j,t}^a}{m_{-j,t}^a} \cdot (1 - \omega_{j,EA-j|-j,t}^a)}_{\text{Extra-EA Contribution}}. \quad (\text{A.10})$$

We measure the sufficient statistic $\omega_{j,EA-j|-j,t}^a$ directly using CPIS data, including the pilot survey conducted in 1997, to empirically implement this decomposition. Figure A.I presents the results, applied to the average EA equity and bond home bias series, $EHB_{EA,t}$ and $BHB_{EA,t}$, prior to our adjustments.⁶ The dashed red lines in the figure's two panels show the home bias time series without the extra-EA contribution term, so that the gaps between the horizontal lines at one and the dashed red lines correspond to the intra-EA contribution in equation (A.9), while the gaps between the dashed and solid red lines correspond to the extra-EA contribution. For both equities and bonds, the observed excess decline in home bias following the introduction of the euro is primarily attributable to the intra-EA component. For equities, the excess decline turns out to be an artifact of OOF activities, as discussed in Section 5. For bonds, it reflects true increasing financial integration within the currency union.

Validation of IIP methodology. The analysis of Section 5 uses an IIP-based methodology to estimate home bias, so as to adopt a consistent methodology throughout the sample period. This was standard practice before the advent of more granular micro data and is still the benchmark when using historical data. For the recent sample from 2014 onwards, we can provide a validation of this IIP methodology by checking that the positions estimated using it align well with those directly measured in the SHS micro data. The correlation between fund share assets in the IIP and foreign fund share claims in SHS is 97.6%. The correlation between common equity assets in the IIP and foreign common equity claims in SHS is 99.3%. The correlation between bond assets in the IIP and foreign bond claims in SHS is 99.6%. The correlations between the estimated domestic positions from the IIP methodology and the holdings of domestic securities in SHS are 99.0% for equities and 97.8% for bonds. This very strong alignment confirms the validity of the IIP-based approach.

Additionally, the baseline home bias adjustment methodology applies the estimated composition of fund share claims on Luxembourg and Ireland to the entirety of the multilateral IIP external fund share assets of Euro Area countries. To validate this approach, we compare the IIP fund share assets to each Euro Area country's bilateral claims towards Luxembourg and Ireland in equity and fund shares in CPIS. The average correlation between these two series is extremely high at 97.8%. Moreover, for the more recent sample we can check directly in SHS what fraction of EA countries' holdings in foreign fund shares is towards Luxembourg and Ireland: across all EA countries (excluding Luxembourg and Ireland themselves), this number is on average 83.4% in 2020. This confirms that the multilateral IIP fund share assets are mostly towards Luxembourg and Ireland, and conversely that the bilateral equity claims in CPIS of Euro Area countries towards Luxembourg and Ireland are primarily in fund shares.⁷

Time series for country-level amounts outstanding. The aggregate home bias analysis of Section 5 also makes use of series on amounts outstanding for both equities and bonds at the country-year level, and it requires a long time series going back to 1995. For equities, we simply aggregate the micro panel constructed using Worldscope as detailed in Section B.6, since this provides coverage throughout the

⁶Figure A.I interpolates the values of $\omega_{j,EA-j|-j,t}^a$ for years in which CPIS surveys were not conducted.

⁷Our home bias adjustment methodology treats the entire multilateral claims on foreign fund shares symmetrically, corresponding to an assumption that the composition of the holdings is the same for claims on Luxembourg and Ireland fund shares as for other foreign fund shares.

sample period.⁸ For bonds, CSDB alone does not provide the required length of coverage, and therefore we construct instead a country-level panel on bond amounts outstanding using data from the Bank of International Settlements (BIS) Debt Securities Statistics, supplemented with debt securities data from the IMF and national statistical sources.

Specifically, we use the BIS Debt Securities Statistics panel as a starting point. The BIS data provides amounts outstanding for total bonds (both sovereign and corporate) across countries, although the panel is unbalanced. Most notably, data for the United Kingdom is only available in the BIS panel starting in 2020. For the UK, we therefore instead use the total debt securities statistics from the Office of National Statistics (ONS), which provide series for all bonds issued by UK residents. For country-year observations not covered by the BIS or ONS data, we use data on sovereign bonds outstanding from the IMF.⁹

D Further Discussion of Fund Holdings Coverage Rates

One challenge in unwinding the fund holding positions of the Euro Area countries in Luxembourg and Ireland arises from the differences in coverage of the various data sources. In particular, in SHS, Luxembourg and Ireland report the individual securities owned by the entire investment fund sector (statistical codes S123 and S124). SHS also reports positions of all Euro Area countries (including Luxembourg and Ireland themselves) in individual investment funds at the ISIN of the fund shares level. Generally, the bulk of the funds that enter into the SHS data are mutual funds and exchange-traded funds with a unique security identifier (ISIN). However, it is possible that certain funds (such as hedge funds) may see their holdings appear on the asset side of Luxembourg and Ireland's reporting to SHS, and at the same time have no corresponding fund shares held by other countries. This is possible because investments in a hedge fund do not have to take the form of a portfolio investment (for instance, if a hedge fund is organized as a limited partnership), and hence countries may not include these investments in their reporting of security positions to SHS.

Our data from commercial sources (Morningstar, Lipper, and Factset) includes the security-level holdings of open-end mutual funds, exchange-traded funds (ETFs), and money market funds. By construction, these data sources do not contain the positions of hedge funds, separately managed accounts, or other forms of closed-end funds. In addition, there is no mandatory disclosure requirement to commercial data providers, so that coverage of mutual funds and ETFs is not complete.

The accuracy of the procedure in estimating individual Euro Area countries' positions after the unwind and the positions of the Rest of World relies on several assumptions. First, as discussed in Section B.3, we assume that the matched positions of individual countries are representative of the positions in funds that are unmatched. The closer this assumption is to holding, the more accurate our restatements of the positions for individual Euro Area countries will be. We manually inspected the funds that are not matched and they did not appear to be skewed in particular dimensions.

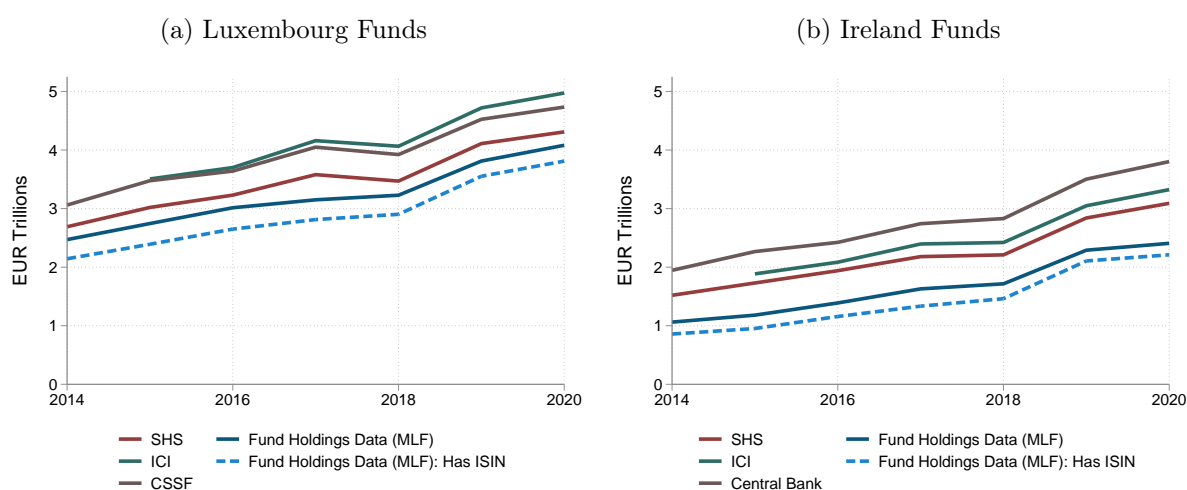
The second assumption underlying our restatement is that funds whose liabilities do not appear in SHS (i.e., the ownership of investment funds which are not classified as portfolio investment) are either relatively small or are primarily owned by investors from outside the Euro Area. Essentially, if in SHS

⁸Prior to the inception of CSDB, we rely on Factset only to perform the cleaning steps for the equity micro panel described in Section B.6. For Canadian equities prior to 2000, we complement the panel with aggregates from the World Federation of Exchanges (WFE) given an idiosyncratic lack of coverage in Worldscope.

⁹While the IMF data only covers the sovereign sector, in ongoing work we are extending the data to also include amounts for corporate bonds for countries not covered in the BIS and ONS panels, and we are integrating longer time series constructed from security-level micro data.

the owner's holdings of a fund do not appear on the asset side of an individual Euro Area country but the corresponding fund holdings do appear in the assets of the Luxembourg and Ireland fund sectors, then our procedure would ascribe those positions to the Rest of World, since RoW holdings are computed as a residual. This is not a concern if these positions are relatively small or if they are indeed owned by the Rest of World. To assess this concern, we compare the size of the assets under management (AUM) of the mutual funds (including ETFs and money market funds) to the total assets reported in SHS by the Luxembourg and Ireland fund sectors. If the latter reported assets vastly in excess of those of mutual funds, we would be more concerned about the presence of large funds not included in our commercial sources.

