The Geography of Capital Allocation in the Euro Area

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

Keywords: Financial Integration, Offshore and Onshore Financial Centers, Capital Markets Union, Residency and Nationality, Home Currency Bias.

JEL Codes: F3, F4, G2, G3.

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1 Introduction

The creation of the Euro Area (EA) has been one of the most important economic developments of the post-World War II international economic architecture. 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 bears parallel to that of offshore financial centers. They play dual roles as both hubs of investment fund intermediation and centers for securities issuance by foreign 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, we present new evidence on the identity of non-Euro Area investors in OOFC funds, and we document consequences for firms’ access to foreign capital.

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 reasonably imagine that BMW would simply issue bonds in Germany that are then bought by the

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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.
Italian investors (as in the arrow labeled 1 in the figure), but in fact this is not what happens, as BMW 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, 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 OOF jurisdictions. Beyond their importance for academic research, for policymakers these magnitudes have prevented a proper 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’ securities investments. This dataset is the micro data behind the EA aggregate domestic and international portfolio investment statistics. It is collected on a residency basis at the security level, with the holder recorded at the country-sector level (for instance, SHS will record holdings of the French banking sector, but not of individual French banks). We combine this data with estimates on fund-level investment for funds domiciled in Luxembourg and Ireland from commercial sources to unwind fund investment by EA residents. We also combine the resulting data with a mapping algorithm that assigns each security not to its immediate issuer but to the ultimate parent entity and determines its nationality.

Reported holdings of fund shares in Luxembourg and Ireland by Euro Area resident investors only account for a fraction of the total fund shares issued by investment funds resident in these OOFs. Throughout the paper, we refer to fund shares not reported to be held by EA investors as being held by the rest-of-world (“RoW”), a residual category. In Section 5, 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 uncoovers 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 large part because a fraction of the fund holdings in Luxembourg and Ireland are reported to not be held by Euro Area residents. Using our fund unwind methodology, we document that the underlying
portfolio of securities held by EA and RoW investors in these funds is highly heterogeneous. 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 research project 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.3

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 home bias for EA countries post-euro is in fact smaller. Quantitatively, our reassessment of home bias is especially significant for equity portfolios, for which our new estimates entirely undo the excess trend relative to other advanced economies, bringing the Euro Area back in line with the rest of developed world. Hence, 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. 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 and bond markets—for instance, models in which frictions causing a home currency bias in portfolios act as key barriers to bond market integration.

Most obviously, 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. More subtly, attempts to naïvely distribute the full Luxembourg and Ireland fund portfolio to the rest of the EA member states (e.g., proportionally to reported fund shares holdings, or by GDP weights) would still result in incorrect estimates. This occurs, despite the netting of fund shares, because the positions of Luxembourg and Ireland funds not held by EA investors are large and more diversified within the EA (on top of being more diversified in the rest of the world.)

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3This paper is part of a research collaboration between the ECB and the Global Capital Allocation Project and we plan to make aggregate estimates publicly available.
than those held by each EA member state. For instance, there is home country bias within the EA even when investing indirectly via Luxembourg and Ireland. Additionally, remapping securities by nationality rather than residency shrinks the cross-border positions of all investors in the EA.

Third, we show that securities issued in OOFCs are more widely held by EA investors than those issued in national capital markets. Firms which raise capital through OOFCs therefore better approximate the policy goal of a Capital Markets Union in the EA, with their liabilities held widely by investors around the currency area. We show that this integration is not purely the result of selection, but rather that there is an allocative effect of moving issuance to the OOFCs. We demonstrate that within a given firm’s issuance (using firm fixed effects) the rest of the EA members are more likely to hold bonds issued in the OOFCs (in the same currency, i.e. euros) than those issued domestically in the country of nationality of the firm. Further, we show that this allocative effect is heterogeneous and related to a North-South asymmetry in EA investment patterns: it is larger for countries in the South, like Italy, and smaller for countries in the North, like Germany.

Fourth, 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 spanning the gamut from all of these unrecorded investors being EA-based to none of them being resident in the EA. Using 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 done on behalf on non-residents.

For Ireland, for example, 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. 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. This supports the notion that there are additional EA holdings unaccounted for, but that these are not the bulk of the holdings.

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.
**Related Literature.** Our paper makes progress on longstanding issues in international macroeconomics and finance, which have implications both within the field but also 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.

Second, 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. 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.

Third, 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 use a version of their remapping 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. Maggiori, Neiman and Schreger (2020) establish home currency bias for ten developed countries and prove a causal relationship using within-firm variation in bonds issued in different currencies, but again consider the Euro Area as a single block of investors. We use estimates, based on their work, of security holdings by funds domiciled in Luxembourg and Ireland.

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. Kojjen, Koulisher, Nguyen and Yogo (2018), Bergant, Fidora and Schmitz (2020), Papoutsi, Piazzesi

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5There 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).
and Schneider (2021), and Holm-Hadulla and Leonbroni (2022) investigate quantitative easing and monetary policy shocks. Boermans and Vermeulen (2016) document a preference of investors for euro-denominated securities and Faia et al. (2022) point out heterogeneity in the currency composition of bond portfolios among different sectors like investment funds and insurance companies. Darmouni and Papoutsis (2022) explore the growth of non-financial corporate bond issuance in the Euro Area. Bergant et al. (2023) investigate capital flows to emerging markets. The literature has varied a lot in its attempt to treat investment fund shares. Most studies, especially those at the EA consolidated level, include all funds. Some studies drop Ireland and Luxembourg funds altogether or treat them separately. 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.6

Fourth, 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.7 Ciccone et al. (2022) provide evidence that Luxembourg based funds are held by investors outside the EA, and that those funds distributed globally pursue more diversified investment strategies.

Fifth, 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 Kojien 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 Unwinding the Dual Roles of OOFCs

This section provides an overview of the usage of OOFC intermediation and financing structures by global investors and firms. It introduces the methodology that we use to unwind the dual roles of Euro Area OOFCs and provide a set of restated financial statistics that better reflect the true financial linkages connecting Euro Area countries to each other and to the rest of the world.

2.1 OOFC Exceptionalism and Impact on EA Aggregate Statistics

To provide an illustrative reference point, Panel A of Figure 2 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 fast over the last thirty years for most countries in the world. To illustrate the extent to

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6Boermans 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.

7See also Alstadsæter et al. (2019), Johannesen et al. (2020), and Menkhoff and Miethe (2019).
which the EA has had an extraordinary growth, we scale the EA index by similar measures computed for other large developed countries. The resulting index (red line) is displayed in Panel A of Figure 2. 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. 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 2: Euro Area external positions and onshore offshore financial centers

(a) Excess growth of Euro Area gross positions
(b) Onshore offshore financial centers

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 B of Figure 2 illustrates just how different the external positions of these OOFC countries

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 2 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:

$$GP_j = \frac{A_j + L_j}{GDP_j}$$

$$GP_{EA} = \frac{\sum_{j \in J_{EA}} (A_j + L_j)}{\sum_{j \in J_{EA}} GDP_j}$$

$$GPR_{EA} = \frac{GP_{EA} \sum_{j \in J_{DM}} GDP_j}{\sum_{j \in J_{DM}} GDP_j}$$

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

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.
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.

