The Geography of Capital Allocation in the Euro Area

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March 2024

Abstract

We assess the pattern of Euro Area financial integration adjusting for the role of "on-shore 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-á-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, Offshore and Onshore Financial Centers, Capital Markets Union, Residency and Nationality, Home Bias, Home Currency Bias.

JEL Codes: F3, F4, G2, G3.

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.[1] Yet 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. 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 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. 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, as compared to what can be ascertained using routinely available 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 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.[2] One might

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[1]There 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.

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

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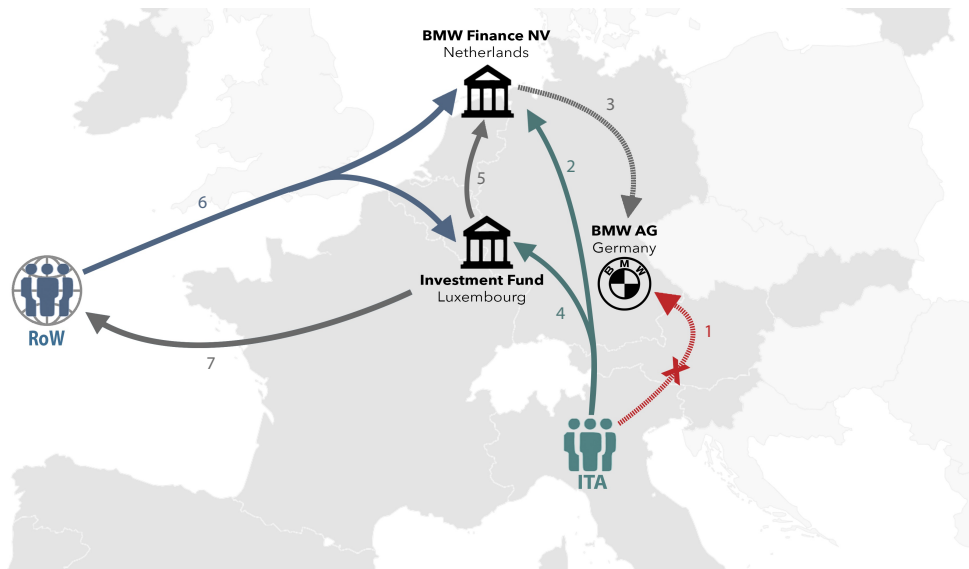
Notes: This figure provides a schematic representation of the dual roles of European OOFCs, focusing on the example of BMW AG raising bond capital from Italian investors as well as investors outside the Euro Area (labeled Rest of the World, or RoW).

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

Our restatement of the Euro Area's investments uncovers several findings. 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. Quantitatively, this happens in

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large part because we find that a significant fraction of the fund holdings in Luxembourg and Ireland not actually held 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 5 trillion euros in non-EA bonds and 4 trillion euros in non-EA equity, we estimate that the Euro Area owns around 2.8 trillion of non-EA bonds and 2 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 3.8 to 1.6 trillion euros, implying roughly a halving of the non-euro share in the overall EA bond portfolio (from 23% to 12%).

Indeed, one goal of this paper is to develop and provide 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 available in full at `globalcapitalallocation.com`. Further, we introduce a simple regression framework to document that Euro Area investors are more home country and home-currency biased in their direct investment positions than when they buy securities via the OOFCs. However, even relative to the OOFC investments of EA investors, the positions of the Rest of the World intermediated via Luxembourg and Ireland are much more globally diversified and tilted way 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' portfolio holdings. For both equity and bond portfolios, the home bias of EA countries—as measured from official data—displays an exceptionally 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, as we document.

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 smaller. Our results indicate that only the Euro Area's bond markets experienced a special burst of integration in the period following the establishment of the currency union 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, in fact also reflect claims on domestic assets as well as on debt securities and other non-equity assets. This new evidence directly informs theories of capital market integration, by providing support for explanations which can generate heterogeneity in the observed differential dynamics of EA equity

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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 provide an analysis of who the unaccounted-for investors in Ireland and Luxembourg funds are likely to be and examine how their portfolio holdings differ from known EA investor holdings. 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. Using new administrative data from the Central Bank of Ireland and the Commission de Surveillance du Secteur Financier (CSSF) for Luxembourg, we show that the United Kingdom now plays an outsized role in investing and intermediating investment into funds based in the OOFCs, having overtaken Swiss intermediaries in this capacity over the past two decades. We discuss the implications of whether this investment recorded as being done by the United Kingdom is actually on behalf of United Kingdom investors or is being done on behalf on non-residents.

For Ireland, we show that both data on the immediate counterpart owners of the fund shares and the composition of the portfolio 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.[3] 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 suggest that the UK is likely intermediating funds largely on behalf of global investors rather than Euro Area residents, but does not yet identify who these global investors are. Uncovering whose wealth the UK is intermediating is one of the keys to identifying the source of global missing wealth (Zucman 2013).

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

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[3]In fact, liability-driven investment (LDI) vehicles of British pension funds are often domiciled in Ireland and to a lesser extend 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.

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.[4] 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 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. We adapt a version of their algorithm. 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.[5]

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. Koijen, Koulischer, Nguyen and Yogo (2018), Bergant, Fidora and Schmitz (2020), Papoutsi, Piazzesi and

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

[5]There 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), Guvenen et al. (2018), Pacheco (2022), and Altshuler et al. (2023).

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 Papoutsi (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 Koijen 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 OOFC financial intermediation activities. We then turn to our methodology for restating Euro Area financial accounts to look through these activities.

2.1 OOFC Exceptionalism and Impact on EA Aggregate Statistics

One of the challenges that OOFCs 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.[6] The resulting index (red line) is displayed in Figure

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[6]We define GP_{EA} to be ratio of the 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:

$$\text{GP}_j = \frac{A_j + L_j}{\text{GDP}_j}, \qquad \text{GP}_{\text{EA}} = \frac{\sum_{j \in \mathcal{J}_{\text{EA}}} (A_j + L_j)}{\sum_{j \in \mathcal{J}_{\text{EA}}} \text{GDP}_j}, \qquad \text{GPR}_{\text{EA}} = \frac{\text{GP}_{\text{EA}}}{\sum_{j \in \mathcal{J}_{\text{DM}}} \text{GP}_j \frac{\text{GDP}_j}{\sum_{j' \in \mathcal{J}_{\text{DM}}} \text{GDP}_{j'}}},$$

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

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.[7] 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 OOFC countries are as 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. 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 OOFCs, this raises the question of how much one misses about European integration without accounting for the nature of this rise.[8]

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 location of total cross-border portfolio investment in the IMF Coordinated Portfolio Investment Statistics (CPIS) for the Euro Area, excluding investment originating in the OOFCs themselves. The issue is immediately apparent. The most important investment destination of capital 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 saying that we do not actually know where Euro Area capital is flowing.

We consider three different possible answers to this question. First, if investment in Luxembourg and Ireland flows outside of the Euro Area, then each European country would be far more integrated with the rest of the world than this official data shows. Second, if investments in Luxembourg and Ireland flow 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. Third, if investment into the OOFCs actually flows 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 indicate 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

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[7]Coeurdacier 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.
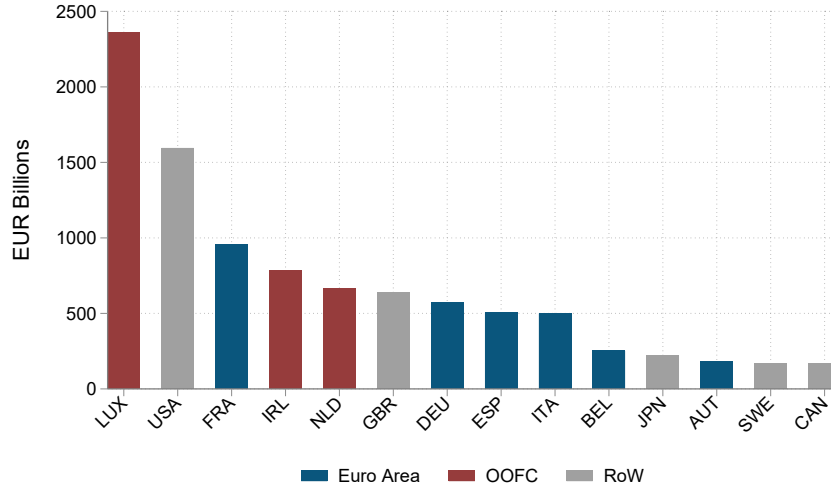
[8]Notably, the UK also has a large external balance sheet relative to the size of its GDP.

Figure 2: **Euro Area external positions and *onshore offshore financial centers***
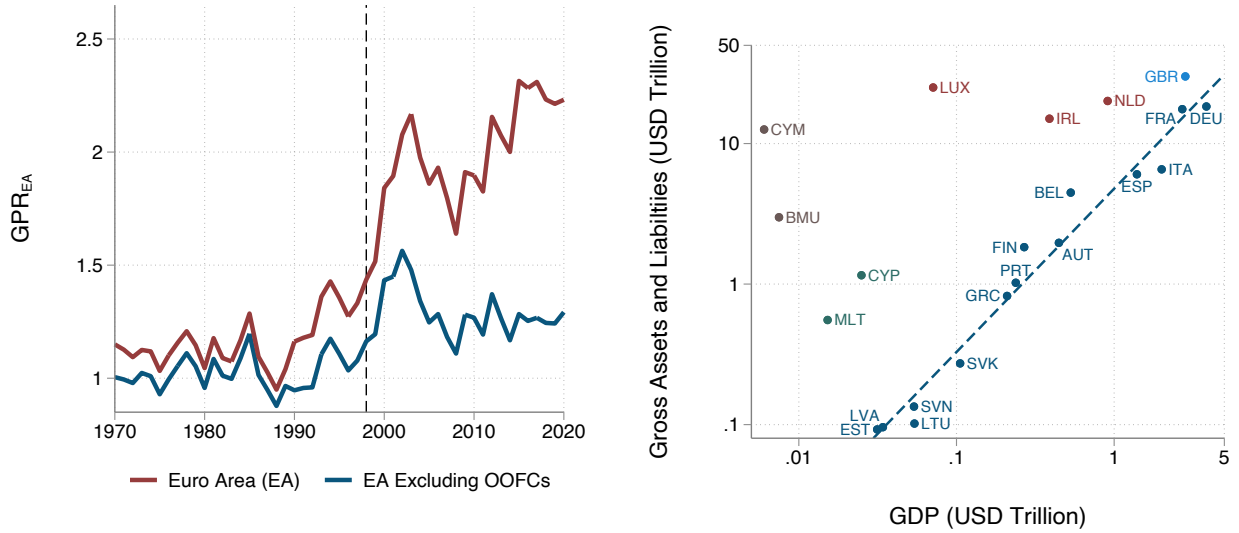
(a) Excess growth of Euro Area gross positions

(b) Onshore offshore financial centers

(c) Geography of cross-border portfolio holdings in public data

Notes: We define GP_{EA} to be ratio of the 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 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: OOFC countries are in red, other EA countries are in blue, and non-EA countries are in gray.

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 OOFC funds to the investors that actually own the funds. Here, we provide further details on this *fund unwind* component of our methodology. Our strategy for unwinding positions held through Luxembourg and Irish investment funds is straightforward. The SHS data reports precisely which investment fund shares each sector in each country in the Euro Area owns. Therefore, whenever we see a given 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.[9] 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 SHS data. For this information, we rely on estimates of security-level holdings of each fund based on the union of Morningstar,[10] Lipper, and Factset Ownership data. 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 SHS records as investments in fund shares domiciled in the OOFCs 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 sometimes 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 so as to make them consistent with the CPIS level.[11] Specifically, for each investor country in the Euro Area and destination country in CPIS, we scale the positions for that bilateral in raw SHS, before any adjustments, so that the total 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.

To conduct the unwind, we let the euro value of a position in the CPIS-equivalent SHS data be $x^{a,f}_{j,i_c,c}$, where c corresponds to a security, j is the investing country, a corresponds to the security's

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[9]We 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.

[10]As discussed in Appendix Section A, these 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. In practice, we merge these estimates to SHS by mapping each fund share's ISIN to the corresponding fund identifier in Morningstar.