Figure A.II: The size of the Luxembourg and Ireland fund sectors



Notes: “Fund Holdings Data (MLF)” denotes the total AUM of open-end funds in the union of Morningstar, Lipper, and Factset. “Fund Holdings Data (MLF): Has ISIN” is the value of the holdings of positions with ISIN security identifiers. “SHS” corresponds to the total value of assets held by the investment fund sector in SHS. “ICI” corresponds to the AUM of the open-end fund sector according to the Investment Company Institute. “Central Bank” denotes the sum of AUM for investment funds and money market funds reported by the Central Bank of Ireland. “CSSF” denotes the AUM of investment funds in Luxembourg according to the Commission de Surveillance du Secteur Financier. All values in billions of euros.

In Figure A.II, we plot the total size of the fund sectors of Luxembourg and Ireland according to a variety of different sources. The line labeled “SHS” shows the total assets owned by the Irish and Luxembourg fund sectors in SHS. ICI stands for Investment Company Institute, the industry group for regulated investment funds. In the figure, the line labeled “ICI” corresponds to the total assets under management series from the ICI Factbook Table 65 (“Worldwide Regulated Open-End Funds: Total Net Assets”). The figure shows that the totals in SHS and ICI align well for both Ireland and Luxembourg, alleviating the concern that there might be other types of funds which account for a large portion of the managed assets. In addition, for Ireland, the line labeled “Central Bank of Ireland” plots the total AUM of investment funds using data from the Central Bank of Ireland. In the case of Luxembourg, we plot data from CSSF on the total size of the investment fund sector.

Finally, for both countries, we plot the value of the holdings that we observe directly in the fund holdings data from Morningstar, Lipper, and Factset. In 2020, the total value of positions in the union of Morningstar, Lipper, and Factset which have ISIN security identifiers covers 88% of total SHS positions for Luxembourg and 72% for Ireland. Since our match rate (conditional on observing a fund share holding in SHS) is 80.2% for Luxembourg and 84.5% for Ireland, once we apply our assumption that the matched

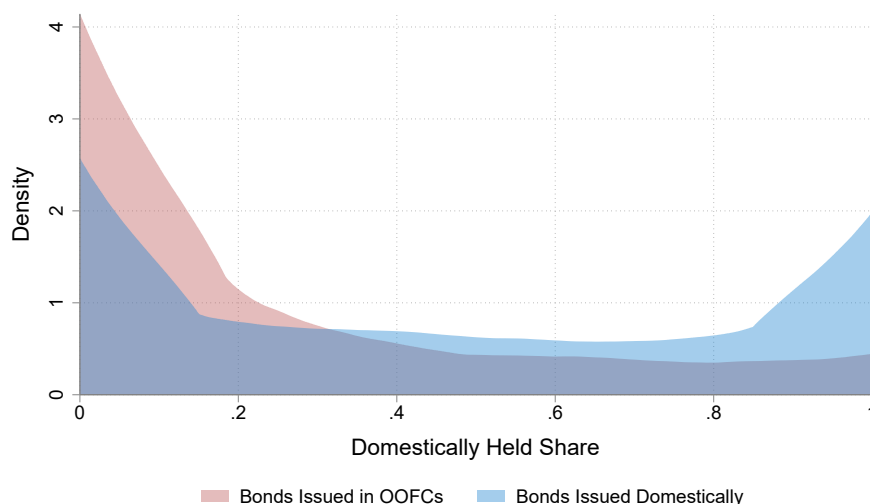
funds are representative of the unmatched positions in the commercial data, the total value of holdings we unwind is close to the total assets reported by ICI and by the regulators (the Central Bank of Ireland and CSSF, respectively). Therefore, while there remains a gap between the total holdings from official sources and our unwind, it is relatively small.

It is important to emphasize that the Rest of World, being measured as a residual, absorbs any potential positions held by funds whose assets are in SHS but whose liabilities are not. In the case of Ireland, we have direct evidence of such funds. In particular, as discussed in the main text, UK investors own Liability-Driven Investment (LDI) funds resident in Ireland, and these are precisely the types of vehicles that are unlikely to be included in the commercial data on open-end funds, so this points towards ascribing the residual to foreign investors (which in this particular case is in fact the correct conclusion). In the case of Luxembourg, there is less evidence pointing towards Rest of World investors, but importantly the remaining gap is also smaller than in the case of Ireland, and therefore it is less likely to affect our restatements quantitatively.

E The Allocative Effects of OOFIC Use Among Firms

In this section, we study the consequences that OOFIC usage has for capital allocation in the cross-section of Euro Area firms. Financial integration in the Euro Area skews heavily towards those firms that use OOFIC financing structures to raise bond capital from investors, a pattern which we establish not only by examining capital allocation across firms, but also by exploiting within-firm variation—which is made possible by the fact that many large European firms issue bonds through financing subsidiaries resident in multiple jurisdictions.

Figure A.III: Bonds issued in OOFICs are held much more widely across borders



Notes: For each bond issued by a European ultimate parent firm in the sample, we compute the share held by domestic investors, after accounting for indirect holdings through our fund unwind step. The *blue density* shows kernel estimates of the distribution of domestically held shares for bonds issued via domestic entities, while the *red density* shows the same but for bonds issued through OOFIC affiliates. The data is shown as of 2020, and ultimate parent firms with nationality in Luxembourg, Ireland, or the Netherlands are excluded.

Figure A.III looks at the cross-section of bonds issued by Euro Area ultimate parent firms, and it

shows a dramatic divergence in the likelihood that domestic investors (those whose residency corresponds to the firms' nationality) hold bonds issued in the firms' domestic resident jurisdictions versus via financing vehicles resident in OOFCS.¹⁰ The blue density shows a kernel estimate of the distribution of the domestically held share for the former bonds (those held domestically), while the red density shows a kernel estimate for the latter type (those issued in OOFCS). The red distribution is clearly much more concentrated towards its lower boundary, implying that most bonds issued in OOFCS are not held by domestic investors, in contrast with domestically issued bonds. The average domestically held share is 23 percent in the red distribution, while it is 44 percent in the blue distribution, nearly twice as large.

Bonds issued in European OOFCS are therefore held far more widely across borders, so that European financial integration is concentrated in firms that have OOFCS financing subsidiaries. This pattern could in principle be due to both selection and treatment effects: while it might be that if a bond is issued in a European OOFCS, that causes the bond to be relatively more attractive to non-domestic investors, it may also be simply the case that non-domestic investors prefer firms with unobserved characteristics that also independently make those firms more likely to raise capital through OOFCS. To resolve this, we turn to within-firm variation, comparing bonds that are issued by the same firms but in different residencies.

Since this approach requires the use of high-dimensional fixed effects, we deviate here from the approach of comparing empirical portfolio shares to CAPM-implied portfolio shares used in the preceding sections. Rather, to make estimation practical, we use a Poisson Pseudo-Maximum Likelihood estimator (PPML), as in [Silva and Tenreyro \(2006\)](#), which allows us to model a multiplicative impact of characteristics on portfolio shares (as in a log-linear model, and consistent with our preceding analysis) while accommodating zero shares and a high number of fixed effects.

Specifically, we let $\theta_{k,i,t}$ be the share of bonds by firm k issued through subsidiaries resident in country i that are held domestically as of year t . The specification estimated through PPML is then

$$\theta_{k,i,t} = \exp\{\alpha_t + \gamma_k + X_{k,i,t}\beta\} + \varepsilon_{k,i,t}, \quad (\text{A.11})$$

where $X_{k,i,t}$ is a vector of characteristics associated with the observation $\theta_{k,i,t}$. In particular, we include in the vector $X_{k,i,t}$ a set of mutually exclusive (and collectively exhaustive) dummies capturing the countries of residency of the immediate entities issuing the bonds: (1) an *OOFCS* dummy takes the value of one if the country of residency i is Luxembourg, Ireland, or the Netherlands; (2) a *rest of the Euro Area* dummy takes the value of one if the country of residency i is in the Euro Area but is not an OOFCS and does not correspond to firm k 's domestic jurisdiction; and (3) a *rest of the world (ROW)* dummy takes the value of one if the country of residency i is outside of the Euro Area. The excluded indicator is therefore the *domestic dummy*, capturing whether the bond is issued in the ultimate parent firm's domestic jurisdiction—so that all effects are estimated relative to domestically-issued bonds. The inclusion of firm fixed effects γ_k at the ultimate parent level in this specification is crucial, as it absorbs any selection that might be due to firm characteristics.