2.2 Estimating OOFC Activities in the Data

Throughout the paper, we rely on multiple data sources. The core data source is the Securities Holdings Statistics database (SHS) maintained by the European Central Bank. This dataset, collected since 2013 in recognition of the importance of tracking the ownership of financial assets for economic policy, is a security-level dataset measuring how much of every portfolio asset each sector-country in each euro area country owns. To perform our analysis and look through the activities of the OOFCs, we link SHS to several commercial data sources. Estimates based on comprehensive fund portfolio holdings from Morningstar, constructed in Maggiori et al. (2020) and Coppola et al. (2021), let us observe each fund’s complete holdings of securities worldwide: by linking these estimates to SHS, we can attribute the funds’ positions to their underlying owners, as discussed further in Section 2.4. Additionally, we use a version of the algorithm built in Coppola et al. (2021)—which assembles the information coming from many commercial data sources—to link each of the securities issued by an entity in OOFCs (as well as all other countries in the world) to its ultimate parent entity and its nationality: this is described in Section 2.5.

To clarify how these multiple sources of data allow us to trace the dual roles of European OOFCs in capital allocation, consider again the example shown in Figure 1. Through the SHS data, we can observe the position of Euro Area investors (at the holder country by holder sector level) in individual securities, including fund shares, which in our example corresponds to arrows 1, 2, and 4: the holdings (or lack thereof) of Italian investors in BMW Finance NV securities, BMW AG securities, and individual Luxembourg fund shares are all contained in SHS. Conversely, the fund holdings estimates based on Morningstar data show us arrow 5: in this data, we can see the securities positions, including in BMW Finance NV bonds, of the individual OOFC investment fund which intermediates the Italian investors’ capital. The securities aggregation algorithm, on the other hand, links the securities issued in OOFCs to their ultimate corporate parents, which corresponds to arrow 3 in the figure. Lastly, since we observe Euro Area investors’ comprehensive holdings in each security plus the securities’ values outstanding (obtained via the ECB’s Centralized Securities Database, or CSDB), we can measure the size of the positions unaccounted for—corresponding to arrows 6 and

\[^{10}\text{Additional data on security characteristics (such as amounts outstanding) comes from the ECB’s Centralized Securities Database (CSDB) as well as Factset.}\]
7—as a residual. We will revisit the question of who exactly holds these unaccounted-for positions, and whether they are actually RoW investors, in Section 5.

By bringing together and linking all the data sources, we gain a complete picture of all these aspects of cross-border financial intermediation through OOFCs, and hence we can more properly understand the real extent of financial integration that has occurred in the Euro Area.

2.3 Growth and Heterogeneity in OOFC Financial Intermediation

We now turn to documenting the growth in the dual roles of European OOFCs and analyzing the heterogeneous ways in which different investors and firms intermediate financial activities through these jurisdictions. Starting with fund intermediation, the heterogeneity is apparent in Figure 3, which displays the aggregate pattern of reallocations via funds based in OOFCs, and also demonstrates our focus on these locations rather than other countries—with Germany shown as a comparative example. The topmost lines plot the total assets of the fund sectors in these three countries. The first takeaway is that the fund sectors in Luxembourg and Ireland are extremely large and rapidly growing, with assets reaching 4 trillion and 3 trillion euros, respectively, and exceeding those of the German fund sector.

Figure 3: 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 REU securities, and dark shades to investment in RoW securities.

The shaded regions in Figure 3 capture the high-level results of our methodology, splitting the investment funds’ assets according to who the ultimate owner is, and which countries’ securities
these portfolios are invested in.\textsuperscript{11} The blue areas correspond to domestic ultimate owners—that is, owners based in the country’s of the investment fund. The red areas correspond to ultimate owners in the rest of the Euro Area, and the green areas correspond to ultimate owners that do not report through the Euro Area’s SHS administrative data (labeled RoW). We refer throughout the paper to these three components of the observed EA portfolios as portfolio component 1 (the blue areas, corresponding to securities held directly by EA investors, outside of OOFc funds), portfolio component 2 (the red areas, corresponding to securities held indirectly by EA investors through OOFc funds), and portfolio component 3 (the securities held by RoW investors through OOFc funds). 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 Euro Area.

This graph allows us to look at 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, the portfolios held by different investors through Luxembourg and Ireland funds are highly heterogeneous, with particularly large differences between EA and RoW investors. RoW investors are much more tilted towards non-EA assets than EA investors when investing through these funds.

We observe a similar pattern when looking at the currency composition of these investments. Figure 4 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 only clearly defined as 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. This heterogeneity in portfolios held through OOFc funds—both

\textsuperscript{11}For Luxembourg and Ireland, we aggregate unwound fund holdings by investment destination for fund positions of domestic and other EA investors. Under the assumption these are representative, we scale up these amounts by the match rate for the unwind in order to account for fund holdings that we do not unwind (see Section 2.4). We then calculate the unallocated, or rest of world, holdings as the residual of the total fund holdings in SHS minus the scaled up domestic and EA fund holdings. For Germany we assume that both domestic, other EA, and rest of world investors have the same share of their fund positions allocated across investment destinations.
in terms of destination country and of currency—has important consequences for our reassessment of the Euro Area’s external financial positions, a topic that we return to and develop in detail in Section 3.

The quantitative importance and heterogeneity in OOFIC intermediation activities is also evident when inspecting their role as domiciles of securities issuance. As shown in Figure 5, corporate bonds issued in OOFICs have accounted for a remarkably high share of cross-border holdings inside the Euro Area: about 33% of all cross-border holdings of corporate bonds within the EA (that is, bonds issued by European firms and held by Euro Area investors outside of their country of issuance) are in bonds issued in OOFICs, with Luxembourg and the Netherlands accounting for most of this phenomenon. The majority of these bonds are reallocated away from the OOFICs on a nationality basis. Darmouni and Papoutsi (2022) document the growing importance of bond financing of non-financial corporates in the Euro Area at the expense of more traditional (in Europe) loan financing from banks. In this context, OOFICs are likely to continue playing a crucial role for capital allocations in the Euro Area. 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.

Zooming in on the cross-section of firms, Figure 6 visualizes the nature of these corporate bonds issued in OOFICs. On the left, we show the relative amounts that Germany, France, Italy, the Netherlands, the rest of the Euro Area (REA), and the rest of the world (RoW) invest in corporate

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 (REU), 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.
bonds issued in Luxembourg, the Netherlands, and Germany (again included for comparison). While 95% of funds invested in Germany on a residency basis remain in Germany on a nationality basis, only 27% of corporate bonds issued in Luxembourg on a nationality basis remain there. Instead, 47% are reallocated to other Euro Area countries, and 26% to the rest of the world. For the Netherlands, 54% of the funds remain, while 31% and 15% are reallocated to the rest of the Euro Area and the rest of the world, respectively.

2.4 Unwinding Holdings Through Luxembourg and Ireland Funds

In this section we provide further details on the 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. 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 Luxembourg, the Netherlands, and Germany (again included for comparison). While 95% of funds invested in Germany on a residency basis remain in Germany on a nationality basis, only 27% of corporate bonds issued in Luxembourg on a nationality basis remain there. Instead, 47% are reallocated to other Euro Area countries, and 26% to the rest of the world. For the Netherlands, 54% of the funds remain, while 31% and 15% are reallocated to the rest of the Euro Area and the rest of the world, respectively.

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12 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 3 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.
Figure 6: Understanding OOFCS’ role as conduits for foreign firms’ securities issuance

Notes: This Sankey chart displays the relative amounts of bonds issued through entities resident in Luxembourg, Ireland, and Germany (column labeled “Subsidiary Location”). We link the securities to their country of nationality (“Ultimate Parent Location”) and to the holders of these bonds (“Investor”). Data shown as of 2020.