[11]Throughout the rest of the paper, for simplicity we refer to the scaled CPIS-equivalent version of the SHS data simply as "SHS."

asset class (equity, fund share, corporate bond, sovereign bond, or structured finance assets), and i_c is the destination country—which can be defined on either a residency or a nationality basis. The superscript f denotes whether the security is held directly by the investing country j, or alternatively via Ireland or Luxembourg funds, so that $f \in \{\text{Direct, IRL, LUX}\}$. We omit time subscripts here since many analyses are cross-sectional: we only include them when time-series clarity is necessary.[12]

Table 1: **Fund unwind: match rates**

	Luxembourg and Ireland	**Luxembourg**	**Ireland**
Total Fund Share Liabilities in SHS*	3,553	2,554	999
Matched to Fund Portfolio Holdings*	3,080	2,265	815
Of which: Unidentified holdings	424	319	104
Of which: Identified holdings	2,656	1,946	710
Share Matched	86.7%	88.7%	81.6%
Share Matched to Identified Holdings	74.8%	76.2%	71.1%

Market values, shown in billions of Euros

Notes: Row 1 shows the total amount of holdings of shares of funds resident in Luxembourg and Ireland observed in SHS: these correspond to the fund share liabilities of these OOFC countries vis-à-vis Euro Area investors. Row 2 reports the value of the positions that we match to fund holdings in Morningstar, Lipper, and Factset, while rows 3 and 4 break down these amounts according to whether the matched fund positions have an ISIN code (row 4) or not (row 3). The positions without an ISIN code are primarily cash instruments. We report these statistics for Luxembourg and Ireland funds separately, as well as jointly. Data shown as of 2020.

Investments in particular Luxembourg and Ireland funds therefore correspond to those positions $x_{j,i_c,c}^{a,f}$ where $c \in \mathcal{F}_i$, with $\mathcal{F}_i$ the set of fund shares corresponding to funds domiciled in country $i \in \{\text{LUX, IRL}\}$. 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 other security c', with $\sum_{c'} \gamma_{c,c'} \leq 1$.[13] The *indirect* positions of individual Euro Area countries through OOFC funds are therefore given by

$$x_{j,i_{c'},c'}^{a,\text{LUX}} = \sum_{c \in \mathcal{F}_{\text{LUX}}} \left(x_{j,i_c,c}^{a,f} \cdot \gamma_{c,c'} \right), \qquad x_{j,i_{c'},c'}^{a,\text{IRL}} = \sum_{c \in \mathcal{F}_{\text{IRL}}} \left(x_{j,i_c,c}^{a,f} \cdot \gamma_{c,c'} \right). \qquad (1)$$

Correspondingly, we can then estimate the total holdings of investor country j in asset c' as

$$x_{j,i_{c'},c'}^{a} = x_{j,i_{c'},c'}^{a,\text{Direct}} + x_{j,i_{c'},c'}^{a,\text{LUX}} + x_{j,i_{c'},c'}^{a,\text{IRL}}. \qquad (2)$$

While we can only directly observe the fund share holdings of Euro Area investors, we can estimate the rest of the world's positions intermediated through OOFC funds as the difference between the OOFC's reported investment in an asset and those holdings that we can account for

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[12]In practice, we also implement our procedure at the investor country by investor sector level. We omit sector indices for simplicity, as most of our analysis does not focus on heterogeneity across investment sectors.

[13]The reason that portfolio shares can sum to less than 1 is that funds may own cash, derivatives, or non-securities like real estate. In these cases, we would see a reduction in total wealth, as these positions should not be considered portfolio holdings in the restated data.

as intermediation of Euro Area investment. In particular, we estimate the rest of world's holding in security c through OOFC funds as

$$x_{\text{RoW},i_c,c}^{a,f} = \tilde{x}_{f,i_c,c}^{a} - \sum_{j \in \mathcal{J}_{EA}} x_{j,i_c,c}^{a,f}, \tag{3}$$

where $\mathcal{J}_{EA}$ is the set of euro area countries and $\tilde{x}_{f,i_c,c}^{a}$ are the direct holdings in security c of the fund sector of country $f \in \{\text{LUX, IRL}\}$ in the SHS data. The overall merge rate between SHS and the union of Morningstar, Lipper, and Factset is 86.7%. Because treating the unmatched funds as belonging to the rest of the 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 in the matched funds and scale up the positions. The exact details of this procedure are reported in Appendix Section B.3.

Table 2: **Summary statistics for fund unwind**

(a) Luxembourg and Ireland

	Fund Holdings	SHS		
	Total	Total	Matched	Residual
Value, Total Holdings	5,656	8,293	2,654	5,639
Value, Bonds & Equities	4,357	7,064	2,386	4,678
Value, Bonds	2,289	4,003	1,121	2,881
Value, Equities	2,068	3,062	1,265	1,797

(b) Luxembourg

	Fund Holdings	SHS		
	Total	Total	Matched	Residual
Value, Total Holdings	3,563	5,018	1,944	3,073
Value, Bonds & Equities	2,803	4,254	1,729	2,524
Value, Bonds	1,460	2,350	813	1,537
Value, Equities	1,343	1,904	916	988

(c) Ireland

	Fund Holdings	SHS		
	Total	Total	Matched	Residual
Value, Total Holdings	2,093	3,275	710	2,566
Value, Bonds & Equities	1,554	2,810	657	2,153
Value, Bonds	829	1,653	308	1,345
Value, Equities	725	1,158	349	809

Notes: The columns marked *SHS* report summary statistics for the assets of Luxembourg and Ireland funds observed in the SHS data (*Total*), the subset of assets that are attributed to Euro Area ultimate investors through the fund unwind (*Matched*), and the subset of assets that are not (*Residual*). We exclude assets corresponding to the unidentified holdings shown in Table 1. The columns marked *Fund Holdings* report statistics for the assets of Luxembourg and Ireland mutual funds in the fund portfolio holdings data (union of Morningstar, Lipper, and Factset). We show the value of total holdings and the value of equity and bond holdings. All figures are market values and in billions of euros. Data shown as of 2020.

Table 1 provides a summary of the match rates in our fund unwind procedure, focusing on the cross-section of data at the end of 2020. The overall holdings in Luxembourg or Ireland fund shares observed in the SHS data are €3,553 billion: these correspond to the fund share liabilities of

Luxembourg and Ireland vis-à-vis Euro Area countries. Our overall match rate for these positions is 86.7%, meaning that we can map €3,080 billion worth of these fund share positions to fund portfolios $\gamma_{c,c'}$ in the fund portfolio holdings estimates.[14] Of these matched positions, €2,656 billions (74.8% of the starting €3,553 billions) are mapped to securities c' for which we have securities identifiers (ISIN code) in the fund portfolio holdings estimates. The rest of the matched positions (€424 billions) are mapped to fund assets without a corresponding ISIN code. These positions consist primarily of cash and cash instruments.[15] These match rates are fairly similar when looking at Luxembourg and Ireland individually, as also shown in Table 1.

Diving further into the details of the fund unwind, Table 2 reports summary statistics for the assets of Luxembourg and Ireland funds observed in the SHS data and in the fund portfolio holdings estimates, including by breaking down the SHS assets into matched and residual components—where the residual components are attributed to RoW investors as per the definition in equation (3).[16] The fund assets in SHS and in the fund portfolio holdings estimates align quite well, although some discrepancies are expected since the SHS data includes not only mutual funds and ETFs, but also other types of investment funds that are not covered in the fund portfolio holdings, as discussed below. For Luxembourg funds, total assets in the fund portfolio holdings estimates are €3,563 billion, as compared to €5,018 billion in SHS, with very similar composition in terms of asset class in the two datasets. For Ireland funds, the fund portfolio holdings estimates contain assets of €2,093 billion, as compared to €3,275 billion in SHS.

Table 3: **Reallocation matrix, EA corporate debt investments**

Destination	Share Reallocated To:									
	Home	CHN	DEU	ESP	FRA	GBR	HKG	ITA	USA	RoW
CYM	8.7	37.7	0.3	0.1	0.4	2.4	12.9	0.2	7.6	29.7
DEU	94.3	0.1		0.5	0.4	0.1	0.0	1.8	0.4	2.5
IRL	63.7	0.0	4.7	1.0	1.0	1.4	0.9	5.1	9.0	13.2
LUX	31.5	4.7	3.8	1.0	17.9	2.5	0.9	1.9	8.6	27.2
NLD	52.1	0.5	18.2	4.9	4.5	5.3	0.0	2.9	2.9	8.6

Notes: This table shows the share of EA 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, Rest of World (RoW), 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.

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[14]We inspected the residual unmatched funds manually and they do not appear to be biased in a particular direction. In ongoing work, we are additionally using fund holdings data from Factset and hand-collected public sources to maximize the match rate.

[15]Not all fund assets are reportable in SHS. Examples include assets that are not securities, such as deposits, real estate, loans, and derivatives. In addition, SHS focuses primarily on securities held as portfolio assets (where each holder has less than a 10% stake, since otherwise it is classified as FDI).

[16]Table 2 excludes the positions that are matched to unidentified securities (primarily cash instruments) from both the SHS total and SHS residual columns.

2.3 Aggregating Securities to Ultimate Corporate Parents

We next turn to outlining further results on the *securities aggregation* component of our methodology, exploring how looking through corporate financing affiliates resident in both European OOFCs 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 this information of interest. Using this algorithm, we are able to match 97% of all equity holdings and 89% of all corporate bond holdings in SHS.

In Table 3, we see where corporate bonds held by Euro Area investors that are resident in the OOFCs belong on a nationality basis. For Luxembourg, we see that only 31.5% of corporate bond held there on a residency basis remain there on a nationality basis, with France, the United States, and Switzerland the largest destinations on a nationality basis. For the Netherlands, 52.1% of Dutch securities on a residency basis remain classified there on nationality basis, with Germany, Spain, and the United Kingdom the largest borrowers via the Netherlands. Finally, a significant majority of Irish-resident corporate bonds (63.7%) remain there on a nationality basis, with the United States, Italy, and Germany the largest reallocations. When we say that these three countries act as OOFCs for securities issuance, we can see clearly why by comparing their behavior to that of the Cayman Islands and Germany. For the Cayman Islands, a classic offshore financial center, we see only 8.7% of corporate resident there remain classified there on a nationality basis, with major reallocations to China, Hong Kong, and the United States. By contrast, 94.3% of securities issued in Germany on a residency basis remain classified there on a nationality basis.

3 The Restated Statistics of the Euro Area

We next turn to exploring the consequences of looking through the OOFCs and global tax havens for our understanding of European capital allocation. We provide comprehensive restated estimates of the bilateral portfolio holdings of Euro Area countries, and we show that the restatements are essential to properly capture exposures. In Figure 3, we begin by constructing a parallel of Figure 2c using the restated data. That is, we plot the location of total cross-border portfolio investments originating from non-OOFC Euro Area countries, now looking through both the fund intermediation and security issuance roles of the OOFCs. The difference is stark. After our adjustments, the United States is the largest bilateral investment destination, with a position of around $2.2 trillion, a nearly €700 billion increase. The four large Euro Area countries of France, Germany, Italy, and Spain, along with the United Kingdom quickly follow, with the positions in the OOFCs dramatically reduced.

These large changes can be better understood by considering the reallocations for a single

Figure 3: **The geography of cross-border portfolio holdings in restated data**
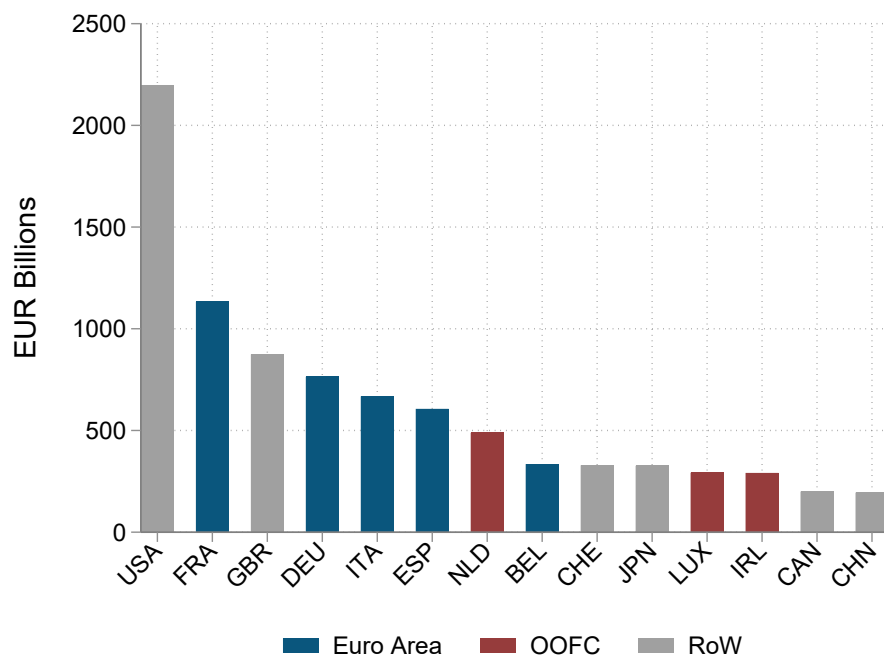
investor country. In Table 4, we consider the case of Italy's total cross-border portfolio investment. Appendix Tables A.V through A.VI report analogous results broken down by asset class (bonds and equities) as well as for Germany and France. Moreover, the complete set of restatements for all Euro Area investor countries, years, asset classes, and destinations is available online at `globalcapitalallocation.com`. We begin by considering Italy's investment in Germany. We can see that in the official data (column labeled *"Official CPIS"*) Italy records an investment position of 57 billion euros in Germany. The second column (*"Nationality Adj."*) reflects our adjustment of Italy's securities portfolios from a residency to nationality basis.[17] Here, we see Italy's investment in Germany increases by €5 billion to €62 billion. This reflects Italian purchases of securities issued in the OOFCs, primarily the Netherlands, as in our motivating Figure 1. The next column (*"Funds Adj."*) reflects the portion of the restatement that comes from looking through Italian investment in funds domiciled in the OOFCs, while leaving the geography of the securities themselves on their original residency basis. This change alone leads us to estimate that Italy owns €85 billion of German assets rather than the original €57 billion. The final column (*"Both"*) puts the two adjustments together, and we see that performing both exercises simultaneously leads us to estimate that Italy owns €98 billion of German assets.