Table [A.I](#) reports the estimates from the PPML estimator applied to the specification in equation [\(A.11\)](#), using the full panel of observations for the years 2014 through 2020. We restrict the sample to Euro-denominated bonds, as foreign-currency denominated bonds are often not targeted towards Euro Area investors' holdings. We show the estimated marginal effects, $\hat{m} = e^{\hat{\beta}} - 1$, as we vary the extent of fixed-effects saturation in the empirical specification. The estimated marginal effect in the saturated

¹⁰To achieve a clear distinction between domestic issuances and OOFCS issuances, this figure excludes ultimate parent firms with nationality corresponding to Luxembourg, Ireland, or the Netherlands.

specification is $\hat{m} = -.33$: given the specification, the marginal effect takes on a semi-elasticity interpretation, implying that being issued by an entity in an OOF jurisdiction causes on average a 33 percent reduction in the share of the bond that is held domestically.

Table A.I: **Within-firm allocative effects**

	Domestically Held Share ($\theta_{k,i,t}$)	
	(1)	(2)
OOFC Dummy [†]	-.48*** (.04)	-.33*** (.06)
Firm FE	N	Y
Year FE	Y	Y
Nationality FE	Y	Y
Identifying Observations	12,930	11,827
R^2	.22	.84

[†] Marginal effect $e^{\hat{\beta}} - 1$ shown

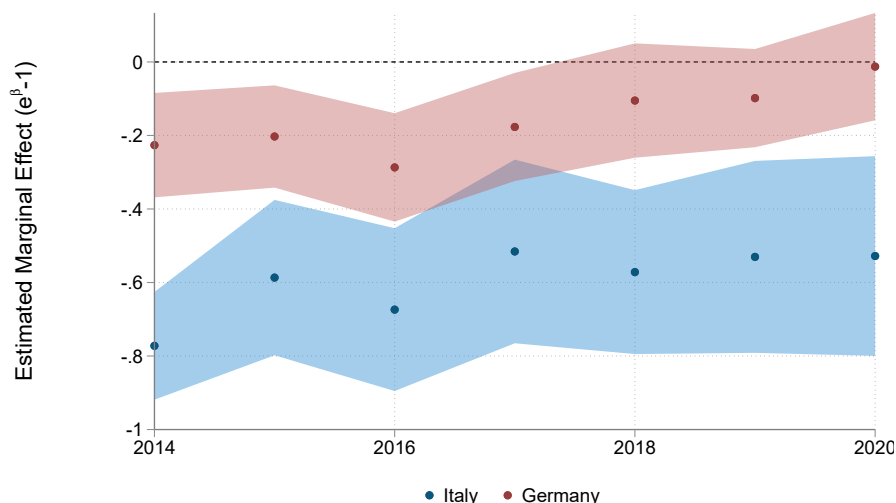
Notes: We estimate the specification in equation (A.11), which regresses the domestically held share $\theta_{k,i,t}$ of Euro-denominated bonds by firm k issued in residency i in year t on dummies capturing issuance location categories. We show the estimated marginal effect for the OOFC dummy, and the specification also includes dummies for residency i in the rest of the Euro Area (excluding the firm's domestic jurisdiction) and the rest of the world. The excluded category corresponds to domestically issued bonds. We include fixed effects for ultimate parent firm, year, and ultimate parent firm nationality. All specifications use the Poisson pseudo-maximum likelihood (PPML) estimator, as in [Silva and Tenreiro \(2006\)](#), and they are weighted by the log of the total amount outstanding for bonds in a given (k, i, t) category. Standard errors for the estimated PPML coefficient $\hat{\beta}$ are clustered at the firm level, and they are converted to standard errors on marginal effects $\hat{m} = \exp\{\hat{\beta}\} - 1$ via the delta method. Ultimate parent firms with nationality in Luxembourg, Ireland, or the Netherlands are excluded. * $p < .1$, ** $p < .05$, *** $p < .01$.

To better understand these magnitudes, consider that the average domestic share $\theta_{k,i,t}$ in the sample for German and Italian firms is, respectively, 45 and 61 percentage points: therefore the estimated multiplicative 33 percent marginal effect from the homogeneous-effects model would imply a reduction in the domestic share of 15 percentage points for German firms, and of 20 percentage points for Italian firms. Importantly, the estimates are similar (although naturally somewhat larger in magnitude) when we exclude the firm fixed effects, with a point estimate of $\hat{m} = -.48$ in the non-saturated specification. This evidence is consistent with the interpretation that the aggregate pattern seen in Figure A.III is in large part due to treatment rather than selection: the legal, regulatory, and withholding tax environment in OOFs makes foreign investors more likely to hold securities issued in these jurisdictions.

Disaggregating the estimates shown in Table A.I further reveals interesting heterogeneity in this treatment effect across countries. We display this heterogeneity in Figure A.IV, where we plot the estimates, again done year-by-year, separately for German firms (in *red*) and for Italian firms (in *blue*). The heterogeneous-treatment estimates for Italy are much larger in magnitude than those for Germany: issuance in a European OOF lowers the domestically share of Italian firms' bonds by a large amount, about 70 percent on average, while the corresponding effect for German firms is about 20 percent on average. This form of heterogeneity may reflect investors' economic rationales. While we cannot conclusively prove this, it may be the case that foreign investors are particularly averse to the legal environment surrounding bonds issued domestically in Southern European countries such as Italy. For example, investors outside of Italy may be especially wary of potential bankruptcy proceedings in Italian courts,

preferring instead the bankruptcy regulations associated with Dutch-resident issuing entities, while being less cautious of the better-functioning German courts.

Figure A.IV: **Within-firm allocative effects: Italy vs. Germany**



Notes: We plot the estimated marginal effects for the same specification as in Table A.I, inclusive of firm fixed effects, but for the two subsamples of Italian (*blue estimates*) and German (*red estimates*) ultimate parent firms. The estimates are done separately for each year in the sample. We show point estimates and the corresponding 95% confidence band. Standard errors for the estimated PPML coefficient $\hat{\beta}$ are clustered at the firm level, and they are converted to standard errors on marginal effects $\hat{m} = e^{\hat{\beta}} - 1$ via the delta method.

Regardless of the underlying economic mechanism driving the heterogeneity across countries, however, it holds true that the use of financing structures in OOFs helps European firms overcome some of the frictions in cross-border financial integration, and that this is particularly true for firms in certain Southern European countries such as Italy, as opposed to German firms. In this sense, capital allocation in Europe is not neutral to the presence of corporate financing affiliates in OOFs, as firms' access to foreign investors and bondholder composition are strongly shaped by the decision to set up such a structure or not. To the extent that setting up OOF financing affiliates involves fixed costs (as in the costs of hiring specialists in international tax and financial planning), the effects we have documented here might skew capital markets integration towards those firms that are largest, most productive, and most sophisticated.

Table A.II: Restated bilateral external statistics: Italy's bond investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
France	106	119	142	153	+44%
Germany	55	65	80	93	+69%
Greece	3	3	4	4	+36%
Spain	107	111	125	131	+23%
Italy (Domestic)	1394	1396	1438	1447	+4%
B. Non-EA					
Argentina	2	2	2	3	+59%
Australia	5	6	7	8	+75%
Brazil	1	2	3	4	+387%
Canada	3	3	6	6	+140%
China	2	4	5	12	+595%
India	0	1	1	3	+1,718%
Indonesia	2	2	5	5	+174%
Japan	11	13	18	21	+91%
Mexico	6	6	10	11	+86%
Russia	1	2	2	4	+348%
Saudi Arabia	1	1	2	2	+87%
South Africa	1	1	3	3	+213%
South Korea	1	1	2	2	+98%
Turkey	2	2	3	3	+113%
United Kingdom	35	32	55	54	+56%
United States	83	87	152	158	+89%
C. Non-OOFC tax havens					
Bermuda	0	0	1	1	+230%
Cayman Islands	1	0	6	1	-33%
Curacao	0	0	0	0	+0%
Guernsey	1	0	1	0	-48%
Hong Kong	0	1	1	2	+578%
Jersey	3	1	4	2	-39%
Panama	0	0	1	1	+205%
British Virgin Islands	1	0	2	0	-48%
D. OOFCs					
Ireland	21	17	26	20	-1%
Luxembourg	20	8	31	12	-42%
Netherlands	51	24	74	34	-33%