SHS data. For this information, we rely on estimates of security level holdings of each fund based on Morningstar 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.

More formally, we let the euro value of a position in SHS to be $x_{j,ic}^{af}$, where $c$ corresponds to a security, $j$ is the investing country, $a$ corresponds to the security’s asset class (equity, fund share, corporate bond, sovereign bond, or structured finance), 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.

Investments in particular Luxembourg and Ireland funds therefore correspond to those positions $x_{j,ic,c}^{af}$, where $c \in F_i$, with $F_i$ the set of fund shares corresponding to funds domiciles in country $i \in \{\text{LUX, IRL}\}$. From the Morningstar 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 $\sum_{c'} \gamma_{c,c'} = 1$. The

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13 As discussed in Section 2.2, 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 (“Master Portfolio ID”) in Morningstar.

14 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.
indirect positions of individual Euro Area countries through OOFC funds are therefore given by

\[ x_{j,i,c,c'}^{a,f} = \sum_{c' \in J} \left( x_{j,i,c,c'}^{a,f} \cdot \gamma_{c,c'} \right). \tag{1} \]

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

\[ x_{j,i,c',c}^{a,0} = x_{j,i,c',c}^{a,Direct} + x_{j,i,c',c}^{a,LUX} + x_{j,i,c',c}^{a,IRL}. \tag{2} \]

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

\[ x_{RoW,j,i,c}^{a,f} = \tilde{x}_{j,i,c}^{a} - \sum_{j \in J_{EA}} x_{j,i,c}^{a,f}, \tag{3} \]

where \( J_{EA} \) is the set of euro area countries and \( \tilde{x}_{j,i,c}^{a} \) are the direct holdings in security \( c \) of the fund sector of country \( f \) \( \in \{ \text{LUX, IRL} \} \) in the SHS data. Our unwind procedure keeps total wealth observed in SHS constant, since the estimated positions \( x_{j,i,c,c'}^{a,f} \) and \( x_{RoW,j,i,c}^{a,f} \) sum to the original fund assets \( \tilde{x}_{j,i,c}^{a} \). We emphasize that there are a number of reasons why the definition of \( x_{RoW,j,i,c}^{a,f} \) might overestimate RoW holdings through Luxembourg and Ireland funds. First, if our commercial data does not contain the underlying positions of the mutual funds, then we cannot ascribe the holdings to a Euro Area investor. If these funds’ holdings appear in the asset-side position of the OOFC, then we would be ascribing European-owned assets to the rest of the world. More substantively, if Europeans are purchasing these funds through third countries (for instance, Switzerland) for tax, privacy, or other reasons, these holdings would not appear in SHS and therefore we would ascribe them to the rest of the world. Lastly, SHS data, while comprehensive, might not report all fund shares held by Euro Area residents because of incomplete data collection. In the interest of clarity, it is best to interpret the term “rest of the world holdings of funds in Luxembourg and Ireland” as what it is formally is in equation (3): the residual from known Euro Area positions in SHS. We return to this in Section 5.

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 2019. The overall holdings in Luxembourg or Ireland fund shares observed in the SHS data are €3,120 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

\[ 15 \]
Table 1: Fund unwind: match rates

<table>
<thead>
<tr>
<th></th>
<th>Luxembourg and Ireland</th>
<th>Luxembourg</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total Fund Share Liabilities in SHS*</td>
<td>3,210</td>
<td>2,337</td>
<td>873</td>
</tr>
<tr>
<td>2. Matched to Holdings in Morningstar*</td>
<td>2,749</td>
<td>2,011</td>
<td>739</td>
</tr>
<tr>
<td>3. Of which: Unidentified holdings</td>
<td>540</td>
<td>353</td>
<td>188</td>
</tr>
<tr>
<td>4. Of which: Identified holdings</td>
<td>2,209</td>
<td>1,658</td>
<td>551</td>
</tr>
<tr>
<td>5. Share Matched</td>
<td>85.6%</td>
<td>86.0%</td>
<td>84.6%</td>
</tr>
<tr>
<td>6. Share Matched to Identified Holdings</td>
<td>68.8%</td>
<td>70.9%</td>
<td>63.1%</td>
</tr>
</tbody>
</table>

*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 OOF countries vis-à-vis Euro Area investors. Row 2 reports the value of the positions that we match to fund holdings in Morningstar, 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 2019. 85.6%, meaning that we can map €2,749 billion worth of these fund share positions to fund portfolios in the Morningstar fund holdings estimates.16 Of these matched positions, €2,209 billions (68.8% of the starting €3,120 billions) are mapped to securities $c'$ for which we have securities identifiers (ISIN code) in the Morningstar estimates. The rest of the matched positions (€540 billions) are mapped to fund assets without a corresponding ISIN code: we have inspected these positions comprehensively by looking at the funds’ reported descriptions of them, and they consist primarily of cash and cash instruments.17 These match rates are fairly similar when looking at Luxembourg and Ireland individually, as also shown in Table 1.

Table 2: Summary statistics for fund unwind

<table>
<thead>
<tr>
<th></th>
<th>Luxembourg and Ireland</th>
<th>Luxembourg Only</th>
<th>Ireland Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Morningstar</td>
<td>SHS</td>
<td>Morningstar</td>
</tr>
<tr>
<td>1. Value, Total Holdings*</td>
<td>5,656</td>
<td>6,958</td>
<td>2,209</td>
</tr>
<tr>
<td>2. Value, Bonds &amp; Equities*</td>
<td>4,357</td>
<td>5,922</td>
<td>1,967</td>
</tr>
<tr>
<td>3. Value, Bonds</td>
<td>2,289</td>
<td>3,441</td>
<td>1,031</td>
</tr>
<tr>
<td>4. Value, Equities*</td>
<td>2,068</td>
<td>2,491</td>
<td>936</td>
</tr>
<tr>
<td>5. Share EUR (Bonds)</td>
<td>34.4%</td>
<td>31.4%</td>
<td>54.0%</td>
</tr>
<tr>
<td>6. Share USD (Bonds)</td>
<td>46.1%</td>
<td>40.7%</td>
<td>32.9%</td>
</tr>
<tr>
<td>7. Share GBP (Bonds)</td>
<td>19.5%</td>
<td>18.9%</td>
<td>12.9%</td>
</tr>
<tr>
<td>8. Share EMU (Bonds)</td>
<td>21.9%</td>
<td>23.7%</td>
<td>27.5%</td>
</tr>
<tr>
<td>9. Share EMU (Equities)</td>
<td>19.7%</td>
<td>22.3%</td>
<td>18.3%</td>
</tr>
</tbody>
</table>

*Market values, shown in billions of Euros

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 Morningstar report statistics for the assets of Luxembourg and Ireland mutual funds in the Morningstar data. We show the value of total holdings (row 1), the value of equity and bond holdings (rows 2 to 4), the currency composition of bond holdings (rows 5 to 7), and the share of assets that are invested in EMU securities by residency (rows 8 and 9). Data shown as of 2019.

Diving further into the details of the fund unwind, Table 2 reports summary statistics for 16We 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 Refinitiv Eikon, Factset, and hand-collected public sources to maximize the match rate. 17Not all fund assets are reportable in SHS. Examples include assets that are not securities, such deposits, alternative assets such as real estate or loans, and derivatives. Also, SHS focuses primarily on securities held as portfolio assets (where each holder has less than a 10 percent stake, since otherwise it is classified as FDI).
the assets of Luxembourg and Ireland funds observed in the SHS data and in the Morningstar 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). The fund assets in SHS and in the Morningstar-based 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 Morningstar, as discussed below. For Luxembourg funds, total assets in the Morningstar estimates are €3,563 billion, as compared to €4,106 billion in SHS, with very similar composition in terms of asset class, currency of denomination (for bond assets), and geographical destination in the two datasets.