It is evident from this example that the joint adjustment amounts to more than the sum of its two

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[17]This column is comparable to the exercise performed in Coppola et al. (2021).

Table 4: **Restated bilateral external statistics: Italy's portfolio investments**

Destination	Official (CPIS)	Restated Statistics (EUR Billions)			
		Nationality Adj.	Funds Adj.	Both	Δ
A. Euro Area (EA) 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)	1,990	1,998	2,049	2,056	+3%
B. Non-EA					
Argentina	2	2	2	3	+59%
Australia	6	7	10	12	+112%
Brazil	1	2	4	6	+471%
Canada	4	5	11	12	+188%
China	2	7	12	36	+1,616%
India	0	1	6	7	+2,242%
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	323	+141%
C. Non-OOFC Tax Havens					
Bermuda	0	0	2	1	+101%
Cayman Islands	4	0	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 class 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.

individual components. The reason this occurs is that the funds which Italy owns in the OOFCs also 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, we see that Italy only reports owning €1 billion in China. However, the nationality adjustment alone 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. This issue is discussed at length in Coppola et al. (2021). The fund unwind alone raises Italian investment in Chinese securities to 7 billion euros, while the joint procedure increases the observed positions to 22 billion euros, a strikingly large increase of more than 1,500% relative to the official position. This again demonstrates 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.

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 127 billion euros of investment in the official data, we estimate that Italy owns 279 billion euros of American 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 must be preserved. In panel C of Table 4, we can see 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 OOFC Activities

Having described our restatements procedure and produced re-assessed versions of the portfolios of Euro Area investors, we now delve into a more detailed examination—using micro data—of the nature of the financial intermediation activities in the OOFCs.

4.1 A Decomposition of the Observed Euro Area Portfolio

We begin by introducing a decomposition of the observed 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 OOFC funds.

2. Component 2 consists of the *indirect holdings of Euro Area investors*: these are the securities held by EA investors indirectly, through OOFC funds.[18]

3. Component 3 consists of the *indirect holdings of Rest of World (RoW) investors*: these are securities held by non-EA investors through OOFC funds. They are part of the observed EA portfolio in official data since they are accounted for as assets of the OOFCs, although economically they do not correspond to EA assets.

Figure 4: **Heterogeneity in holdings through Luxembourg and Ireland funds: geography**
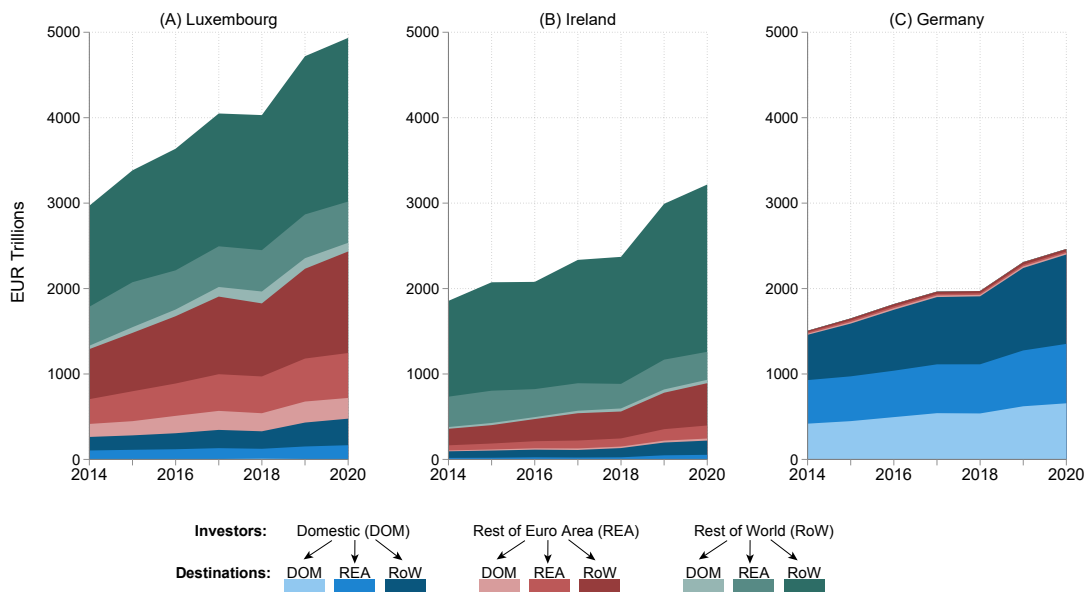
Notes: This figure uses our methodology to decompose the assets of investments funds domiciled in Luxembourg, Ireland, and Germany in SHS according to who the ultimate investors are and which countries' securities (by nationality) the investments are in. Blue areas correspond to domestic investors, red 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.

To document the heterogeneity in these three portfolio components, we take several complementary approaches. While in Section 4.3 we introduce a formal analytical framework that will quantify their properties using micro data, we start by showing this heterogeneity in the aggregate (and Section 4.2 then documents its impact on our understanding of the aggregate external position of the Euro Area). To do this, Figure 4 decomposes the assets of investment funds domiciled in

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[18]For the OOFCs themselves, we consider investments in domestic funds part of portfolio component 1, and investments through foreign OOFC funds part of portfolio component 2. This is a purely expositional distinction.

Luxembourg, Ireland, and Germany—where Germany is included as a point of comparison, being the largest non-OOFC country. The assets are split according to who the ultimate owner is, and which countries' securities these portfolios are invested in. We then calculate the Rest of World holdings as the residual of the total fund holdings in SHS minus the scaled up domestic and EA fund holdings.

The blue areas represent portfolio component 1 (direct EA holdings): these correspond to domestic ultimate owners—that is, owners based in the country's of the investment fund. The red areas represent portfolio component 2 (indirect EA holdings): they correspond to ultimate owners in the rest of the Euro Area. Lastly, the green represent portfolio component 3 (indirect RoW holdings): these correspond to ultimate 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.

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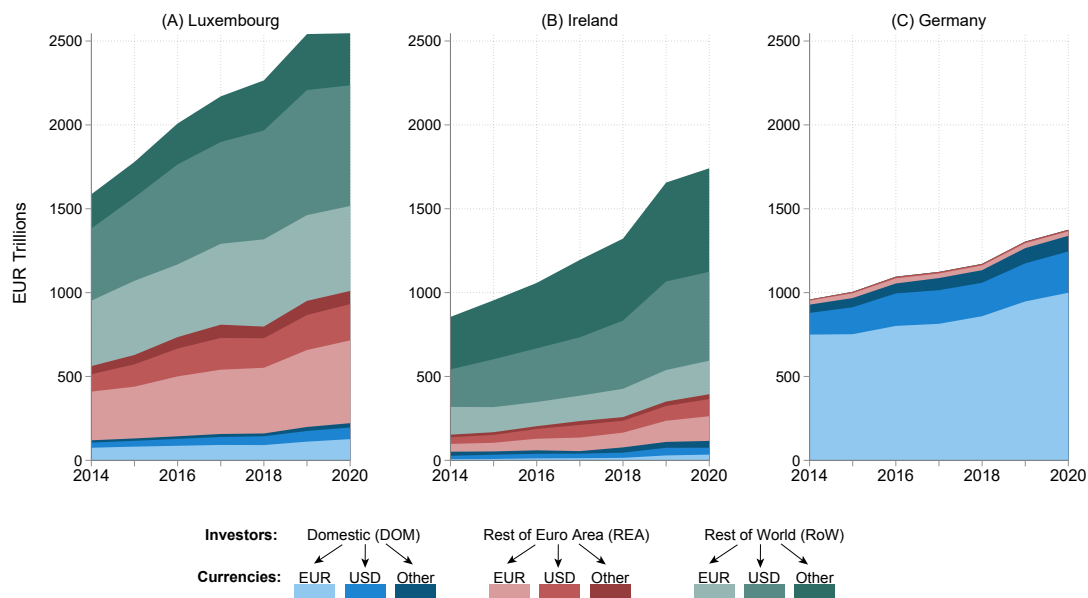

Notes: This figure decomposes the bond assets of investments funds domiciled in Luxembourg, Ireland, and Germany according to our estimates of who the ultimate investors are and which currencies the bond holdings are denominated in. Blue areas correspond to domestic investors, red areas to investors in the rest of the Euro Area (REA), and green areas are unaccounted for (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.

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 it is virtually only

German investors who hold assets through German funds. However, for Luxembourg and Ireland the pattern is starkly different: holdings by domestic investors are minuscule, and only around half of the positions are accounted for by reported positions of investors in the Euro Area. For Ireland, the situation 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 huge portion of the positions are unaccounted for in SHS, indicating that they are potentially held by investors outside of the Euro Area. Moreover, it is evident that the portfolios held by different investors through Luxembourg and Ireland funds are highly differentiated, with particularly large differences between EA and RoW investors. RoW investors are much more tilted towards non-EA assets than EA investors 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.

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

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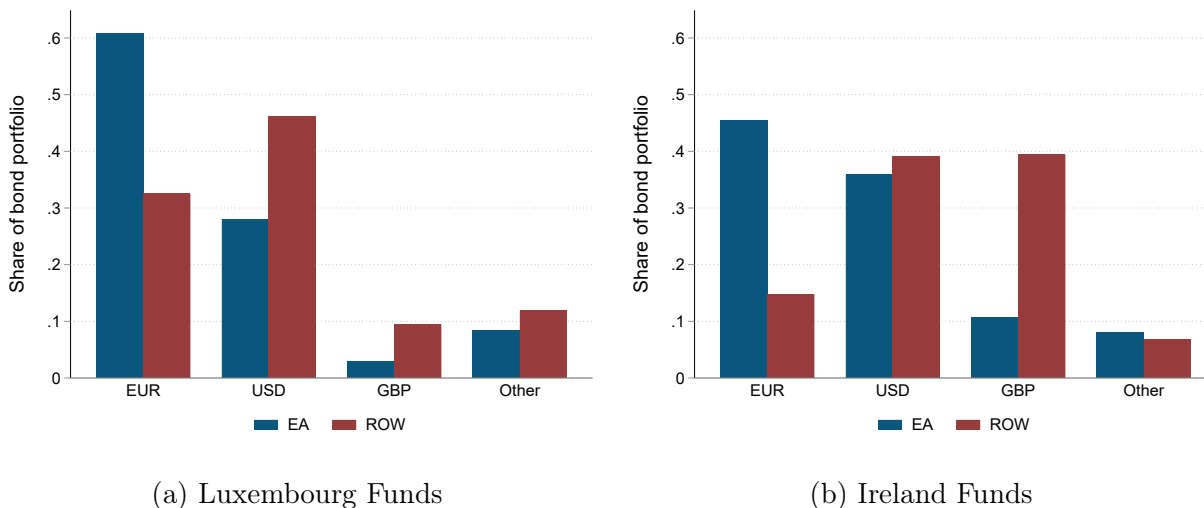
Notes: This figures plots the share of bonds denominated in the euro, the US dollar, the British pound, and other currencies held by Euro Area (EA) and Rest of World (RoW) investors via funds domiciled in Luxembourg and Ireland. All data is as of 2020.