Notes: This table shows estimates of the restated bond investments of Italian investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “*Nationality Adj.*” shows the positions after adjusting securities from a residency to a nationality basis. The column “*Funds Adj.*” shows the positions after unwinding the holdings of Italian investors through Luxembourg and Ireland funds. The column “*Both*” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Table A.III: Restated bilateral external statistics: Italy's equity investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
France	56	56	79	79	+41%
Germany	20	19	36	35	+74%
Greece	0	0	0	0	+86%
Spain	4	4	8	8	+126%
Italy (Domestic)	595	602	611	609	+2%
B. Non-EA					
Argentina	0	0	0	0	+124%
Australia	1	1	3	4	+301%
Brazil	0	0	2	2	+893%
Canada	2	2	5	6	+270%
China	0	3	7	24	+6,748%
India	0	0	5	4	+2,758%
Indonesia	0	0	1	1	+2,651%
Japan	4	4	17	18	+343%
Mexico	0	0	1	1	+1,228%
Russia	0	0	1	1	+844%
Saudi Arabia	0	0	0	0	+1,164,483%
South Africa	0	0	1	2	+1740%
South Korea	1	1	5	5	+901%
Turkey	0	0	0	0	+4,122%
United Kingdom	9	12	24	29	+206%
United States	51	51	165	166	+226%
C. Non-OOFC tax havens					
Bermuda	0	0	2	0	+28%
Cayman Islands	3	0	19	0	-86%
Curacao	0	0	0	0	+0%
Guernsey	0	0	0	0	+111%
Hong Kong	0	0	3	4	+1,043%
Jersey	1	0	2	0	-90%
Panama	0	0	0	0	-77%
British Virgin Islands	0	0	0	0	+78%
D. OOFCs					
Ireland	152	152	24	24	-84%
Luxembourg	665	666	34	36	-95%
Netherlands	20	12	24	21	+2%

Notes: This table shows estimates of the restated equity and fund share investments of Italian investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “Nationality Adj.” shows the positions after adjusting securities from a residency to a nationality basis. The column “Funds Adj.” shows the positions after unwinding the holdings of Italian investors through Luxembourg and Ireland funds. The column “Both” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Table A.IV: Restated bilateral external statistics: Germany's portfolio investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
France	448	432	491	475	+6%
Italy	122	141	138	159	+30%
Greece	5	6	6	6	+19%
Spain	149	145	162	159	+7%
Germany (Domestic)	4129	4177	4202	4257	+3%
B. Non-EA					
Argentina	1	1	1	1	+49%
Australia	33	40	38	46	+42%
Brazil	5	8	8	12	+154%
Canada	82	82	92	93	+13%
China	15	47	25	76	+416%
India	6	7	13	14	+120%
Indonesia	8	8	10	10	+35%
Japan	45	54	69	80	+79%
Mexico	15	16	18	19	+31%
Russia	6	10	9	13	+112%
Saudi Arabia	3	4	4	5	+49%
South Africa	4	7	7	11	+158%
South Korea	12	12	20	20	+71%
Turkey	4	3	5	5	+33%
United Kingdom	197	210	232	242	+23%
United States	509	523	677	691	+36%
C. Non-OOFC tax havens					
Bermuda	3	2	4	2	-18%
Cayman Islands	33	4	53	4	-87%
Curacao	1	1	1	1	+0%
Guernsey	3	0	3	0	-87%
Hong Kong	8	11	12	16	+118%
Jersey	13	6	16	8	-42%
Panama	2	2	3	2	-10%
British Virgin Islands	5	1	7	1	-77%
D. OOFCs					
Ireland	237	218	113	96	-60%
Luxembourg	677	641	160	109	-84%
Netherlands	285	188	307	203	-29%

Notes: This table shows estimates of the restated total portfolio investments across all assets class of German investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “*Nationality Adj.*” shows the positions after adjusting securities from a residency to a nationality basis. The column “*Funds Adj.*” shows the positions after unwinding the holdings of German investors through Luxembourg and Ireland funds. The column “*Both*” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Table A.V: Restated bilateral external statistics: Germany's bond investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
France	343	328	365	349	+2%
Italy	110	129	122	142	+29%
Greece	2	3	2	3	+41%
Spain	121	132	130	142	+17%
Germany (Domestic)	877	937	912	978	+11%
B. Non-EA					
Argentina	1	1	1	1	+47%
Australia	27	33	29	35	+30%
Brazil	3	6	4	8	+184%
Canada	68	68	70	70	+4%
China	9	23	11	29	+219%
India	3	4	4	5	+62%
Indonesia	7	7	9	9	+29%
Japan	21	26	26	32	+53%
Mexico	14	15	16	18	+28%
Russia	3	6	4	8	+164%
Saudi Arabia	3	4	3	4	+37%
South Africa	3	4	4	5	+102%
South Korea	4	4	5	5	+26%
Turkey	3	3	4	4	+36%
United Kingdom	151	139	162	150	-1%
United States	277	282	313	319	+15%
C. Non-OOFC tax havens					
Bermuda	1	1	2	2	+8%
Cayman Islands	14	3	17	3	-76%
Curacao	1	1	1	1	+0%
Guernsey	2	0	2	0	-98%
Hong Kong	3	6	4	6	+87%
Jersey	11	6	13	8	-33%
Panama	2	2	3	2	-1%
British Virgin Islands	5	1	6	1	-80%
D. OOFCs					
Ireland	66	57	70	60	-9%
Luxembourg	84	52	104	55	-35%
Netherlands	239	150	253	155	-35%

Notes: This table shows estimates of the restated bond investments of German investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “*Nationality Adj.*” shows the positions after adjusting securities from a residency to a nationality basis. The column “*Funds Adj.*” shows the positions after unwinding the holdings of German investors through Luxembourg and Ireland funds. The column “*Both*” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Table A.VI: Restated bilateral external statistics: Germany's equity investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
France	105	104	126	125	+20%
Italy	12	13	15	16	+42%
Greece	3	3	3	3	+6%
Spain	28	14	32	18	-37%
Germany (Domestic)	3252	3240	3290	3280	+1%
B. Non-EA					
Argentina	0	0	0	0	+117%
Australia	5	7	9	11	+102%
Brazil	2	2	5	4	+114%
Canada	15	15	22	22	+51%
China	6	23	14	47	+724%
India	3	3	9	9	+181%
Indonesia	1	1	2	1	+106%
Japan	24	28	44	48	+102%
Mexico	1	1	1	1	+109%
Russia	3	3	5	5	+62%
Saudi Arabia	0	0	1	1	+407%
South Africa	1	3	3	5	+268%
South Korea	8	8	15	15	+92%
Turkey	0	0	1	1	+17%
United Kingdom	46	71	70	92	+101%
United States	232	242	364	372	+60%
C. Non-OOFC tax havens					
Bermuda	1	0	3	1	-46%
Cayman Islands	19	1	36	1	-95%
Curacao	0	0	0	0	+0%
Guernsey	0	0	0	0	-27%
Hong Kong	4	6	8	10	+143%
Jersey	2	0	3	0	-99%
Panama	0	0	0	0	-90%
British Virgin Islands	0	0	0	0	-9%
D. OOFCs					
Ireland	171	161	43	36	-79%
Luxembourg	593	589	56	54	-91%
Netherlands	46	38	54	47	+2%

Notes: This table shows estimates of the restated equity and fund share investments of German investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “*Nationality Adj.*” shows the positions after adjusting securities from a residency to a nationality basis. The column “*Funds Adj.*” shows the positions after unwinding the holdings of German investors through Luxembourg and Ireland funds. The column “*Both*” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Table A.VII: Restated bilateral external statistics: France's portfolio investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
Italy	197	238	208	249	+27%
Germany	207	250	226	272	+31%
Greece	2	3	3	3	+20%
Spain	174	187	183	196	+13%
France (Domestic)	5406	5327	5433	5361	-1%
B. Non-EA					
Argentina	0	0	1	1	+74%
Australia	30	36	32	38	+29%
Brazil	6	6	7	8	+43%
Canada	25	28	28	32	+26%
China	12	45	17	60	+404%
India	11	13	14	16	+41%
Indonesia	3	2	4	4	+48%
Japan	91	99	101	109	+19%
Mexico	8	12	10	14	+65%
Russia	1	2	2	3	+195%
Saudi Arabia	1	1	1	2	+95%
South Africa	2	4	3	6	+194%
South Korea	12	12	15	16	+29%
Turkey	1	2	2	2	+41%
United Kingdom	209	260	236	278	+33%
United States	348	368	424	444	+28%
C. Non-OOFC tax havens					
Bermuda	2	1	2	1	-7%
Cayman Islands	19	3	29	3	-83%
Curacao	1	1	1	1	+0%
Guernsey	3	1	3	1	-72%
Hong Kong	6	6	8	8	+40%
Jersey	9	1	10	1	-86%
Panama	0	0	1	0	-18%
British Virgin Islands	3	1	4	1	-70%
D. OOFCs					
Ireland	124	104	74	55	-55%
Luxembourg	420	329	170	64	-85%
Netherlands	258	166	269	176	-32%