For Ireland funds, the Morningstar estimates contain assets of €2,093 billion, as compared to €2,282 billion in SHS, and there is a notable difference in the currency composition of bond holdings: while the British pound (GBP) share of bond holdings is 11.4% in the fund holdings data, it is a much higher 33.6% in SHS. These differences are accounted for by the fact that Irish fund sector holdings as reported in SHS also incorporate the positions of British liability-driven investment (LDI) funds that are resident in Ireland, and which do not instead enter into Morningstar given their organizational structure. 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). Since these gilt holdings are virtually all GBP-denominated, the inclusion of LDI funds results in the tilt towards the British pound that we observe in SHS, and also for part of the gap in total assets.

Table 2 also makes clear that the portfolios of Euro Area and RoW investors held through OOFC funds are highly heterogeneous, consistent with the results shown in Section 2.3. For instance, as already noted in the case of Ireland, the currency composition of the bond holdings attributed to Euro Area ultimate owners and RoW investors is markedly different. For Luxembourg funds, 57.9% of the bond positions linked to EA investors are Euro-denominated, in contrast with a 28.2% in the residual component attributed to RoW investors, which instead tilts much more heavily towards the US dollar and the pound. For Ireland funds, the bond holdings attributed to RoW investors have a 39.6% GBP share: it is reasonable in this case to think of these RoW investors as being primarily United Kingdom residents, as they will account for virtually all of the liabilities of British pension funds which hold gilts in Ireland through LDI vehicles. Similarly, for both OOFC countries, and for both bond and equity holdings, the holdings attributed to Euro Area investors are biased towards EA assets, while the holdings attributed to RoW investors tilt towards non-EA assets.

### 2.5 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 99.9% of all equity holdings and 92.5% of all corporate bond holdings in SHS.

Figure 7: Reallocations from security issuance: cross-border investment

(a) Bonds, Residency

(b) Bonds, Nationality

(c) Equity, Residency

(d) Equity, Nationality

Notes: We display the residency-based cross-border positions in bonds (Panel A) and equities (Panel C) of various countries by Euro Area investors as SHS, as well as the corresponding positions on a nationality basis after reallocating positions by linking securities to their ultimate corporate parents (Panels B and D).

In Figure A.XI, we document the change in Euro Area investment patterns coming from restating the SHS holdings data from a residency to a nationality basis. Panels A and C report the aggregate bilateral cross-border positions of Euro Area investors in SHS in bonds and equities of countries around the world, on a residency basis: red bars correspond to positions in European OOFCS, green bars to the rest of the Euro Area, blue bars to offshore financial centers outside the EA (such as the Cayman Islands), and gray bars to the rest of the world. Panels B and D show the
same bilateral cross-border positions, but estimated instead on a residency basis. As we move from residency to nationality, the holdings in European OOFCS are substantially reduced, much like those in offshore financial centers. The positions are instead reallocated to other EA countries such as France, Germany, or Italy, as well as to countries outside the Euro Area.

Table 3: **Euro Area investment in large emerging markets: residency vs. nationality**

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Destination</th>
<th>Euro Area Holdings (€B)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SHS</td>
<td>Restated</td>
<td>Δ</td>
</tr>
<tr>
<td><strong>Equities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>124</td>
<td>340</td>
<td>216</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>5</td>
<td>27</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>14</td>
<td>120</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td><strong>Corporate Bonds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>9</td>
<td>19</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td>1</td>
<td>15</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>3</td>
<td>9</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Notes: We show the positions of Euro Area investors in the equities and corporate bonds of firms in large emerging markets. The column labeled **SHS** shows the aggregate value of these positions in the raw SHS data, which reports them on a residency basis. The column labeled **Restated** shows the corresponding nationality-basis position, which also includes securities issued by these firms through affiliates in foreign jurisdictions. Data shown as of 2020.

The fact that firms outside the Euro Area also issue securities in European OOFCS was similarly evident in Figure 6, with a sizable portion of the holdings in Luxembourg and the Netherlands reallocated to RoW. Examples include the Brazilian state-owned oil giant Petrobras, which raises bond capital through its Netherlands-based financing subsidiary Petrobras Global Trading BV. Moreover, while for fund intermediation only European OOFCS played a role, this is not the case for securities issuance: European OOFCS play this role alongside offshore financial centers outside of the Euro Area. In Table 3, we examine the consequences of our reallocations for Euro Area investment in RoW firms—focusing in particular on reallocations for large emerging markets, which are especially sizable. A few key findings arise. Euro Area investment in Chinese firms increases many-fold, with equity positions going from €124 billion in 2020 to €340 billion, and corporate bond positions going from €14 billion to €120 billion. For bonds, we see significant reallocations beyond China. Investment in Brazil on a nationality basis increases by €22 billion, or 340%, and we see a similar €14 billion increase Russia from a residency-based baseline of €1 billion. In Section 3, we show that this contributes to the overstatement of Euro Area gross financial positions.

19These results are broadly consistent with Coppola et al. (2021), who estimate similar patterns for large developed economies including the Euro Area. The estimates in the present paper align particularly well for countries, such as China, which rely on offshore financial centers outside the EA, while they are lower for countries which instead mostly use European OOFCS, such as Brazil or Russia. In this paper, we find that EA-domiciled mutual funds are more likely to invest in emerging markets via tax havens than are other types of European investors. We also find that this is even more likely for assets of Luxembourg and Ireland funds held by RoW investors.
3 The Role of OOF Cs in Euro Area Capital Allocation

We now turn to a deeper and more formal analysis of the consequences of OOFC intermediation for our understanding of the Euro Area’s integration within the monetary union and with the rest of the world.

3.1 Euro Area Integration With RoW and Currency Exposures

Figure 8 demonstrates the magnitude of the adjustment to the Euro Area’s aggregate external position arising from looking through investment fund intermediation in the OOFCs. The blue lines in these plots report the overall amount of non-EA bonds and equities held by Euro Area investors in the official SHS data, prior to our fund unwind correction. The dashed red lines show these quantities after we remove the bonds and equities that are owned by RoW investors through Luxembourg and Ireland funds. The size of the Euro Area’s external assets shrinks dramatically: holdings of foreign bonds go from €5 trillion to less than €3 trillion, nearly a 50% reduction. Holdings of foreign equities similarly go from €4 trillion to €2 trillion. These very large adjustments are the result of two phenomena: (i) Luxembourg and Ireland are one of the main avenues through which EA residents invest in securities in the rest of the world; and (2) approximately 50 percent of fund holdings in these jurisdictions are held by RoW investors.

The forces in (i) and (ii) have an interesting interaction. Consider three portfolios. First, the direct portfolio of bonds and equities held directly by EA member countries. Second, the EA indirect portfolio of bonds and equities held indirectly by EA member countries via funds in Ireland and Luxembourg. Third, the RoW indirect portfolio of bonds and equities held via funds in Ireland and Luxembourg. The exposure to RoW securities is strongly increasing going from portfolio one to three. The large drop in RoW securities for the overall Euro Area in Figure 8 arises from a level effect, the third portfolio being large even compared to the sum of the first two portfolios, and a composition effect, the third portfolio being substantially more exposed to RoW securities than portfolio one or two, as previewed in Figure 3.