We observe a similar pattern when looking at the currency composition of these investments. Figure 5 repeats the same decomposition exercise, but now instead of looking at the destination of these investments, we focus on their currency composition. Since currency of denomination is most meaningful a security attribute for fixed income securities, the figure now includes only the bonds held by these funds. Hence 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 idea by further disaggregating the set of currencies while focusing on a particular cross-section, at the end of 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 the currency composition for assets held via Luxembourg funds, while panel B plots the results for Ireland funds. We see that 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 the 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.[19]

Notably, 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 position enter 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 GBP-denominated, the presence of the LDI funds contributes to the tilt towards the British pound that we observe in the RoW holdings.[20]

4.2 Aggregate Consequences for the Euro Area's External Position

The heterogeneity in portfolios held through OOFC 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 see that instead of the €4.2 trillion of RoW equities in their 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 in the official data is actually owned by the Euro Area. The effect is even more stark when we turn to currency, as we see that only €2.0 trillion of the €4.2 trillion of foreign currency denominated debt reported owned by the Euro Area

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[19]The quantitative importance and heterogeneity in OOFC intermediation activities is also evident when inspecting their role as domiciles of securities issuance. As shown in Appendix Figure A.XII, corporate bonds issued in OOFCs 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 OOFCs, with Luxembourg and the Netherlands accounting for most of this phenomenon. The majority of these bonds are reallocated away from the OOFCs 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 billions in 2023.

[20]The fact that the LDI funds do not enter the commercial fund portfolios data accounts for the notable difference in the currency composition of bond holdings between the fund portfolio holdings data and SHS seen in Appendix Table A.VII: while the British pound share of bond holdings is 11.4% in the fund holdings data, it is a much higher 33.6% in SHS. This also accounts for part of the gap in total assets between the two datasets.

Figure 7: **Reassessing the Euro Area's aggregate external position**
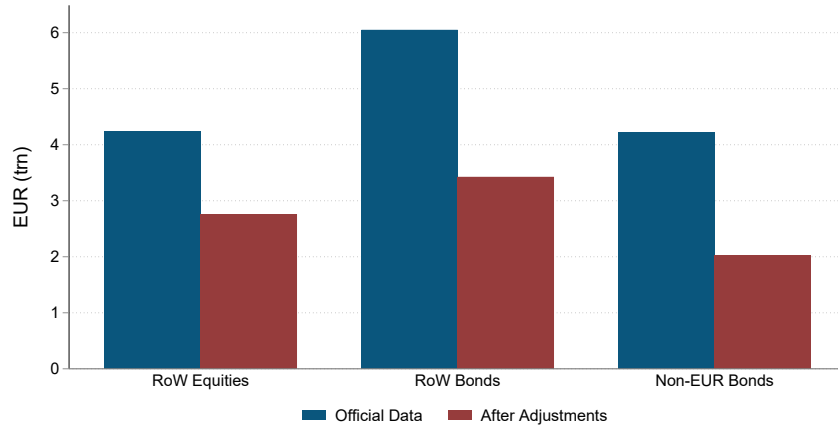
Notes: This figure shows the size of the external assets of the Euro Area in official data (blue bars) and after our restatements (red bars). We show the position of the Euro Area as a whole in RoW equities, RoW bonds, and non-euro denominated bonds.

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-á-vis the Rest of the World than official data suggests. This fact is a first indication that the financial intermediation activities taking place in the OOFCs artificially overstate the extent of financial integration occurring in Europe, something that we return to in Section 5.

4.3 An Analytical Framework for Examining the Portfolios

We now analyze the heterogeneity in the various EA portfolio components more formally, using an econometric approach that exploits the granularity 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 according to the security's weight in the global market portfolio (French and Poterba 1991, Lewis 1999). This very simple benchmark is both the subject of a large literature in international finance and of major policy relevance since it can be used as a metric to measure progress towards the Capital Markets Union in the Euro Area.[21] We quantify deviations from this simple benchmark along various dimensions of interest. For country j we define portfolio weights as

$$\omega_{j,i,c}^{a,\text{Total}} = \frac{x_{j,i_c,c}^a}{\sum_{c' \in \mathcal{C}} x_{j,i_{c'},c'}^a}, \qquad \omega_{j,i,c}^{a,f} = \frac{x_{j,i_c,c}^{a,f}}{\sum_{c' \in \mathcal{C}} x_{j,i_{c'},c'}^{a,f}}, \tag{4}$$

where $\mathcal{C}$ is the set of all securities outstanding worldwide at a point in time, irrespective of whether country j holds any. Note that here $\omega_{j,i,c}^{a,\text{Total}}$ denotes the weights in country j's overall portfolio, while $\omega_{j,i,c}^{a,f}$ conditions on a particular route of investment (direct or through Luxembourg or Ireland

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[21]See 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).

funds).[22] We let $\bar{x}_{i,c}^a$ be the outstanding value of a security, so CAPM weights are:

$$m_{i,c}^a = \frac{\bar{x}_{i,c}^a}{\sum_{c' \in \mathcal{C}} \bar{x}_{i,c'}^a}. \tag{5}$$

Notice that CAPM weights are defined over the universe of world securities.[23] Deviations from a simple benchmark of perfect financial market integration and diversification based on the international CAPM in a particular portfolio can be estimated via a simple linear regression:

$$\omega_{j,i,c}^{a,f} = \alpha^{a,f} + m_{i,c}^a \sum_{k \in \mathcal{K}} \beta_k^{a,f} \mathbf{1}_{c \in k} + \epsilon_{j,i,c}^{a,f}. \tag{6}$$

where we denote sets of mutually exclusive and collectively exhaustive characteristics by $k \in K$. In these regressions, $\mathbf{1}_{c \in k}$ 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 of this regression is to include no characteristics at all, corresponding to the following specification:

$$\omega_{j,i,c}^{a,f} = \alpha^{a,f} + m_{i,c}^a \beta_{\mathrm{CAPM}}^{a,f} + \epsilon_{j,i,c}^{a,f}. \tag{7}$$

If the international CAPM held perfectly, this regression would have an R^2 of 1, with $\hat{\alpha}^{a,f} = 0$ and $\hat{\beta}_{\mathrm{CAPM}}^{a,f} = 1$, 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 European or not. In particular, we run the following regression:

$$\omega_{j,c} = \alpha + m_c \left[\beta_{\mathrm{RoW}} \mathbf{1}_{c \in \mathrm{RoW}} + \beta_{\mathrm{REA}} \mathbf{1}_{c \in \mathrm{EA}-j} + \beta_{\mathrm{Home}} \mathbf{1}_{c \in \mathrm{Home}} \right] + \varepsilon_{j,c}, \tag{8}$$

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[22]When writing down general empirical specifications with $\omega_{j,i,c}^{a,f}$ on the left-hand side, from here onward we always implicitly include the case in which $f = \mathrm{Total}$.

[23]We obtain the market value outstanding of each security worldwide from the ECB Centralised Securities Database (CSDB). The securities covered by CSDB are not limited to those held only by Euro Area investors. Appendix Section B.5 discusses how we build this global issuance file and benchmarks the market value of securities outstanding to common aggregate sources like the World Federation of Exchanges and the BIS Debt Statistics.

where $1_{c\in\text{Home}}$ is an indicator that security c was issued by an entity from country j, $1_{c\in\text{EA}-j}$ is an indicator that it was issued by an Euro Area issuer other than country j, and $1_{c\in\text{RoW}}$ is an indicator that the security was issued by a non-Euro Area investor. Table 5 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: (1) portfolio component 1, consisting of the direct holdings of Euro Area investors outside of OOFC funds (what we call *"EA Direct"*); (2) portfolio component 2, consisting of the holdings of EA investors channeled through investment funds domiciled in the OOFCs of Luxembourg and Ireland (*"EA Indirect"*); (3) 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 (4) portfolio component 3, consisting of the positions held by RoW investors via OOFC funds (*"RoW Indirect"*).

Beginning with the equity portfolio estimates in panel A, we see strong but heterogeneous levels of home bias in each specification for Euro Area investors. In particular, in the direct EA holdings, we see that investors place on average a portfolio weight on domestic securities that is 25 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 see 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 level, with a resulting estimate of home bias of 22.6. Comparing across the direct and indirect portfolios of EA investors, we nonetheless see that despite the home bias, the investment through the OOFCs is the key channel for international diversification for Europeans. In particular, while EA investors own only 35% of the market weight of RoW securities in their direct holdings, this number increases to 73% when investing through the OOFCs. Compared to the RoW portfolio invested via the OOFCs, however, we see how tilted EA investors remain towards domestic and other EA securities. The RoW portfolio has a loading of 0.81 on RoW equities and 1.24 on EA securities, meaning that while global investors do slightly tilt their holdings via the European OOFCs towards the Euro Area, they continue to buy a very globally diversified portfolio.

Table 5b performs the equivalent analysis for bonds portfolios and finds similar results. In particular, we see that EA investors are more home biased in their direct portfolio than they are via the OOFCs, but they continue to display a strong degree of home bias in their indirect investments. In the case of bond investment, investors are even more underweight RoW debt securities than they are for equities. In this case, the Rest of World's portfolio via the OOFCs is actually more tilted towards RoW bonds than it is towards Euro Area debt. 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.

Table 5: **Quantifying home bias across portfolios**

(a) Equity investments

	Equities			
	EA Direct	**EA Indirect**	**EA Total**	**RoW Indirect**
$\hat{\beta}_{\text{RoW}}$	0.33***	0.73***	0.40***	0.79***
	(0.09)	(0.06)	(0.08)	(0.14)
$\hat{\beta}_{\text{REA}}$	1.69***	2.17***	1.78***	1.24***
	(0.14)	(0.12)	(0.13)	(0.26)
$\hat{\beta}_{\text{Home}}$	25.64***	3.36***	23.11***	—
	(2.47)	(0.27)	(2.51)	
Obs.	521,934	521,934	521,934	30,702
R^2	0.62	0.66	0.66	0.66

(b) Bond investments

	Bonds			
	EA Direct	**EA Indirect**	**EA Total**	**RoW Indirect**
$\hat{\beta}_{\text{RoW}}$	0.09***	0.21***	0.10***	0.62**
	(0.01)	(0.02)	(0.01)	(0.24)
$\hat{\beta}_{\text{REA}}$	1.50***	1.57***	1.51***	0.52***
	(0.22)	(0.09)	(0.20)	(0.04)
$\hat{\beta}_{\text{Home}}$	13.56***	2.54***	12.87***	—
	(2.71)	(0.48)	(2.47)	
Obs.	8,136,013	8,136,013	8,136,013	478,589
R^2	0.39	0.21	0.40	0.09

Notes: We present the estimates from the regressions specification in equation (8), which quantifies the tilt attached to the geography of securities in various portfolios. Panel A considers equity portfolios, while panel B is for 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.

Table 6: **Quantifying home currency bias across portfolios**

(a) Total bond investments

	Bonds			
	EA Direct	**EA Indirect**	**EA Total**	**RoW Indirect**
$\hat{\beta}_m$	0.08***	0.20***	0.09***	0.62***
	(0.01)	(0.02)	(0.01)	(0.24)
$\hat{\beta}_{\text{EUR}}$	3.72***	1.58***	3.56***	-0.10
	(1.08)	(0.14)	(1.01)	(0.24)
Obs.	8,271,180	8,271,180	8,271,180	486,540
R^2	0.131	0.214	0.140	0.084

(b) Corporate bond investments, with firm fixed effects

	Corporate Bonds			
	EA Direct	**EA Indirect**	**EA Total**	**RoW Indirect**
$\hat{\beta}_m$	0.13*	0.40***	0.15**	0.69***
	(0.07)	(0.09)	(0.07)	(0.22)
$\hat{\beta}_{\text{EUR}}$	2.86***	1.42***	2.75***	-0.09
	(0.72)	(0.46)	(0.70)	(0.17)
Obs.	2,788,442	2,788,442	2,788,442	157,317
R^2	0.063	0.170	0.068	0.333
Firm FE	Yes	Yes	Yes	Yes

Notes: We present the estimates from the regressions 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 already discussed Figures 5 and 6 show that one major area where the unadjusted Euro Area statistics are potentially misleading is in the dimension of the currency of denomination of the assets. In particular, the difference between the currency composition of the assets purchased by Euro Area investors and Rest of World investors in Luxembourg and Ireland 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 of 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). In particular, we begin by running a regression where the only characteristic included is the currency of denomination of a bond:

$$\omega_{j,c} = \alpha + \beta_m m_c + \beta_{\text{EUR}} \, 1_{c \in \text{EUR}} \times m_c + \varepsilon_{j,c}, \tag{9}$$

where the dummy $1_{c \in \text{EUR}}$ indicates whether security c is denominated in euros or not.