Notes: This table shows estimates of the restated total portfolio investments across all assets class of French investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “*Nationality Adj.*” shows the positions after adjusting securities from a residency to a nationality basis. The column “*Funds Adj.*” shows the positions after unwinding the holdings of French investors through Luxembourg and Ireland funds. The column “*Both*” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Table A.VIII: Restated bilateral external statistics: France's bond investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
Italy	167	207	173	215	+28%
Germany	127	159	133	167	+32%
Greece	2	2	2	2	+19%
Spain	153	167	157	172	+13%
France (Domestic)	2405	2397	2407	2409	+0%
B. Non-EA					
Argentina	0	0	1	1	+79%
Australia	28	32	29	33	+18%
Brazil	2	2	2	4	+96%
Canada	23	26	24	27	+18%
China	3	24	4	27	+827%
India	0	2	1	2	+525%
Indonesia	1	1	2	2	+91%
Japan	78	85	79	87	+12%
Mexico	7	11	9	12	+68%
Russia	0	1	1	2	+418%
Saudi Arabia	1	1	1	1	+92%
South Africa	1	1	1	2	+169%
South Korea	6	7	7	7	+10%
Turkey	1	1	2	2	+47%
United Kingdom	158	171	172	177	+12%
United States	243	257	262	278	+14%
C. Non-OOFC tax havens					
Bermuda	0	1	1	1	+82%
Cayman Islands	5	2	7	2	-60%
Curacao	0	0	0	0	+0%
Guernsey	2	0	2	0	-94%
Hong Kong	3	2	3	3	+3%
Jersey	6	1	7	1	-81%
Panama	0	0	1	0	-26%
British Virgin Islands	2	0	3	0	-78%
D. OOFCs					
Ireland	51	36	54	38	-27%
Luxembourg	135	33	151	34	-75%
Netherlands	202	107	209	110	-45%

Notes: This table shows estimates of the restated bond investments of French investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “*Nationality Adj.*” shows the positions after adjusting securities from a residency to a nationality basis. The column “*Funds Adj.*” shows the positions after unwinding the holdings of French investors through Luxembourg and Ireland funds. The column “*Both*” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Table A.IX: Restated bilateral external statistics: France's equity investments

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			Δ
		Nationality Adj.	Funds Adj.	Both	
A. Euro Area Countries					
Italy	29	31	34	34	+17%
Germany	80	91	94	104	+30%
Greece	0	0	0	0	+27%
Spain	21	20	25	24	+12%
France (Domestic)	3001	2931	3026	2952	-2%
B. Non-EA					
Argentina	0	0	0	0	+11%
Australia	2	4	3	5	+223%
Brazil	4	4	5	5	+18%
Canada	2	2	4	4	+137%
China	9	21	14	33	+267%
India	11	11	14	14	+24%
Indonesia	1	1	2	2	+12%
Japan	14	14	22	22	+62%
Mexico	1	1	1	1	+39%
Russia	1	1	1	1	+89%
Saudi Arabia	0	0	0	0	+114%
South Africa	1	3	2	4	+207%
South Korea	6	6	9	9	+50%
Turkey	0	0	1	1	+25%
United Kingdom	51	90	64	101	+99%
United States	105	111	162	167	+58%
C. Non-OOFC tax havens					
Bermuda	1	0	2	1	-47%
Cayman Islands	14	1	22	1	-91%
Curacao	1	1	1	1	+0%
Guernsey	1	1	1	1	-4%
Hong Kong	3	3	5	5	+75%
Jersey	3	0	4	0	-99%
Panama	0	0	0	0	+651%
British Virgin Islands	1	0	1	0	-49%
D. OOFCs					
Ireland	72	68	21	18	-75%
Luxembourg	285	296	19	30	-90%
Netherlands	56	59	60	66	+17%

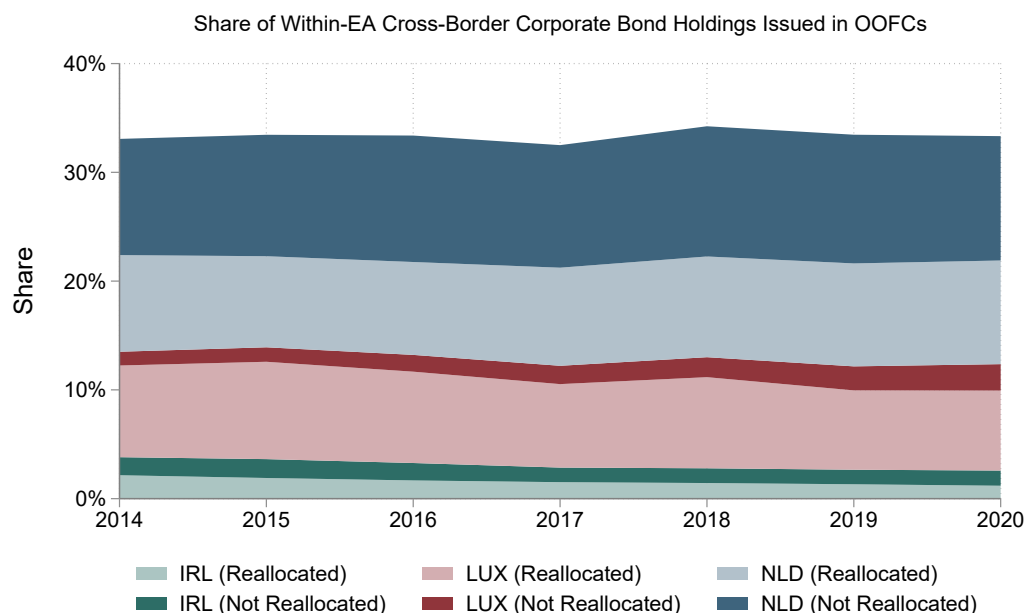
Notes: This table shows estimates of the restated equity and fund share investments of French investors. We compare these to the official positions in the IMF Coordinated Portfolio Investment Survey (CPIS). The column “*Nationality Adj.*” shows the positions after adjusting securities from a residency to a nationality basis. The column “*Funds Adj.*” shows the positions after unwinding the holdings of French investors through Luxembourg and Ireland funds. The column “*Both*” applies both adjustments simultaneously. The final column shows the percentage change from the official CPIS data to the fully adjusted data. All data are for the end of 2020.

Table A.X: Equity home bias regressions with fund shares

Equities & Fund Shares	
EA Direct	
$\hat{\beta}_{\text{RoW}}$.20*** (.06)
$\hat{\beta}_{\text{REA}}$	1.63*** (.28)
$\hat{\beta}_{\text{Home}}$	18.98*** (2.88)
Obs.	2,006
R^2	.53

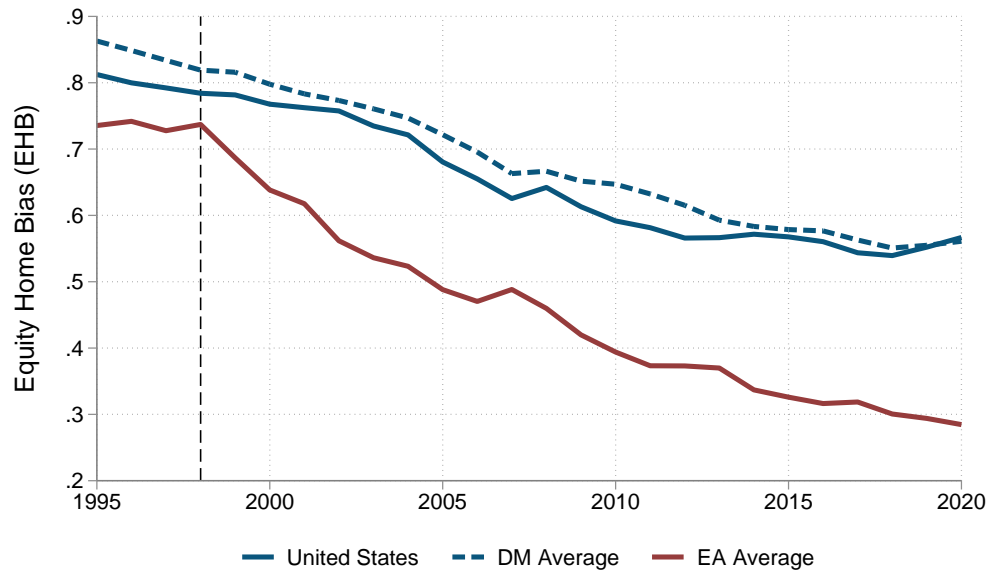
Notes: We provide a version of the regression estimates of Table 4a which mirrors the standard calculation of aggregate home bias by including foreign fund shares in the calculation of equity holdings. We follow the regressions specification in equation (8), but since we do not have the market weight of all global funds, we run the regression at the aggregate country-pair level rather than the country-security level. We find that after including fund share holdings, home bias estimated in this way is biased down from the results in Table 4a.