The shrinkage of Euro Area foreign asset holdings is matched (in part) by a decrease in liabilities, since fund shares of RoW investors also inflate the Euro Area’s gross liabilities, so the adjusted gross liabilities of the Euro Area correspondingly shrink. As a result, the effective gross external position of the Euro Area is reduced. Removing the RoW indirect portfolio makes a large difference in computing Euro Area risk exposures to the rest of the world. This netting is appropriate for many economic analyses because of the nature of fund intermediation. While legally funds own the securities they invest in, and hence international financial statistics consider them the immediate owner, from an economic perspective they pass on all the risks and returns (net of fees) to the underlying investors in the fund. This is not to say that there are no important economic consequences of this intermediation ranging from allocative effects to taxation and financial stability, which we discuss further below.

Strikingly, the currency composition of the Euro Area’s bond investment as a whole is also
Figure 8: The Euro Area’s gross external position is smaller

(a) Non-EA bonds held by EA residents

(b) Non-EA equities held by EA residents

Notes: We plot the overall amounts of bonds and equities by issuers outside of the Euro Area held by EA investors in SHS before (blue lines) and after (red line) our fund unwind adjustment.

heavily affected by the fund unwind.\footnote{On the importance and measurement of international currency exposures, see Lane and Shambaugh (2010) and Bénétrix, Lane and Shambaugh (2015).}

In Panel A of Figure 9, we plot the level of foreign investment in foreign currency (non-euro denominated bonds) for the Euro Area before and after adjusting for RoW investment in OOFC domiciled funds. By the end of 2020, we estimate that of the €3.8 trillion of foreign currency bond investments, only €1.6 trillion is actually owned by Euro Area investors. This reduces the share of Europe’s bond portfolio that is denominated in foreign currency from 23% to 12%. This large drop in exposure to foreign currency bonds is again the result of a level and composition effect in the investment in OOFC domiciled funds. The exposure to foreign currency bonds increases going from the direct portfolio, to the EA indirect portfolio, to the RoW indirect portfolio. Intuitively, most EA member countries do the bulk of their foreign currency bond investment via Luxembourg and Ireland, but RoW investors choose a portfolio of bonds even more skewed toward foreign currency than do EA investors in funds domiciled in Luxembourg and Ireland (as previewed in Figure 4).

The change in currency exposure at the EA level on the foreign asset side is not offset by a change in currency exposure on the bond liabilities. Instead, the liabilities that offset these foreign currency bonds are fund shares, a form of equity, even if some of these shares are denominated in the same currency as the bonds.

3.2 A Regression Framework for Analyzing Financial Integration

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
Figure 9: **Euro Area external position has larger net Euro exposure**

(a) Foreign currency bonds held by EA residents  
(b) Share of FC bonds in EA portfolio

Notes: Panel A plots the overall amounts of bonds denominated in non-Euro currencies held by EA investors in SHS before (blue lines) and after (red line) our fund unwind adjustment. Panel B plots the share of the overall EA bond portfolio that is in non-Euro denominated bonds, again before (blue lines) and after (red line) our fund unwind adjustment.

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 toward the Capital Markets Union in the Euro Area.\(^{21}\)

We quantify deviations from this simple benchmark. For country \(j\) we define portfolio weights as

\[
\omega_{j,i,c}^{a, \text{Total}} = \frac{x_{j,i,c}}{\sum_{c' \in \mathcal{C}} x_{j,i,c'}}, \quad \omega_{j,i,c}^{a, \text{f}} = \frac{x_{j,i,c}^{a, \text{f}}}{\sum_{c' \in \mathcal{C}} x_{j,i,c'}^{a, \text{f}}},
\]

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 \(\omega_{j,i,c}^{a, \text{f}}\) conditions on a particular route of investment (direct or through Luxembourg or Ireland funds).\(^{22}\)

We let \(\bar{x}_{i,c}\) be the outstanding value of a security, so CAPM weights are:

\[
m_{i,c}^{a} = \frac{\bar{x}_{i,c}^{a}}{\sum_{c' \in \mathcal{C}} \bar{x}_{i,c'}^{a}},
\]

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


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

\(^{23}\)We obtain the market value outstanding of each security worldwide from CSDB. The securities covered by CSDB are not limited to those held only by Euro Area investors. Appendix Section A 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.
international CAPM can be estimated via a simple linear regression:

\[ \omega_{j,i,c}^{a,f} = \alpha_{a,f} + m_{i,c}^{a} \sum_{k \in K} \beta_{j,k}^{a,f} \mathbf{1}_{c \in k} + \epsilon_{j,i,c}^{a,f}. \]  

(6)

where we denote sets of mutually exclusive and collectively exhaustive characteristics by \( k \in K \).

The simplest version of this regression is to include no characteristics at all, so that we would run

\[ \omega_{j,i,c}^{a,f} = \alpha_{a,f}^{i} + m_{i,c}^{a} \beta_{j}^{a,f}_{\text{CAPM}} + \epsilon_{j,i,c}^{a,f}. \]

(7)

If the international CAPM held perfectly, this regression would have an \( R^2 \) of 1, with \( \hat{\alpha}_{a,f}^{i} = 0 \) and \( \hat{\beta}_{j}^{a,f}_{\text{CAPM}} = 1 \), 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 three sets of characteristics: the residence of the issuing entity, the currency of a bond, and whether or not a security is issued in an OOFC. We then extend this framework to other characteristics, such as the industry of the issuer, the relative size of the issuer, the legal and tax regime governing the security, and so on.

Fixing a country \( j \), asset class \( a \), and investment route \( f \), summing both sides of equation (6) over the entire set of securities in \( C \), and recalling that both country \( j \)'s portfolio share and market shares have to sum to 1 over this set, we obtain:

\[ 1 = \sum_{c \in C} \sum_{f} \omega_{j,i,c}^{a,f} = N \alpha_{j}^{a,f} + \sum_{k \in K} \hat{\beta}_{j,k}^{a,f} m_{k}^{a}, \]

(8)

where \( N \) is the number of securities in the set \( C \), and \( m_{k}^{a} = \sum_{c \in k} m_{i,c}^{a} = \sum_{c \in C} m_{i,c}^{a} \mathbf{1}_{c \in k} \) is the market share of all securities with characteristic \( k \). The above identity describes the deviations of the portfolio of country \( j \) from the CAPM along the dimensions set out in the regression analysis. This formulation makes it easier to quantify which deviations are big or small in terms of their overall impact on the portfolio. If country \( j \) is overweight one characteristic, say being overweight securities issued by EA residents \( (k = \text{EA}) \) so that \( \hat{\beta}_{j,\text{EA}}^{a,f} > 1 \), then it must be underweight on some other characteristic, such as securities issued by the rest of the world, e.g. \( \hat{\beta}_{j,\text{RoW}}^{a,f} < 1 \). The extent of this depends on market weights, so that for a given \( \beta \) the impact is proportional to market weight (for instance, being very overweight—a high beta—securities with very low market weight does not need much of an offset somewhere else in the portfolio).24

### 3.3 Measures of OOFC Heterogeneity at the Security Level

**Geography.** We document the heterogeneity in how different investor groups utilize investment funds resident in Luxembourg and Ireland to invest both in the EA and the RoW. In particular, in Table 4 we estimate a geography-based version of equation (6) by focusing on the characteristic of

---

24Given that even this augmented CAPM-style specification will fit far from perfectly, we will continue to estimate the regression with an intercept to allow for this misspecification.
whether a security is issued by an entity resident in the Euro Area or the Rest of the World:
\[
\omega_{j,t,c}^{a,f} = \alpha_{j,t,c}^{a,f} + m_{t,c}^{a} \left[ \beta_{RoW}^{a,f} 1_{c \in RoW} + \beta_{EA}^{a,f} 1_{c \in EA} \right] + \epsilon_{j,t,c}^{a,f}. \tag{9}
\]

As a starting point for analyzing how EA-member countries invest, column 1 of Table 4 reports results from the above specification for all individual EA countries excluding Luxembourg and Ireland.\(^{25}\) The results show that each individual European country is significantly overweight bonds issued in the EA, with a point estimate of 2.32. This contrasts sharply with bonds issued by entities resident in the rest of the world, where the coefficient is only 0.07. Of course, this EA coefficient conflates investment in the home country with the rest of the Euro Area, and we separate these two effects further below.