The results from this specification are reported in Table 6a. We see that EA investors are 3.5 times overweight euro-denominated bonds when investing directly, and 1.6 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 OOFCs: in the final column, we see that RoW investors are in fact underweight euro-denominated securities, albeit not statistically significantly so. Still, however, the possibility remains that these results are driven by compositional differences. To rule out such compositional differences, we extend the previous regression specification to include firm fixed effects at the ultimate parent level, and correspondingly we restrict the set of debt instruments in the sample to corporate bonds:

$$\omega_{j,c} = \alpha + \gamma_{f(c)} + \beta_m m_c + \beta_{\text{EUR}} \, 1_{c \in \text{EUR}} \times m_c + \varepsilon_{j,c}, \tag{10}$$
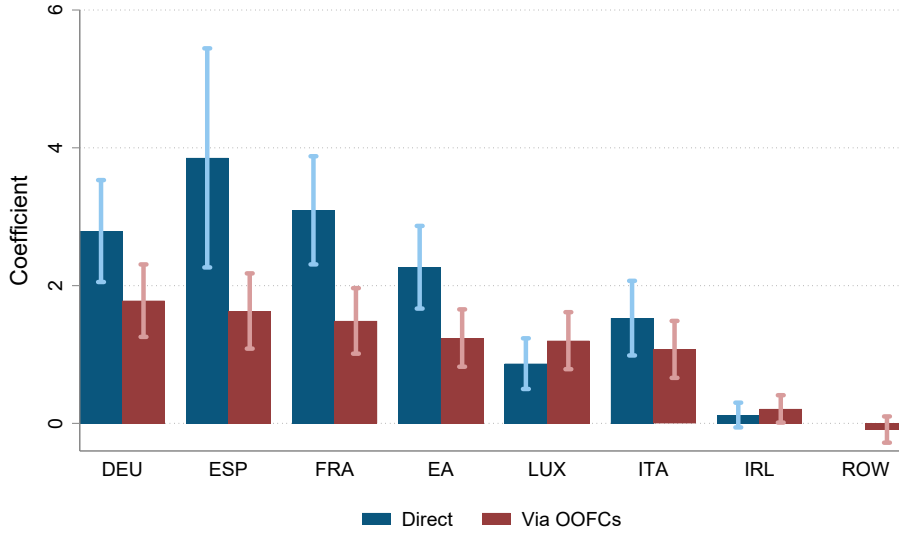
where $\gamma_{f(c)}$ is an ultimate parent fixed effect, indicating that security c was issued by firm f or one of firm f's subsidiaries. With firm fixed effects, the partial effect of the currency of denomination on the issuing share is identified only from multi-currency issuers, as in Maggiori et al. (2020).

While we see an attenuation of the coefficient on euro-denominated debt for EA investors, the heterogeneity between the investment patterns of EA and RoW investors is confirmed. This suggests that the portfolio differences between EA investors and RoW investors are in fact driven by the currency of denomination, rather than by a compositional difference.[24] Finally, in Figure 8, we report the euro bias coefficients $\hat{\beta}_{\text{EUR}}$ estimated in the direct and indirect portfolios of individual EA countries and for the EA as a whole, as well as for the indirect RoW portfolio. This allows 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 very strong in

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[24]One 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, and so one auxiliary benefit of our residency-to-nationality aggregation is that it leads to the introduction of a firm identifier.

Figure 8: **Country heterogeneity in home currency bias**

direct holdings and continues to have significant explanatory power in the indirect portfolios albeit with a reduced magnitude, mirroring the result of the Euro Area as a whole. By contrast, in the unadjusted direct portfolio data, Luxembourg and especially Ireland have fairly weak bias towards euro-denominated securities. In the next section, we move beyond these cross-sectional patterns and explore how these heterogeneity results potentially change our view of the dynamics of European financial integration in the time series.[25]

5   Reassessing Aggregate Home Bias in the Euro Area

We now use our new estimates to revisit the nature and historical dynamics of financial integration within the Euro Area. In particular, we reassess 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 European common currency.

5.1   Equity Home Bias Revisited

Definitions and methodology.   Home bias captures the tendency of capital to remain invested within domestic borders. 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 review) compares the share

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[25]Foreign investment via Luxembourg and Ireland will therefore lead to an underestimate of the degree of European home currency bias in mutual funds as discussed in Maggiori et al. (2020).

of a country's holdings that is invested in foreign securities to a world market portfolio benchmark. For equity portfolios, this *equity home bias index* is defined as

$$\text{EHB}_{j,t} = 1 - \frac{\omega^E_{j,-j,t}}{m^E_{-j,t}}, \tag{11}$$

where $\omega^E_{j,-j,t}$ is the share of country j's equity portfolio invested in foreign securities, and $m^E_{-j,t}$ is the share of foreign securities in the world market portfolio. As clear from equation (11), as long as the restriction $\omega^E_{j,-j,t} \leq m^E_{-j,t}$ is satisfied (investors are not overweight foreign securities relative to their share of the global portfolio, which is virtually always the case in practice), then the index is bounded between zero and one, $\text{EHB}_{j,t} \in [0,1]$. If $\text{EHB}_{j,t} = 0$, country j has no equity home bias at all and hence holds exactly the market portfolio. On the other hand, the case $\text{EHB}_{j,t} = 1$ corresponds to complete home bias, where the country does not hold any foreign equities. The average degree of equity home bias for the Euro Area (asset-weighted) is then given by

$$\text{EHB}_{\text{EA},t} = \sum_{j \in \text{EA}} s^E_{j,t}\, \text{EHB}_{j,t}, \qquad s^E_{j,t} = \frac{x^E_{j,t}}{\sum_{j' \in \text{EA}} x^E_{j',t}}, \tag{12}$$

where $s^E_{j,t}$ are weights proportional to the overall size $x^E_{j,t}$ of country j's equity portfolio.

While the object $m^E_{-j,t}$ can be constructed simply from information on the amounts outstanding of equity securities by country of issuer, measuring the portfolio shares $\omega^E_{j,-j,t}$ requires an assessment of all components of each country's portfolio holdings. In particular, to construct equity home bias 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 funds 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 foreign equity share for each country j would be given by

$$\omega^E_{j,-j,t} = \frac{x^{E,\text{Direct}}_{j,-j,t} + x^{F,\text{Direct}}_{j,-j,t}}{x^{E,\text{Direct}}_{j,-j,t} + x^{F,\text{Direct}}_{j,-j,t} + x^{E,\text{Direct}}_{j,j,t}}, \tag{13}$$

where $x^{E,\text{Direct}}_{j,-j,t}$ corresponds the country's direct holdings of foreign equities, $x^{F,\text{Direct}}_{j,-j,t}$ to their direct

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holdings of foreign fund shares, and $x_{j,j,t}^{E,\text{Direct}}$ to their direct holdings of domestic equities. While these positions can all be directly observed for the most recent years, the SHS 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—we estimate the positions from countries' multilateral international investment positions (IIP) accounts and data on securities' amounts outstanding.[26] We measure direct holdings of foreign equities and foreign fund shares directly by observing each country's foreign common equity assets and foreign fund share assets in the IIP accounts collected by the ECB:

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

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

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

We obtain data on equity outstanding amounts by combining the Global Capital Allocation Project (GCAP) equity issuance micro dataset with aggregates from the World Federation of Exchanges (WFE). We also use these issuance series to compute the market portfolio shares $m_{-j,t}^{E}$.

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 foreign portfolio share:

$$\omega_{j,-j,t}^{E} = \frac{x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{E,\text{Indirect}}}{x_{j,-j,t}^{E,\text{Direct}} + x_{j,-j,t}^{E,\text{Indirect}} + x_{j,j,t}^{E,\text{Direct}} + x_{j,j,t}^{E,\text{Indirect}}}, \qquad (16)$$

where $x_{j,-j,t}^{E,\text{Indirect}}$ and $x_{j,j,t}^{E,\text{Indirect}}$ correspond, respectively, to indirect equity holdings through OOFC funds of foreign and domestic equity securities. As compared to the naive methodology in equation (13), this approach replaces the foreign fund share holdings terms in the numerator with just the component comprising claims on foreign equities. It also replaces the same term in the denominator with the components reflecting claims on any equity assets, thus subtracting any indirect non-equity positions. The key assumption that we make to estimate the indirect holdings historically is that for each country, the fraction 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. That is, we estimate the indirect positions as

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

where $\phi_{j,-j}^{E}$ and $\phi_{j,j}^{E}$ are the foreign and domestic equity shares, which we estimate by averaging their observed values in each yearly cross-section in the sample for which SHS micro-data is available.

Our restatement of average Euro Area home bias $\text{EHB}_{\text{EA},t}$ additionally adjusts the weighting

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[26]For the recent sample from 2014 onwards, the positions estimated with the IIP methodology align well with those directly measured in the SHS data.

terms $x_{j,t}^E$ for Luxembourg and Ireland, shrinking them to account for all the indirect positions of other Euro Area countries, as well as for the positions held by RoW investors (which removes portfolio component 3, in the decomposition of Section 4.1). On net, this has the effect of reducing the weight of Luxembourg and Ireland to correspond only to the assets that these country hold on behalf of investors actually resident there—whereas in the baseline approach, they have a very large weight due to all the foreign assets invested through their funds, and a correspondingly very low measured degree of home bias, which artificially lowers EA average home bias.[27]

Figure 9: **The dynamics of equity home bias in the Euro Area**
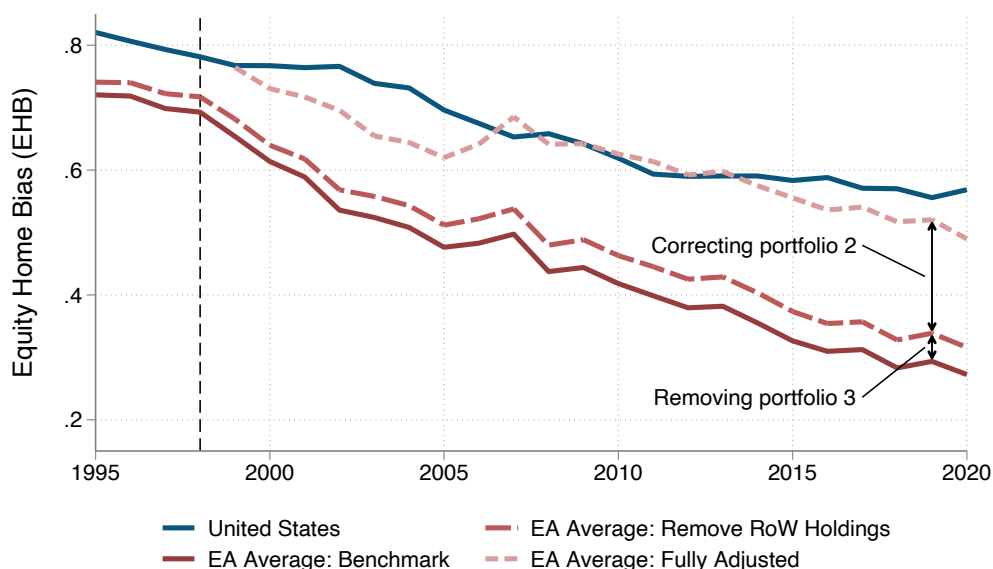
Notes: The red lines display the time series for average equity home bias for Euro Area countries, $\text{EHB}_{\text{EA},t}$. The *solid red line* shows the baseline estimate without corrections, the *short-dashed red line* adjusts for the presence of RoW investors' holdings in Luxembourg and Ireland funds, and the *long-dashed red line* additionally adjusts the indirect equity portfolios held by Euro Area investor countries. The *solid blue line* shows equity home bias for the United States, for comparison.

Estimation results. The solid lines in Figure 9 show the picture that emerges when estimating home bias using the previously standard methodology, with foreign portfolio shares computed as in equation (13), and without adjusting for RoW investors' holdings in OOFC funds. The solid red line displays $\text{EHB}_{\text{EA},t}$, 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 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.X for an average for non-EA developed economies).

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[27]In principle, when accounting for portfolio component 3, there are also second-order effects having to do with the changing composition of the portfolios held by Luxembourg and Ireland themselves. However, since after our adjustments these two countries receive negligible weight in the asset-weighted average $\text{EHB}_{\text{EA},t}$, adjusting for these would only have a small effect on our results.

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. This shows why the standard calculation points to a remarkable change in financial integration in the Euro Area once the currency union was in place. As discussed in Appendix Section H.1, the bulk of this apparent excess decline in home bias—for equity markets and bond markets alike—occurs because of increasing measured integration within the Euro Area, rather than vis-á-vis the rest of the world.

The dashed lines in 9 implement our adjustments, which we do in progressive steps to highlight the varying quantitative importance of the various corrections. The short-dashed red line adjusts the series to remove portfolio component 3—i.e., the holdings of RoW investors that are otherwise spuriously accounted for as belonging to Luxembourg and Ireland. 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. The additional adjustment from restating portfolio component 2, such that portfolio shares are now calculated according to equation (16), leads to the gap between the short-dashed and long-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, 54 cents constitute claims on non-equities, and 1 cent constitutes claims on domestic equities. Once all adjustments are accounted for, Euro Area home bias is fully back on trend with the United States and the rest of the developed world. These results therefore fully overturn the notion that the Euro Area experienced an excess decline in equity home bias after the introduction of the euro.[28]

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:

$$\text{BHB}_{j,t} = 1 - \frac{\omega^B_{j,-j,t}}{m^B_{-j,t}}, \qquad \text{BHB}_{\text{EA},t} = \sum_{j\in\text{EA}} s^B_{j,t}\,\text{BHB}_{j,t}, \qquad s^B_{j,t} = \frac{x^B_{j,t}}{\sum_{j'\in\text{EA}} x^B_{j',t}}, \qquad (18)$$

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[28]In Appendix Table A.IV, 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 see that home bias estimated in this way is biased down from the results in Table 5a.