Figure A.V: The OOFCS' role in securities issuance



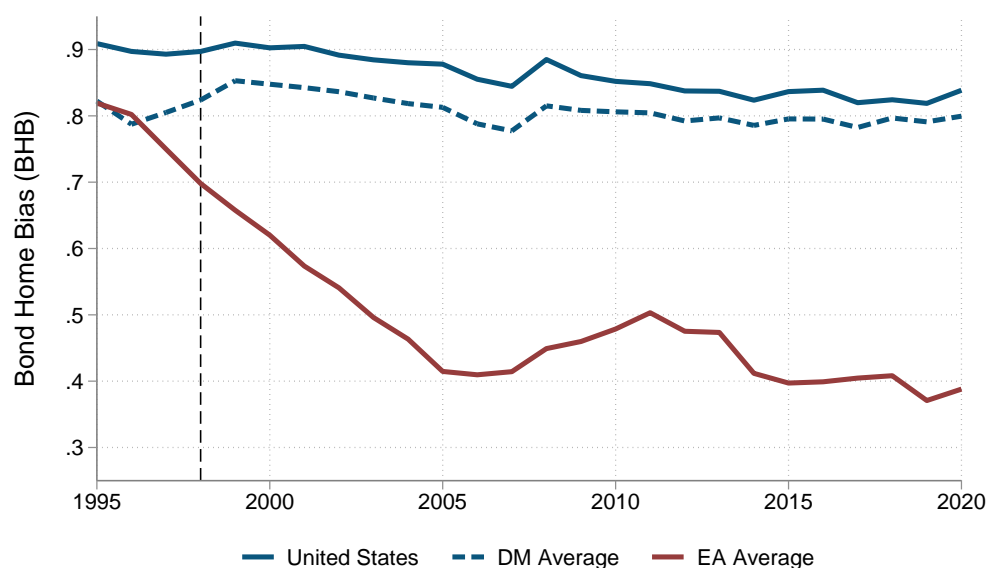
Notes: This figure considers the set of all cross-border holdings of corporate bonds within the Euro Area observed in SHS. We plot the share of these cross-border positions that are in bonds issued in the Netherlands (blue area), Luxembourg (red area), and Ireland (green area). Light shades correspond to bonds that are reallocated away from the OOFCS on a nationality basis, while dark shades correspond to bonds that are not reallocated. We include bonds issued by ultimate parent firms with nationality in the Euro Area, and a position is classified as cross-border if the residency of the bond's immediate issuer is not equal to the investor's.

Figure A.VI: Equity home bias trend: other developed economies



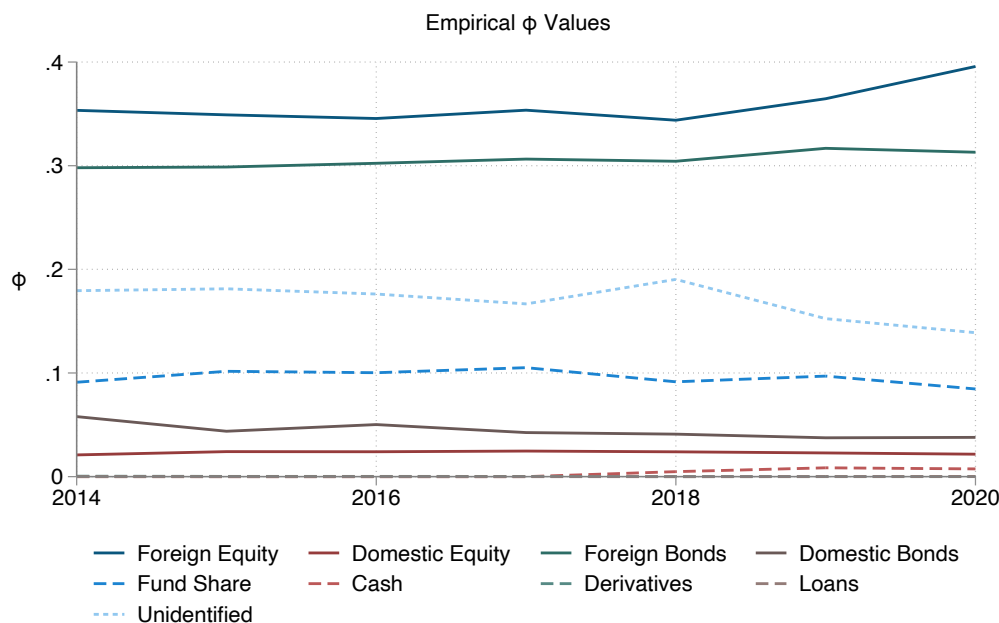
Notes: The dashed blue line displays average equity home bias for a set of non-EA developed economies: the United States, Canada, Great Britain, Japan, Switzerland, Australia, New Zealand, South Korea, and Norway.

Figure A.VII: Bond home bias trend: other developed economies



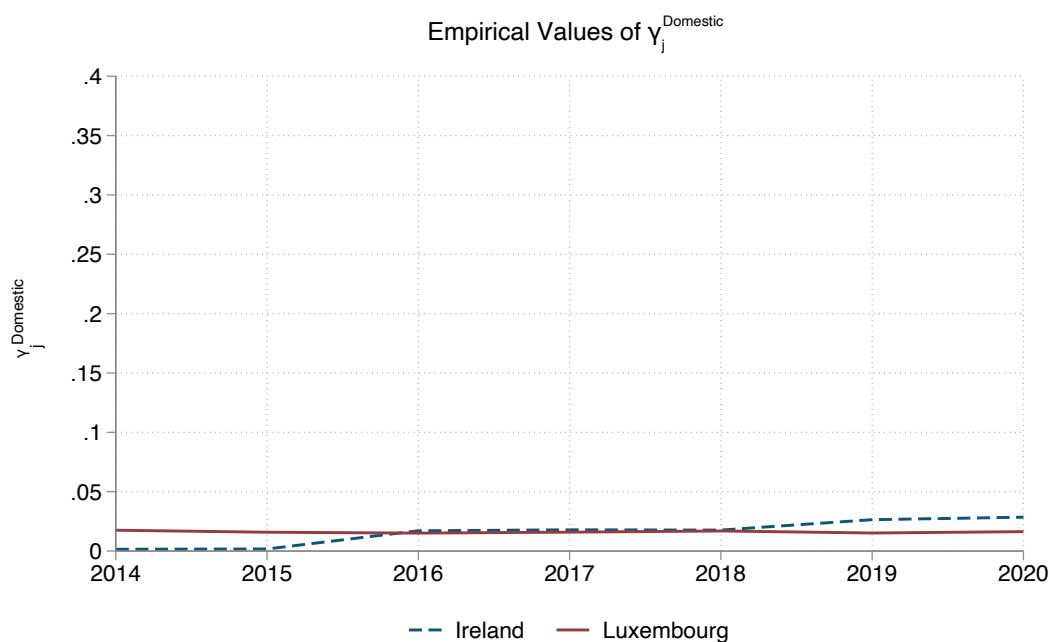
Notes: The dashed blue line displays average bond home bias for a set of non-EA developed economies: the United States, Canada, Great Britain, Japan, Switzerland, Australia, New Zealand, South Korea, and Norway.

Figure A.VIII: Empirical ϕ values for home bias estimation.



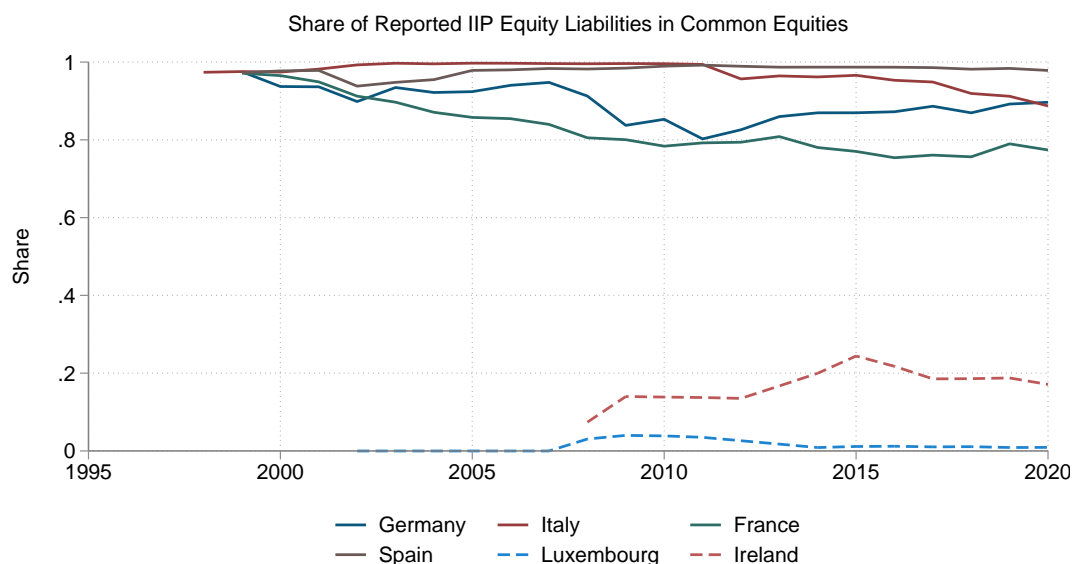
Notes: We plot the composition of the assets held by Euro Area countries via Luxembourg and Ireland funds, which constitute the vectors $\phi_{j,t}$ used in our aggregate home bias analysis. These are estimated using our fund unwind methodology. We break down the assets into mutually exclusive categories: foreign equities, domestic equities, foreign bonds, domestic bonds, fund shares, cash, derivatives, and loans. The unidentified category corresponds to fund assets which do not have an ISIN code (such as cash instruments that lack a securities identifier) or do not have an identifiable asset class (using the classification algorithm of Appendix Section B.2). We plot the average value of $\phi_{j,t}$ across Euro Area countries, excluding Luxembourg and Ireland themselves, weighted by the size of their external IIP fund share assets.