In the next three columns, we contrast this baseline effect with investment going through Luxembourg. In column 2, labeled “Raw”, we run the regression for all investment from Luxembourg funds as reported in SHS. We observe stark differences in the loading on the EA: while still above the CAPM level of 1, it is well below the non-OOF countries’ “Direct” level in column 1. In addition, the coefficient on the rest of the world (RoW) increases approximately four-fold. Therefore, while we do find that Luxembourg funds are biased towards the Euro Area and away from the rest of the world, the pattern is much less stark than when Euro Area countries invest directly. In column 3, we report the same specification but restricted to those investments through Luxembourg funds that we match to Euro Area underlying investors. The coefficients on \(m \times EA\) and \(m \times RoW\) are in between those obtained for direct investments of non-OOF countries and of Luxembourg. In column 4, we run the same specification for the investments by Luxembourg funds that we ascribe to non-Euro Area investors and the coefficient on EA bonds is halved, but that on the RoW is 60% larger than for Euro Area investors. In the next three columns, we perform the same exercise for investments intermediated via Irish funds and find a very similar pattern.

This immediately provides a quantification of a key question of the paper: how do OOFCs impact investment portfolios? For investment funds, they facilitate European investors’ access to the rest of the world, and the rest of the world’s access to Europe. However, they do not perform these functions symmetrically. The heterogeneous matching between investors and investment funds makes it valuable to provide a full unwind at the fund level of intermediation in Luxembourg and Ireland, rather than relying on representativeness assumptions or collapsing all Euro Area holdings together. In Table 5, we perform the same exercise for equities and find similar qualitative patterns. The primary difference between bonds and equities is that both EA investors and the RoW are more diversified in the RoW for OOFC investments in equities than they are for bonds.

**Currency.** We next turn to analyzing deviations from full financial integration along the dimension of currency. We introduce an indicator for the characteristic that bonds are denominated in

\(^{25}\)We include the Netherlands because while it acts as an OOF for security issuance, it does not for investment fund intermediation.
Table 4: Heterogeneity in OOFC use: Bond geography

<table>
<thead>
<tr>
<th></th>
<th>Non-OOFC</th>
<th>Luxembourg</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct</td>
<td>Raw</td>
<td>EA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-OOFC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m × EA</td>
<td>2.324**</td>
<td>1.189***</td>
<td>1.641***</td>
</tr>
<tr>
<td></td>
<td>(0.425)</td>
<td>(0.115)</td>
<td>(0.235)</td>
</tr>
<tr>
<td>m × RoW</td>
<td>0.067**</td>
<td>0.331***</td>
<td>0.237***</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.072)</td>
<td>(0.061)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.000***</td>
<td>0.000**</td>
<td>0.000**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Obs.</td>
<td>8,603,139</td>
<td>506,067</td>
<td>506,067</td>
</tr>
<tr>
<td>R²</td>
<td>0.022</td>
<td>0.364</td>
<td>0.362</td>
</tr>
</tbody>
</table>

Notes: This table estimates equation (9). The dependent variable is the share of the a particular bond in an investor’s bond portfolio. The independent variable is the share of a given security in the global bond portfolio, m, interacted with indicator variables for whether the security was issued by an entity resident in the Euro Area (EA) or the rest of the world (RoW). Non-OOFC Direct refers to investments from all individual Euro Area countries other than Luxembourg and Ireland, as reported in the SHS data. A heading of “Luxembourg” refers to investment from Luxembourg on a residency basis, with “Raw” denoting the unadjusted SHS data, “EA” denoting investment from Luxembourg on behalf of identified Euro Area investors, and “RoW” denoting investment from Luxembourg on behalf of investors that were not matched to the Euro Area. The “Ireland” heading is defined equivalently for investment from Ireland. Standard errors clustered at the investor-issuer country level in column 1 and at the issuer country level in all other columns. *p < .1, **p < .05, ***p < .01.

Table 5: Heterogeneity in OOFC use: Equity geography

<table>
<thead>
<tr>
<th></th>
<th>Non-OOFC</th>
<th>Luxembourg</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct</td>
<td>Raw</td>
<td>EA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-OOFC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m × EA</td>
<td>2.615**</td>
<td>2.581***</td>
<td>2.522***</td>
</tr>
<tr>
<td></td>
<td>(0.643)</td>
<td>(0.385)</td>
<td>(0.396)</td>
</tr>
<tr>
<td>m × RoW</td>
<td>0.387***</td>
<td>0.731***</td>
<td>0.744***</td>
</tr>
<tr>
<td></td>
<td>(0.075)</td>
<td>(0.232)</td>
<td>(0.240)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.000***</td>
<td>0.000</td>
<td>0.000</td>
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<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Obs.</td>
<td>711,467</td>
<td>41,851</td>
<td>41,851</td>
</tr>
<tr>
<td>R²</td>
<td>0.013</td>
<td>0.436</td>
<td>0.455</td>
</tr>
</tbody>
</table>

Notes: This table estimates equation (9). The dependent variable is the share of the a particular equity in an investor’s equity portfolio. The independent variable is the share of a given security in the global equity portfolio, m, interacted with indicator variables for whether the security was issued by an entity resident in the Euro Area (EA) or the rest of the world (RoW). Non-OOFC Direct refers to investments from all individual Euro Area countries other than Luxembourg and Ireland, as reported in the SHS data. A heading of “Luxembourg” refers to investment from Luxembourg on a residency basis, with “Raw” denoting the unadjusted SHS data, “EA” denoting investment from Luxembourg on behalf of identified Euro Area investors, and “RoW” denoting investment from Luxembourg on behalf of investors that were not matched to the Euro Area. The “Ireland” heading is defined equivalently for investment from Ireland. Standard errors clustered at the investor-issuer country level in column 1 and at the issuer country level in all other columns. *p < .1, **p < .05, ***p < .01.
euros or denominated in all other currencies and estimate:

\[
\omega^{a,f}_{j,i,c} = \alpha^{a,f} + m^{a,c} \left[ \beta^{a,f}_{\text{EUR}} 1_{c \in \text{EUR}} + \beta^{a,f}_{\text{NonEUR}} 1_{c \in \text{NonEUR}} \right] + \epsilon^{a,f}_{j,i,c} \tag{10}
\]

where \(1_{c \in \text{EUR}}\) is an indicator for a bond denominated in euros and \(1_{c \in \text{NonEUR}}\) is an indicator for a bond denominated in any currency other than the euro. If investors do not display a currency bias, we would have \(\beta^{a,f}_{\text{EUR}} = \beta^{a,f}_{\text{NonEUR}}\), and if they are perfectly diversified according to market weights, both coefficients would equal 1.