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 foreign portfolio share $\omega^B_{j,-j,t}$ for each country j is given by

$$\omega^B_{j,-j,t} = \frac{x^{B,\text{Direct}}_{j,-j,t}}{x^{B,\text{Direct}}_{j,-j,t} + x^{B,\text{Direct}}_{j,j,t}}, \tag{19}$$

which only accounts for countries' direct holdings of domestic and foreign bonds. Relative to the prior baseline expression for equity markets, there are no terms corresponding to holdings of foreign fund shares here, since these are treated as claims on foreign equities (and not foreign bonds) in standard approaches. Our adjustments to portfolio component 2 imply a different foreign portfolio share, now given by:

$$\omega^B_{j,-j,t} = \frac{x^{B,\text{Direct}}_{j,-j,t} + x^{B,\text{Indirect}}_{j,-j,t}}{x^{B,\text{Direct}}_{j,-j,t} + x^{B,\text{Indirect}}_{j,-j,t} + x^{B,\text{Direct}}_{j,j,t} + x^{B,\text{Indirect}}_{j,j,t}}, \tag{20}$$

which accounts for indirect holdings of domestic and foreign bonds via OOFC funds.

As before, we use 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 bond asset claims, and we estimate direct holdings of domestic bonds by subtracting IIP bond liabilities from the overall stock of bonds outstanding:

$$x^{B,\text{Direct}}_{j,-j,t} = \text{IIP Bond Assets}_{j,t}, \qquad x^{B,\text{Direct}}_{j,j,t} = \text{Bonds Outstanding}_{j,t} - \text{IIP Bond Liabilities}_{j,t}. \tag{21}$$

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 H for details). We use the same data to compute market shares $m^B_{-j,t}$. Like for equities, we estimate indirect positions by assuming the fractions of foreign fund share investments that are claims on domestic and foreign bonds ($\phi^B_{j,j}$ and $\phi^B_{j,-j}$, respectively) are constant over time:

$$x^{B,\text{Indirect}}_{j,-j,t} = \phi^B_{j,-j} \cdot x^{F,\text{Direct}}_{j,j,t}, \qquad x^{B,\text{Indirect}}_{j,-j,t} = \phi^B_{j,j} \cdot x^{F,\text{Direct}}_{j,j,t}. \tag{22}$$

Estimation results. Figure 10 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 very similar trend, as shown in Appendix Figure A.XI). 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, while the long-dashed red line additionally incorporates our correction to EA countries' indirect holdings.

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 OOFCs.

Figure 10: **The dynamics of bond home bias in the Euro Area**
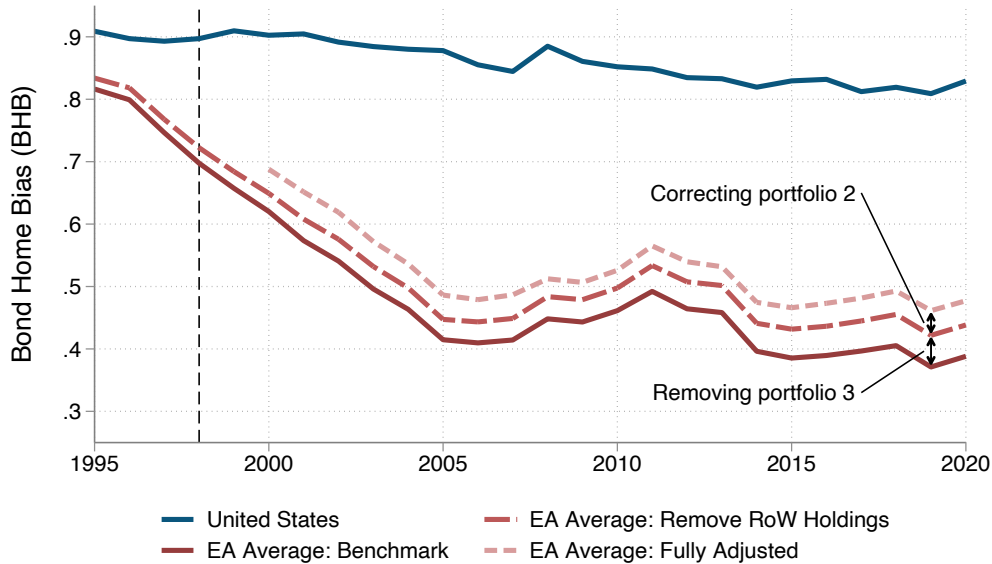
Notes: The red lines display the time series for average bond home bias for Euro Area countries, $\text{BHB}_{\text{EA},t}$. The *solid red line* shows the baseline estimate without corrections, the *short-dashed red line* adjusts for the presence of RoW investors' holdings in Luxembourg and Ireland 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.

However, unlike for equities, the upwards adjustment to the home bias series is not quantitatively large enough to change the qualitative conclusion that the Euro Area experienced a rapid excess decline in bond home bias, relative to the rest of the developed world, following the introduction of the common currency. 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 saw 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 H.1, 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-a-vis

the rest of the world, as established in Section H.1). For instance, it might have been reasonable to theorize that both bond home bias and 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 analyzed the systematic differences in holdings by funds known to be held by EA investors and those that are unaccounted for in SHS. Quantitatively, unaccounted-for investors hold approximately 50% of fund investments undertaken by Luxembourg and Ireland. Throughout the preceding sections, we have referred to these unaccounted-for holdings as RoW investments. In this section, we dive deep into who these "RoW" investors actually are. Here, we bring to bear new data on the immediate counterparties of these funds and demonstrate that the bulk of non-EA positions are now accounted for by the holdings of the United Kingdom. Whereas historically Switzerland used to play a dominant role, the UK gradually supplanted Switzerland's intermediation role over the past two decades.

We show that the positions of the United Kingdom are much larger than what the United Kingdom itself reports owning on a residency basis to the IMF Coordinated Portfolio Investment Survey (CPIS). We present evidence that this discrepancy may arise due to both incomplete reporting by the United Kingdom of positions where its households are the ultimate owners, as well as likely custodial holdings of the UK where it is acting as an intermediary for non-resident wealth around the world. We confirm the findings of Zucman (2013) that Switzerland generates part of the overall missing global assets due to custodial bias. Our analysis emphasizes that understanding the activities of the United Kingdom is key to accounting for the missing wealth of Luxembourg and Ireland,

a long-standing issue in international and public finance.

6.1 Who Accounts for the €3.2trn 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 liabilities to foreign investors of €3.0trn and €4.9trn, respectively.[29] At the same time, Ireland and Luxembourg also report foreign portfolio equity liabilities of €624bn and €47bn, respectively.[30] All other countries combined, however, report owning only €2.0trn and €3.3trn of portfolio equity and fund shares in Ireland and Luxembourg, respectively.[31] Hence, at the end of 2020 there are holdings of approximately €1.6trn of fund shares and equity unaccounted in each of Ireland and Luxembourg, an amount so large that it has attracted the attention of academics, policy markers, and statisticians. In Appendix Section C, we further review this issue and the several possible explanations that have been proposed for it.

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 (at the ISIN level) issued by funds domiciled in Luxembourg and Ireland. Second, from the IMF Coordinated Portfolio Investment Survey (CPIS), we use information 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 fund domiciled in Luxembourg and Ireland as well as information on the fund shares issued by these funds (by amount, currency, and country in which they are available or registered for sale). Fourth, we use novel administrative data provided by the Central Bank of Ireland and the Commission de Surveillance du Secteur Financier (CSSF) for Luxembourg on the country of the immediate counterparts of the fund shares. These entities are often financial intermediaries (e.g., custodians) and hence different from the ultimate owner of the fund shares.

In Figure 11, we plot the geography of the immediate ownership of Irish and Luxembourg fund shares using the administrative data. The data from the Central Bank of Ireland and the CSSF both tell us where the immediate owner of a fund is based. However, and importantly, if this immediate position is being held on behalf of a non-resident, say on a custodial basis, then the country of residency of the investment and the immediate basis might differ. For both Ireland and Luxembourg, the data covers the universe of investment funds, including non-UCITS funds.[32]

Using the immediate counterparty data, we document how a number of important facts emerge. Beginning with Ireland, we see that on an immediate counterparty basis, the overwhelming share of

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[29]As in the ECB's Statistical Data Warehouse for Ireland and Luxembourg (retrieved on March 1, 2023).

[30]As in the ECB's Statistical Data Warehouse for Ireland and Luxembourg (retrieved on March 1, 2023).

[31]According 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 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).

[32]We 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.

Figure 11: **Geography of investors' holdings in fund shares**

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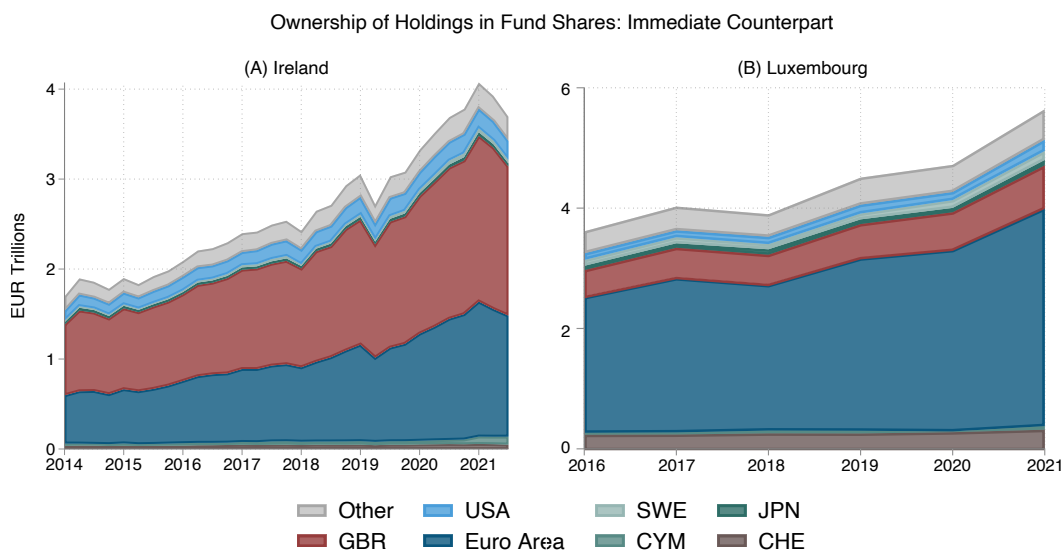
Notes: We use data from the Central bank of Ireland and the Luxembourg Commission de Surveillance du Secteur Financier (CSSF) to decompose the assets of Ireland and Luxembourg funds according to the immediate counterpart owners of the fund shares.

the funds are owned by either Euro Area or UK investors. The UK component is the most striking, with British counterparties accounting for around half of all Irish fund share liabilities. Just as important, however, are the countries that are revealed to not be major owners of the Irish funds. We see that Switzerland, much like global tax havens like the Cayman Islands, accounts for a very small share of Irish funds, even on an immediate counterparty basis. Although we might not expect these tax havens to be major final holders of the securities, if non-residents purchased securities via these countries, then on an immediate counterparty basis we would have expected to see more reported claims.

For Luxembourg, the picture is similar. We see that the overwhelming share of ownership of the Luxembourg funds are accounted for by Euro Area and UK investors. However, in this case, a large share of the Euro Area total position is actually accounted for by Luxembourg itself. For instance, in 2020, Luxembourg accounts for €1,230 billion of the Euro Area's holdings of Luxembourg funds. Of course, Luxembourg's holdings of its own fund shares highlights the limitations of the immediate counterparty data, as it is very likely that these holdings are actually on behalf of ultimate investors based outside of Luxembourg. In the case of Luxembourg, this large position most likely represents the large custodial positions of the country, likely consisting of holdings of Euro Area residents. We once again see that Switzerland and global tax havens account for a relatively small share of ownership of the Luxembourg funds on an immediate counterparty basis. This analysis 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 percent of Luxembourg UCITS fund holdings on an immediate counterparty basis.

6.2 Immediate Counterparty vs. Residency

We next turn to comparing these immediate counterparty holdings to the positions that each country itself reports owning in Ireland and Luxembourg. Importantly, 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 final investors' residency. Of course, 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.