Figure A.IX: Empirical $\gamma_j^{\text{Domestic}}$ values for home bias estimation.



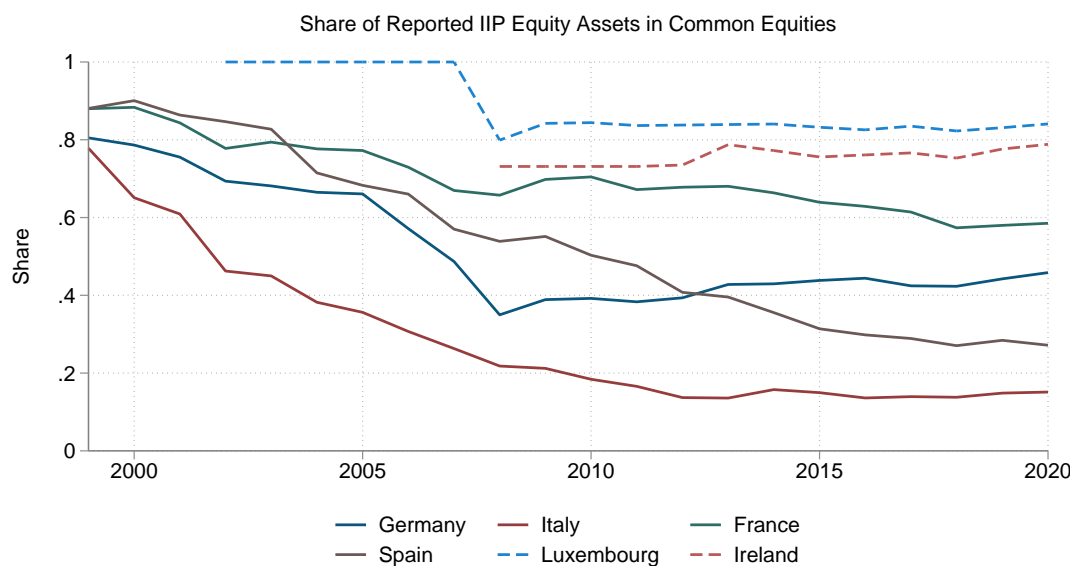
Notes: We plot the share $\gamma_j^{\text{Domestic}}$ of fund assets owned by domestic investors for Luxembourg and Ireland in the SHS data.

Figure A.X: **Breakdown of reported composition of IIP equity liabilities.**



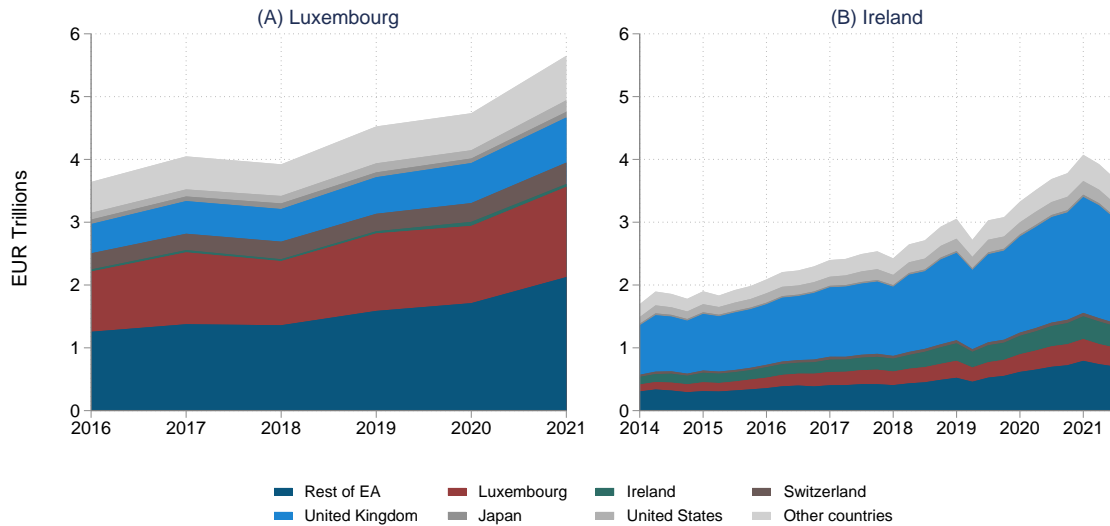
Notes: We plot the share of each country's equity liabilities that are in common equities in the IIP data provided by the European Central Bank, for the years in which the split between common equities and fund shares is available.

Figure A.XI: **Breakdown of reported composition of IIP equity assets.**



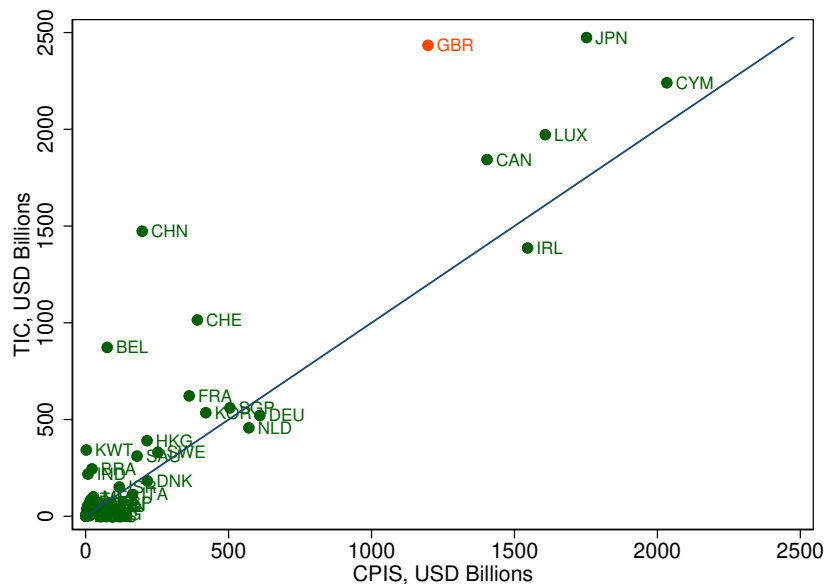
Notes: We plot the share of each country's equity assets that are in common equities in the IIP data provided by the European Central Bank, for the years in which the split between common equities and fund shares is available.

Figure A.XII: Geography of investors' holdings in fund shares



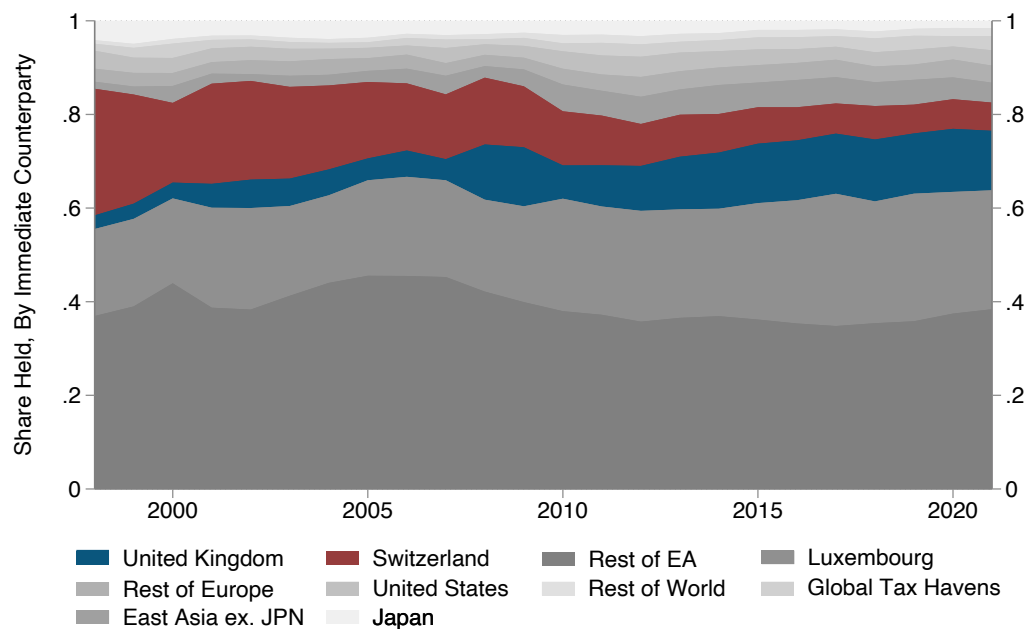
Notes: We use data from the Central bank of Ireland and the Luxembourg Commission de Surveillance du Secteur Financier (CSSF) to decompose the assets of Ireland and Luxembourg funds according to the immediate counterpart owners of the fund shares.