In column 1 of Table 6, we again begin by running this regression for the non-OOFC Euro Area countries as a benchmark. We find strong home currency bias, as in Maggiori et al. (2020), with the coefficient on euro-denominated bonds approximately 40 times higher than that on non-euro denominated bonds. Columns 2 and 5 report the results for all investment by Luxembourg and Ireland funds: home currency bias from Luxembourg is significantly lower than in column 1 but above one, and for Ireland the coefficient is actually below one. Columns 3 and 6 focus on those positions in Luxembourg and Ireland funds, respectively, that are attributed to Euro Area underlying investors. Here, home currency bias is both stronger for Luxembourg and actually present in Ireland funds. By contrast, in columns 4 and 7, we observe significant bias away from euro-denominated bonds for the Luxembourg and Ireland fund positions attributed to the RoW ultimate investors. The results for Ireland are connected to the earlier discussion in Section 2.4 (see also Section 5) of British investors having a dominant role in Irish fund intermediation. These investors, much like the Euro Area ones, have a home currency bias that leads the overall (raw) Irish fund portfolio to have a large position in pound-denominated bonds.

This has important implications for assessing the extent of home currency bias in the Euro Area as well as the exposure of neighboring bond markets, such as the UK, to Euro Area investors. Hence work which relies on representativeness assumptions or collapses all Euro Area holdings together overestimates Euro Area investors’ exposures to foreign currencies (i.e., underestimates home currency bias), especially those of countries like the UK, whose investors intermediate their savings via Luxembourg and Ireland. In Appendix Table A.III, we perform this analysis restricting it to corporate bonds and find the results are qualitatively similar.

### 3.4 Financial Integration and Biases of the Euro Area

We next turn to exploring the full extent of Euro Area financial integration along a number of dimensions. In particular, we contrast how individual European countries invest directly in the SHS data, as compared to how they invest via Luxembourg and Ireland. Finally, we contrast these patterns with the full picture of their investment, which combines the direct investment and the indirect investment intermediated via fund holdings in the OOFs.

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26For example, Sweden is another country with access to Luxembourg and Ireland fund intermediation via EU legal harmonization. Indeed, we find unusually high holdings of bonds denominated in Swedish krona in the raw data of Ireland and Luxembourg funds.
and other currencies. A large deviation from the international CAPM where the bulk of securities would be in US dollars from the home currency bias results of the last section, where even conditional on investing through the OOFCs, Euro Area investors disproportionately buy euro-denominated securities, generating a large deviation from the international CAPM where the bulk of securities would be in US dollars and other currencies.

For bonds, this can largely be understood as arising dramatically higher fit of the CAPM for the RoW investment through OOFCs than we do for the EA’s investment through these same countries. For bonds, this can largely be understood as arising from the home currency bias results of the last section, where even conditional on investing through the OOFCs, Euro Area investors disproportionately buy euro-denominated securities, generating a large deviation from the international CAPM where the bulk of securities would be in US dollars and other currencies.

To provide a benchmark, we begin by estimating the baseline international CAPM specification in Table 7. For bond investment, the international CAPM is a better description of the data for investment intermediated via Luxembourg and Ireland than for the direct holdings. In addition to a slightly higher coefficient on the global portfolio shares \(m\), we observe a large increase in the fit of the regression as measured by the \(R^2\). Nevertheless, there is only a small difference in the fit of the CAPM between the raw data and our fully unwound data. However, this similarity is itself an important result. As previewed in the aggregate patterns on the heterogeneity in holdings through Luxembourg and Ireland in Figures 3 and 4, one important facet of our fund unwind procedure is that it allocates more than half of the OOFC holdings to the rest of the world rather than Euro Area countries, and so given the large amounts of bonds investors own directly, reallocating the OOFC positions owned by individual EA countries does not have a large quantitative effect on their total position. However, if rather than undertaking this fund-level unwind procedure we were to naively proportionally reallocate all of the holdings of the OOFC fund sector to Europe, or consolidate all holdings at the Euro Area level, we would have erroneously estimated a large increase in the fit of the CAPM. This effect can be seen in the first two columns of Appendix Table 5, where we see a dramatically higher fit of the CAPM for the RoW investment through OOFCs than we do for the EA’s investment through these same countries. For bonds, this can largely be understood as arising from the home currency bias results of the last section, where even conditional on investing through the OOFCs, Euro Area investors disproportionately buy euro-denominated securities, generating a large deviation from the international CAPM where the bulk of securities would be in US dollars and other currencies.

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In columns 5 through 8, we perform the same exercise for equity investments, and we find an
Table 7: CAPM regressions

<table>
<thead>
<tr>
<th></th>
<th>Bonds</th>
<th>Equities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct via LUX via IRL</td>
<td>Unwound</td>
</tr>
<tr>
<td>m</td>
<td>0.347***</td>
<td>0.475***</td>
</tr>
<tr>
<td></td>
<td>(0.068)</td>
<td>(0.050)</td>
</tr>
<tr>
<td></td>
<td>0.408***</td>
<td>0.408***</td>
</tr>
<tr>
<td></td>
<td>(0.064)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.000***</td>
<td>0.000***</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Obs.</td>
<td>8,603,139</td>
<td>8,603,139</td>
</tr>
<tr>
<td>R$^2$</td>
<td>0.004</td>
<td>0.047</td>
</tr>
</tbody>
</table>

Notes: This table estimates equation (7). The dependent variable is the share of a particular bond in an investor’s bond portfolio. The independent variable is the share of a given security in the global bond portfolio, $m$. “Direct” refers to investment originating from a given country as reported in SHS, “via LUX” and “via IRL” refers to investment done by a given country that is intermediated through Luxembourg and Ireland, respectively, by our fund-level unwind of the OOFCs. “Unwound” refers to our estimated total investment position of a country from combining direct investment in SHS with our indirect positions via Luxembourg and Ireland. Standard errors clustered at the investor-issuer country level. * $p < .1$, ** $p < .05$, *** $p < .01$.

even more striking role for OOFC intermediation. First, the estimate $\hat{\beta}_a,f^{CAPM}$ for direct investment is 0.50 as compared to 0.84 for equity investment via Luxembourg and 1.19 via Ireland. Looking at the $R^2$ of the regressions, we find that the $R^2$ of 0.01 for direct investment increases to 0.30 and 0.49 for investment via Luxembourg and Ireland, respectively. Considering that these results pool together the larger countries like Germany and France with much smaller countries like Latvia and Slovenia that own fewer funds in the OOFCs, the strength of this fit is remarkable. It is clear that in the realm of equities, the OOFCs provide global diversification. Turning to the “Unwound” column, we can see a 25% increase in the point estimate and a more than doubling of the $R^2$, despite the fact that the overwhelming share of equity investment continues to be done directly.