Due to confidentiality restrictions in the SHS data, we report each country's claims on Ireland and Luxembourg based on the self-reported positions in the IMF Coordinated Portfolio Investment Survey (CPIS). However, the CPIS data pools together standard equity claims (common equities as well as preferred equities) and fund shares. For Luxembourg, this is unlikely to be a large concern as there is very little regular equity relative to the size of the fund sector, but this is more likely to be a concern for the larger Irish economy, particularly given that investment in American firms that tax-invert to Ireland will also be included. Given that this latter bias is likely to be a particularly large concern for American investors, for the United States position, we are able to use the reported investment in Irish (and Luxembourg) fund shares using the Treasury International Capital (TIC) data, dropping 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.

In both panels of Figure 12, we see that the United Kingdom is a huge outlier in terms of appearing as a much larger immediate owner of Irish and Luxembourg funds than it itself reports owning in CPIS. For Ireland in particular, this is all the more surprising because—given the close financial, political, and cultural connections between the United Kingdom and Ireland—one might have expected the CPIS data on the UK's holdings in Ireland to be particularly high, since it appears to be likely to invest heavily in Irish equities. Despite this, we see a huge discrepancy in the position, with the recorded liabilities by Ireland vastly exceeding (at €1,529bn) the assets recorded by the UK. The UK does not separately report fund shares and equity portfolio investment in Ireland, but the total of the two is only €336bn in CPIS. The difference at €1.2trn is extremely large, and likely a lower bound since it assumes all the position in CPIS to be in fund shares. While smaller than for Ireland, the discrepancy is also enormous for Luxembourg, with Luxembourg authorities reporting €637bn but the UK only reporting holdings of €134bn of fund shares and equities combined.

The role of the United Kingdom. The major question is then how much of the UK position represents custodial positions on behalf on non-UK residents versus incomplete reporting of the United Kingdom of the true positions in the funds by its households and other sectors. There are reasons to believe both channels are important. Beginning with the possibility of incomplete

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

(a) Ireland Funds
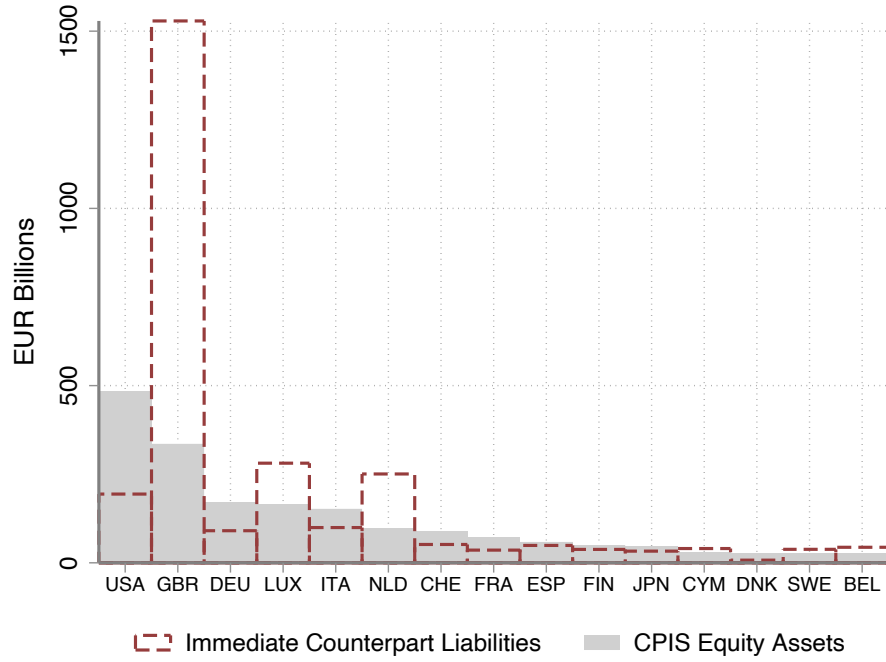
(b) Luxembourg Funds
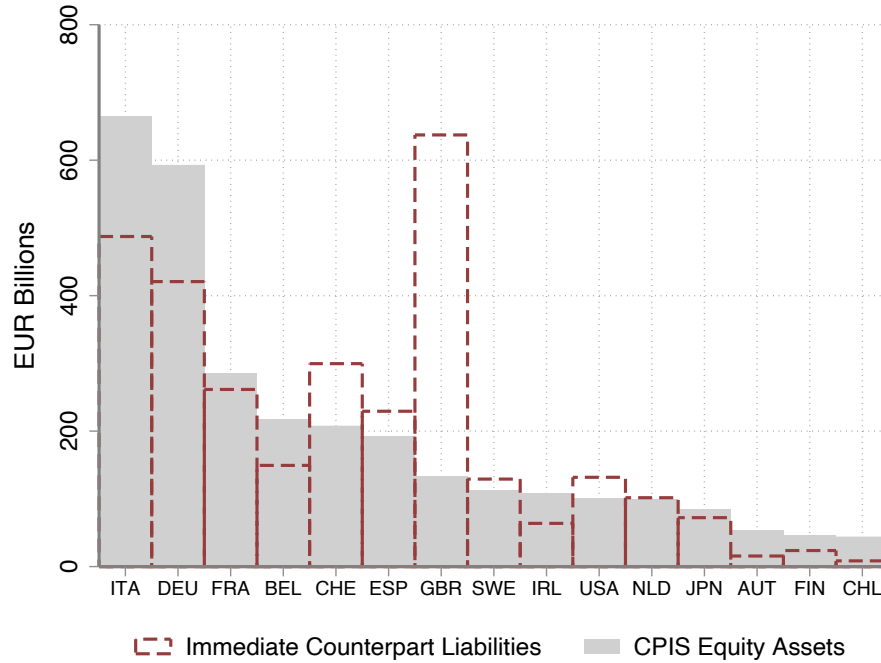
Notes: This figure compares the amount of funds the regulatory authorities (Central Bank of Ireland and CSSF) report to be owned by each country on an immediate counterparty basis (dashed red bars) to the amount of fund shares and equity that each country reports owning in CPIS (solid gray bars). For 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.

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 to important holders of foreign investment funds. For instance, in December 2020, in the Enhanced CPIS Table 3.A, Italian households account for 46% ($86bn of $186bn) of Italy's equity and fund share investment in Ireland and 53% ($433bn of $816bn) of their investment in Luxembourg. The composition of the unaccounted portfolio holdings, particularly in Ireland, as well as the publicly disclosed pension fund holdings of Ireland-resident LDI funds investing in gilts, points to a significant component of these investment funds having British ultimate owners.

The heterogeneity results of Section 4 further point to the importance of the UK as an ultimate investor. In particular, as shown in Figure 6, only 10% 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 ultimate holders are pound-denominated. While British investors invest a very high share of their bond portfolio pounds, the rest of the world generally denominates very little of their assets in pounds (Maggiori et al. 2020). Because in 2020 there were €1.2 trillion in unaccounted bond positions in Ireland, this means that there were €474 billion in pound-denominated assets alone. If these positions are largely owned by British investors, then this would point to large-scale underreporting of UK positions, in addition to the other assets that UK investors are likely to own.

However, given the magnitude of the discrepancy, it is likely that a significant portion of this UK investment must be done on behalf of non-UK residents. The sheer magnitude of the positions implies that if all of the securities recorded as belonging to the UK in the administrative data on a residency basis were actually owned by British residents, the UK net foreign asset position would be (directly) massively underreported. In addition, examining the holdings of some of the individual funds that Europeans do not report owning in the SHS data, it appears very likely these funds are owned by non-UK and non-European investors. For instance, some major funds measure their returns in currencies such as the Hong Kong dollar, with their marketing material clearly indicating that they are targeting a non-European and non-UK investor base.[33]

Putting this together, it is clear that the key to a complete understanding of the missing wealth in Luxembourg and Ireland is understanding what share of UK investments in these countries on an immediate basis is actually on behalf of British residents, and then which foreign investors own the remaining funds via the UK. 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 tax 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 tax evasion of this massive scale. Second, as we have shown in Section 4, the portfolio of securities held by

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[33]In Appendix Figure A.III, we note that the UK is a major under-reporter in its own 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.

RoW investors via Irish mutual funds is very different on observables such as currency and country of the issuer from the portfolio that EA residents are known to hold via the Irish funds. 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 second point in depth in the next subsection.

The Euro Area, Switzerland, and tax havens. Despite the clear importance of the UK, there is still much we can learn from the other positions in Figure 12. For both Luxembourg and Ireland, we see that Germany, Italy, and France all report owning more fund shares and equity than the country reports them owning on an immediate basis. The overall pattern is consistent with exchanges of information within the EA on security holdings, so that some shares issued by Irish funds and held on an immediate counter-party basis by a custodian—for example in Luxembourg (i.e., an Irish immediate counter-party 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. Interestingly, we see that the United States reports significantly less ownership of Luxembourg and Irish fund shares in its official Treasury International Capital data than the two countries report Americans owning on an immediate basis.

The next question is how Switzerland and global tax havens fit into the picture. We see that Switzerland and global tax havens do not account for a particularly large portion of the position.To better understand the potential role of Switzerland, we update the result 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 percent of the discrepancy (€802bn of the €1641bn).[34] On the one hand, this assumption is likely to overestimate the amount invested by 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 percent, supporting the view that the two series are indeed related.

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[34]The 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 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 €790bn. 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.

Figure 13: **Home bias via Luxembourg funds: immediate counterparty data**
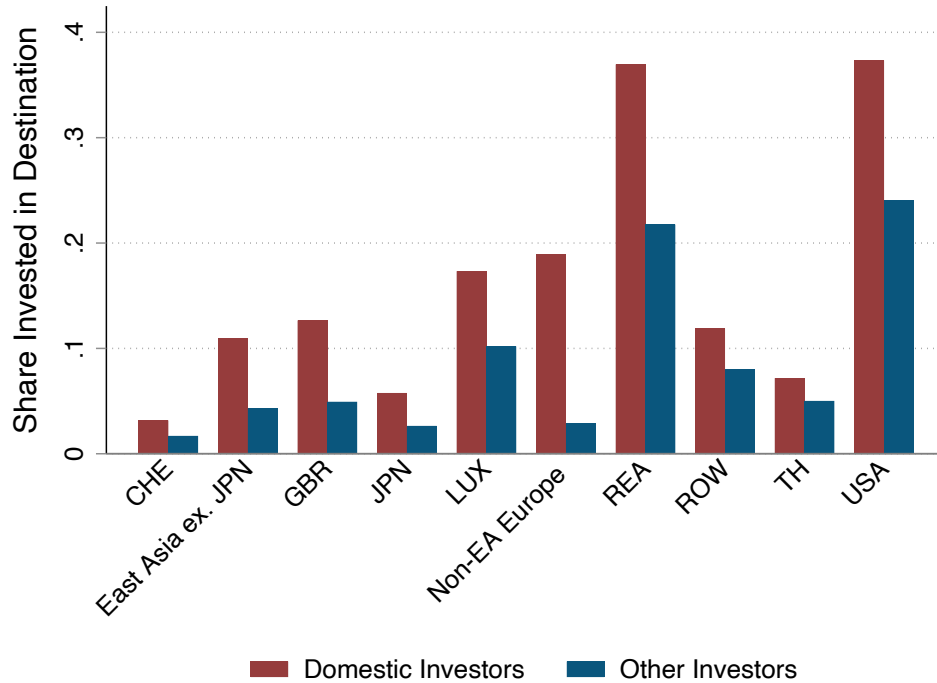
Notes: We use the CSSF administrative data to plot the share of each country or area's investment in Luxembourg funds (on an immediate counterparty basis) that is invested back into the investor country or area ("Domestic Investors") in the *red* bars. In *blue*, we use the same administrative data to plot the share of all other investor's Luxembourg fund investment that flows back to the particular country or region ("Other Investors"). Data from end of year 2020.

6.3   Is the "Rest of the World" Actually the Rest of the World?

In this section we use an additional new dataset from CSSF on the geography of the investments intermediated by Luxembourg funds. In particular, the CSSF has provided us with data that allows us to observe the geography of the holdings of mutual funds interacted with the geography of the immediate holder. This data provides evidence that the Luxembourg funds owned by non-EA investors on an immediate counterparty basis are also likely to be held by non-EA investors on an ultimate counterparty basis.

As part of their regulatory reporting to CSSF, Luxembourg domiciled funds report the geographic composition of their investments by destination. If we combine the geography of who owns the funds on an immediate counterparty basis with the geography of investment destinations, we can then ask how differently funds owned by different investor countries allocate their portfolios. Intuitively, we exploit the fact that investors exhibit different investment patterns depending on their country of origin (home bias, home currency bias, gravity, etc.) and that these effects are present even conditionally on investing in or via an offshore financial center (Coppola et al. 2021). This leads to a "revealed preference" approach whereby if we were to find that funds held by the UK on an immediate counterparty basis disproportionately invest 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.