Figure A.XIII: Claims on US in TIC vs. CPIS



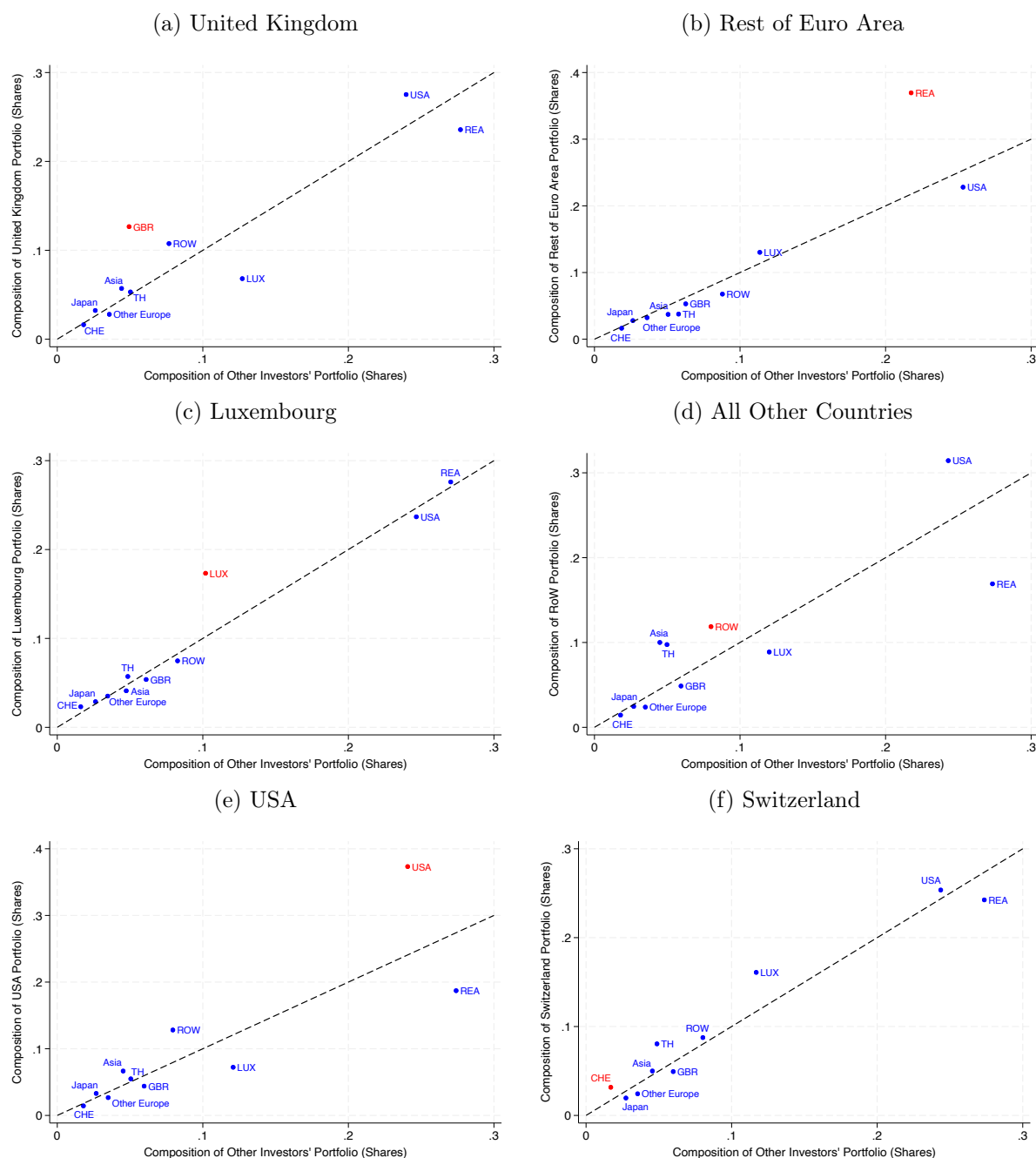
Notes: The vertical axis shows how much the US reports owing to each country in the Treasury International Capital (TIC) data, while the horizontal axis shows how much each country claims on the United States in CPIS. Data shown as of June 2022.

Figure A.XIV: Ownership of Luxembourg funds: from Switzerland to the UK



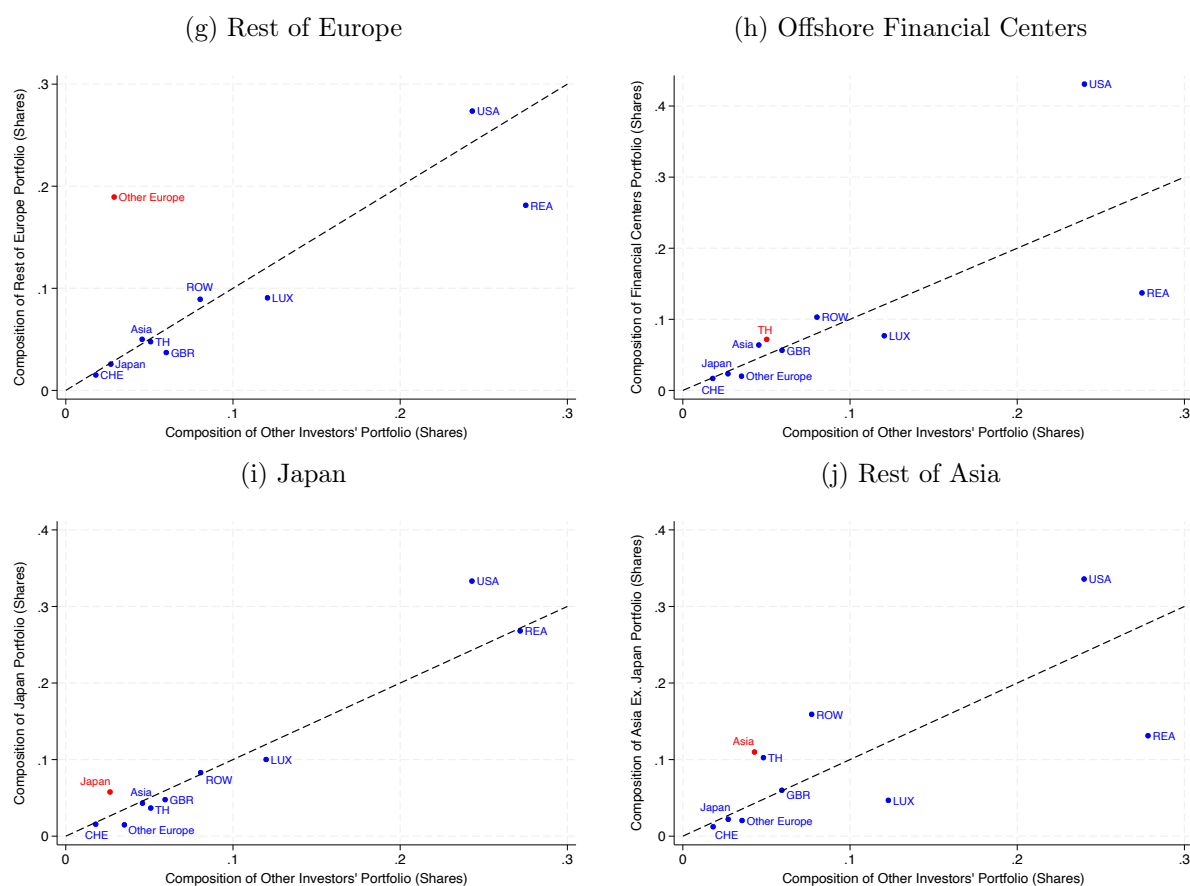
Notes: We show a longer time series of ownership of Luxembourg funds on an immediate counterparty basis, using data from CSSF which is provided at a coarser level of geographical aggregation.

Figure A.XV: Composition of portfolios via Luxembourg funds, by immediate counterparty



Notes: This figure uses the administrative data from CSSF to plot, on the vertical axis, the geographical composition of the portfolios held via Luxembourg funds by each investor country or region on an immediate counterparty basis. On the horizontal axis, we show the geographical composition of the portfolios owned by all other investors. Data from end of year 2020.

Figure A.XV: Composition of portfolios via Luxembourg funds, by immediate counterparty (continued)



Notes: This figure uses the administrative data from CSSF to plot, on the vertical axis, the geographical composition of the portfolios held via Luxembourg funds by each investor country or region on an immediate counterparty basis. On the horizontal axis, we show the geographical composition of the portfolios owned by all other investors. Data from end of year 2020.

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