This data combining the geographies of ownership and of investment is available at a more coarse level of geographical aggregation. In particular, we observe investment to and from Switzerland, the UK, Japan, Luxembourg, and the United States, and then aggregated version of Asia (excluding Japan), the Rest of the Euro Area (REA), small offshore financial centers (TH), the rest of Europe (Other Europe), and then all other countries (RoW).

We begin by looking for heterogeneity in how these geographies invest in Figure 13. In particular, we ask how much each of these investor groups invests in itself via the funds it owns in Luxembourg and how much all *other* investor groups put into this destination. For all ten investor groups, we find evidence of round-tripping, or home bias in holdings through Luxembourg funds. While our results earlier in the paper demonstrated that the Euro Area excluding Luxembourg (REA) invests disproportionately back into the Euro Area, the fact that every other investor jurisdiction also does this type of round-tripping is only visible in the new administrative data from CSSF. For those jurisdictions where we would expect direct holdings rather than custodial positions, such as Asia, Japan, Other Europe, the Euro Area and the United States, we see that home investment shares are often twice or more what the rest of the investors allocate.

Of particular interest for our analysis, 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 already provides supportive evidence that a substantial share of UK immediate holdings are actually on behalf of its residents. For the UK to be investing solely on behalf of the rest of the world, it would need to be that foreigners investing through the UK choose to actually invest disproportionately back in the UK. Why such a custodial route would lead to 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 portfolio, rather than focusing only on round-tripping. In particular, we divide our source and destination of investment into three broad categories: the Euro Area (EA), the United Kingdom (GBR), and the Rest of World (RoW). Figure 14 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 investments by RoW counterparties than by Euro Area 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. While at present we cannot split the share of the UK's investment on an immediate counterparty basis which

Figure 14: **Portfolio heterogeneity via Luxembourg funds: immediate counterparty data**
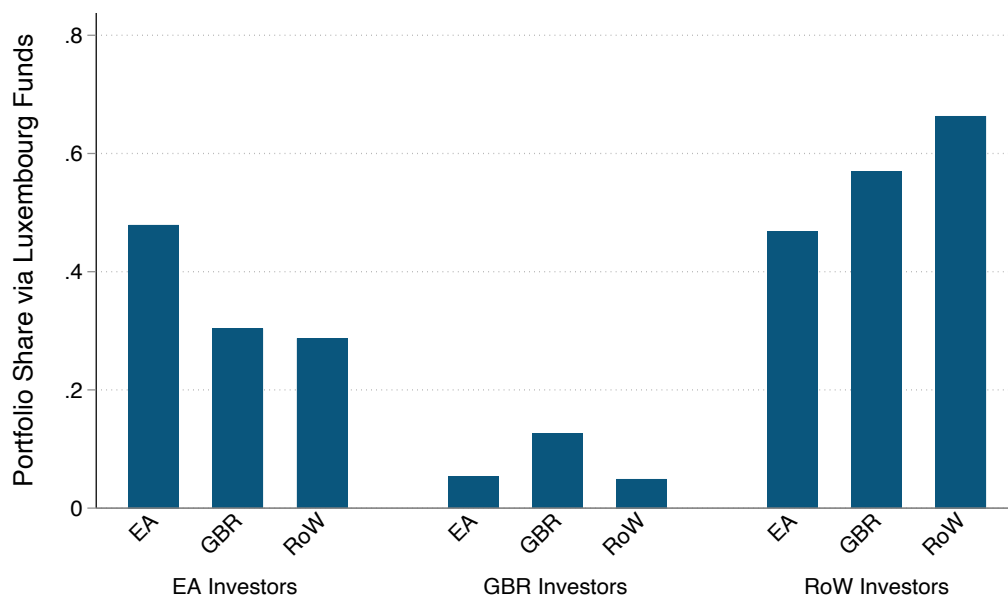
Notes: We use the CSSF administrative data to look at the geography of investment of Luxembourg funds depending on whether they are held by Euro Area (EA), United Kingdom (GBR) or Rest of World (RoW) investors on an immediate counterparty. EA includes all Euro Area countries including Luxembourg. Rest of World includes all investors not in the EA and UK. The first three bars from the left show the composition of investments held by EA counterparties, the second set of three bars is for UK counterparties, and the last set is for RoW counterparties. Within each set, the three bars show the share of the portfolio held via Luxembourg fund invested in each destination (EA, UK, or RoW).

belong to each non-European investor country on an ultimate counterparty basis, for the purposes of restating the Euro Area's investment patterns, we do not need to. Instead, it is enough to know that the UK is overwhelmingly investing on its own behalf or on behalf of investors outside the Euro Area, so that the investment we ascribe to the "Rest of the World" in Sections 1 through 5 is likely to actually be coming from the Rest of the World.[35]

Was it always the UK? Having documented in 2020 the outsized role that the UK plays in intermediating global fund investment via the OOFCs, one natural question is whether the UK has always played this role. This is important in light of the conclusion of Zucman (2013) that

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[35]In Appendix Figure A.VI, we compare the share invested by each country through Luxembourg funds relative to the positions of all other countries in Luxembourg. In Panel A, we observe that the UK is overweight itself and the Rest of the World and slightly underweight the Euro Area (REA). In Panel B, by contrast, we see that when the Euro Area invests via Luxembourg it is massively overweight itself, while being underweight all other destinations but Luxembourg. When we turn to panel C, Luxembourg's investment in itself, it also has a lot of its positions invested in the Euro Area, consistent with the idea that its holdings largely represent custodial holdings of the rest of Europe. 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 Euro Area investors. We show that indeed Switzerland has a Euro Area tilted portfolio (combining REA and Luxembourg). 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 Euro Area rather than investing for itself or on behalf of non-European.

Figure 15: **Ownership of Luxembourg funds: from Switzerland to the UK**
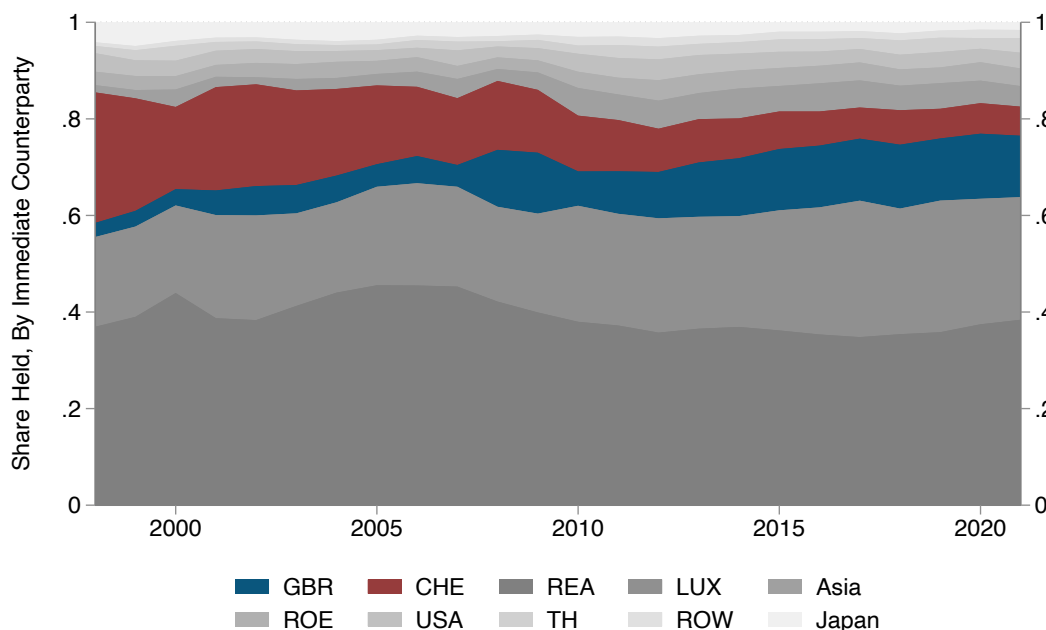
Notes: We show the time series of ownership of Luxembourg funds on an immediate counterparty basis, using data from CSSF. "GBR" denotes Great Britain, "CHE" Switzerland, "REA" the Rest of the Euro Area, "LUX" Luxembourg, "ROE" the Rest of Europe outside the Euro Area, "USA" the United States, "TH" global tax havens, and "ROW" the Rest of World.
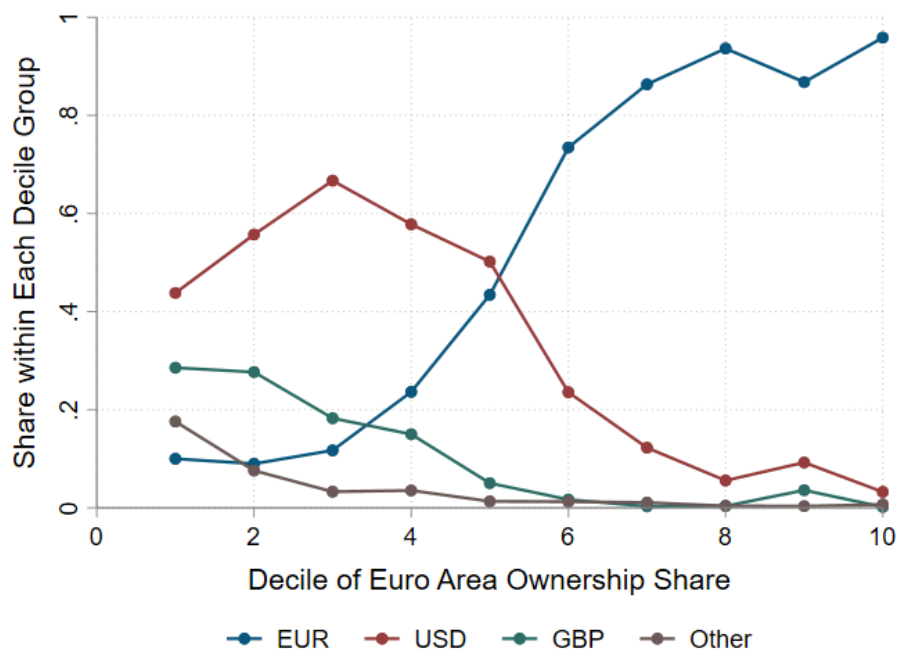
intermediation via Switzerland accounted for the bulk of missing wealth in the world. In Figure 15, we use new data from CSSF and plot the time series of the share of Luxembourg funds owned by different investors around the world back to the late 1990s. As we can see, in the 1990s and early 2000s, Switzerland was one of the largest international owners of these funds, consistent with the findings of Zucman (2013). However, in more recent years, we have seen the Swiss ownership share fall to 6.3%, while the UK ownership share increased to 13.4%.[36] 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). It is an open question the extent to which investors that previously intermediated their investment through Switzerland switched to going through the UK, or if these are new investors into the OOFC funds.

6.3.1 A Revealed Preference Approach to Investigate Ultimate Ownership

Finally, we turn to exploring the extent to which EA and RoW investors differ in the types of funds they buy. This will be our final piece of evidence that the RoW investors are not actually Euro Area investors in disguise. We take a "revealed preference" approach to exploring this question. We do so by classifying the share classes of funds according to their *base currency*. Importantly, the

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[36]No comparable data with this length of the time series is available for Ireland.

Figure 16: **Investigating ownership via revealed preference**

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 profits and losses. Generally, we believe that if investors think in terms of their home currency, then a fund that targets particular investors will report its profit and losses in their clientele's currency.

To explore this idea, we classify each fund based in Luxembourg and Ireland based on what share of its assets under management is owned by Euro Area investors in the SHS data. We then split these funds by decile of the Euro Area ownership share. For each of these ownership deciles, Figure 16 plots the share of the funds which have a base currency corresponding to the euro, the US dollar, the British pound, and all other currencies. We see that for the top decile of Euro Area ownership (funds entirely owned by Euro Area investors), 95.9% of the funds are denominated in Euros with 3.3% in US dollars, and only a negligible amount in other currencies. In other words, the funds that are owned entirely by Europeans are nearly all denominated in Euros.

By contrast, when we consider the funds that Euro Area investors report owning the least of, we see 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 see a nearly monotonic relationship between the Euro Area ownership share and whether the fund itself uses the euro as its base currency. We take this as strong evidence that the investors we classify as "Rest of World" are actually not Euro Area residents. Otherwise, one would need a reason for why Euro Area

investors holding assets via Luxembourg or Irish funds prefer to think in euros, but when routing their funds through the UK or other jurisdictions, they suddenly prefer funds with a different base currency.

While 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 16 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.

7 Conclusion

We reassess 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 OOFCs, as hubs of financial intermediation and 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-á-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 OOFC activities for equity portfolios. Further, using new administrative evidence on the identity of non-Euro Area investors in OOFC 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. Activities taking place in OOFCs have important consequences for both international financial measurement and for the allocation of capital in the Euro Area and beyond.

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