Next, we turn to understanding the geographic sources of these deviations from the international diversification benchmark. To do so, we extend our geographic characteristics beyond equation (9) to separate the Euro Area into the home country of the investor (“Home”) and the Rest of the Euro Area (“REA”):

$$\omega_{j,i,c}^{a,f} = \omega_{i,c} + m_{i,c} \left[ \beta_{RoW}^{a,f} 1_{i,c \in RoW} + \beta_{REA}^{a,f} 1_{i,c \in EA - j} + \beta_{Home}^{a,f} 1_{i,c = j} \right] + \epsilon_{j,i,c}^{a,f}$$

We report the results in Table 8 where we pool the regression results for all non-OOFC Euro Area countries. Beginning with bonds, Euro Area investors are significantly overweight in the RoW in their direct holdings (as in Table 4). However, we now see that they are actually slightly overweight the rest of the EA with a coefficient of 1.22. Of course, this is dramatically lower than the 2.32 coefficient on the EA in Table 4, because investors are roughly 20 times overweight their home bonds, in line with the large literature on home bias (French and Poterba 1991, Lewis 1999). Via Luxembourg and Ireland, Euro Area investors are significantly overweight the rest of the Euro Area’s bonds in addition to increasing their exposure to the rest of the world. Interestingly, the estimate $\hat{\beta}_{Home}^{a,f}$ falls by an order of magnitude from 20 to around 2 and is similar in magnitude to the weight placed on the rest of the Euro Area. For Euro Area investors going through Luxembourg and
Table 8: CAPM regressions: Home, Euro Area, and RoW

<table>
<thead>
<tr>
<th></th>
<th>Bonds</th>
<th>Equities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct via LUX via IRL Unwound</td>
<td>Direct via LUX via IRL Unwound</td>
</tr>
<tr>
<td>$m \times \text{RoW}$</td>
<td>0.067*** (0.010) 0.225*** (0.019) 0.268*** (0.050) 0.078*** (0.010)</td>
<td>0.387*** (0.075) 0.760*** (0.072) 1.157*** (0.121) 0.518*** (0.076)</td>
</tr>
<tr>
<td>$m \times \text{REA}$</td>
<td>1.220*** (0.116) 2.253*** (0.216) 1.388*** (0.071) 1.280*** (0.109)</td>
<td>1.167*** (0.167) 2.348*** (0.144) 1.759*** (0.090) 1.408*** (0.139)</td>
</tr>
<tr>
<td>$m \times \text{Home}$</td>
<td>20.573*** (5.820) 2.103*** (0.527) 1.592*** (0.265) 19.265*** (5.333)</td>
<td>28.202*** (6.059) 3.482*** (0.800) 1.778*** (0.192) 24.733*** (5.234)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.000*** (0.000) 0.000*** (0.000) 0.000*** (0.000) 0.000*** (0.000)</td>
<td>0.000*** (0.000) 0.000*** (0.000) –0.000 0.000*** (0.000)</td>
</tr>
</tbody>
</table>

Obs. 8,603,139 8,603,139 8,603,139 8,603,139 711,467 711,467 711,467 711,467
$R^2$ 0.102 0.141 0.089 0.105 0.064 0.358 0.492 0.083

Notes: This table estimates equation (11). The dependent variable is the share of a particular bond in an investor’s bond portfolio. The independent variable is the share of a given security in the global bond portfolio, m, interacted with indicator variables for whether the security was issued by an entity resident in the Rest of the World (RoW), the Rest of the Euro Area (REA), defined as the Euro Area excluding the investor country’s residency, the Home, a bond where investor and security residency coincide. "Direct" refers to investment originating from a given country as reported in SHS, "via LUX" and "via IRL" refers to investment done by a given country that is intermediated through Luxembourg and Ireland, respectively, by our fund-level unwind of the OOFCs. "Unwound" refers to our estimated total investment position of a country from combining Direct investment in SHS with our indirect positions via Luxembourg and Ireland. Standard errors clustered at the investor-issuer country level. *p < .1, **p < .05, ***p < .01.

Ireland, it is about Euro Area bias more so than home bias per se. Nonetheless, it is interesting that even when investing via Luxembourg and Ireland, Euro Area investors are overall biased towards their home country.

In the last four columns of Table 4, we perform the equivalent exercise for equities. The major difference here is that conditional on investing through the OOFCs, the individual Euro Area countries buy relatively more assets from the rest of the world than the rest of the Euro Area, generating more global diversification than diversification within the Euro Area. As is the case for bonds, we continue to see the striking pattern of home bias in OOFCs with $\beta_{a,f}^{H}$ significantly greater than 1 for investment in equities via both Luxembourg and Ireland. Understanding the incentives of households and institutions to acquire domestic assets even when they invest via the OOFCs rather than directly is a promising avenue for shedding further light on the economic consequences of OOFC intermediation. It also opens the possibility of shedding light on the underlying causes of home bias as being driven by preferences, information, or other factors.

In both bonds and equities, the fully unwound data shows lower home bias than the direct data of Euro Area members (excluding Luxembourg and Ireland). This result is consistent with the analysis by Vivar et al. (2020) and Carvalho and Schmitz (2021), who find lower home bias once accounting for the diversification Euro Area member countries obtain from their fund investment in Luxembourg and Ireland. The quantitative impact is limited by the combination of a level and composition effect: (i) home investments via the direct route are large compared to the fraction of Luxembourg and Ireland funds that are attributed to Euro Area members; and (ii) the portfolio of
Euro Area investors in Luxembourg and Ireland features more home and Euro Area bias than the portfolio of the rest of the world via the same funds’ jurisdictions.

4 Reassessing 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.

4.1 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 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

$$EHB_{j,t} = 1 - \frac{\omega_{j,-j,t}^E}{m_{j,t}^E},$$

where $\omega_{j,-j}^E$ is the share of country $j$’s equity portfolio invested in foreign securities, and $m_{j,t}^E$ is the share of foreign securities in the world market portfolio. As clear from equation (12), as long as the restriction $\omega_{j,-j,t}^E \leq m_{j,t}^E$ is satisfied, which is virtually always the case in practice, then the index is bounded between zero and one, $EHB_{j,t} \in [0,1]$. If $EHB_{j,t} = 0$, country $j$ has no equity home bias at all and hence holds exactly the market portfolio. On the other hand, the case $EHB_{j,t} = 1$ 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

$$EHB_{EA,t} = \sum_{j \in EA} s_{j,t}^E EHB_{j,t}, \quad s_{j,t}^E = \frac{x_{j,t}^E}{\sum_{j' \in EA} x_{j',t}^E},$$

where $s_{j,t}^E$ are weights proportional to the overall size $x_{j,t}^E$ of country $j$’s equity portfolio.

While the object $m_{j,t}^E$ can be constructed simply from information on the amounts outstanding of equity securities by country of issuer, measuring the portfolio shares $\omega_{j,-j,t}^E$ requires an assessment of 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 2.3. 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

\[
\omega^{E}_{j,-j,t} = \frac{x^{E,\text{Direct}}_{j,-j,t} + x^{F,\text{Direct}}_{j,-j,t}}{x^{E,\text{Direct}}_{j,-j,t} + x^{F,\text{Direct}}_{j,-j,t} + x^{E,\text{Direct}}_{j,-j,t} + x^{F,\text{Direct}}_{j,-j,t}},
\]

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 holdings of foreign fund shares, and \( x^{E,\text{Direct}}_{j,j,t} \) 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.\(^{27}\) 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:

\[
x^{E,\text{Direct}}_{j,-j,t} = \text{IIP Common Equity Assets}_{j,t}, \quad x^{F,\text{Direct}}_{j,-j,t} = \text{IIP Fund Share Assets}_{j,t}.
\]

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

\[
x^{E,\text{Direct}}_{j,j,t} = \text{Equities Outstanding}_{j,t} - \text{IIP Common Equity Liabilities}_{j,t}.
\]

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 share \( m^{E}_{j,t} \).

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

\(^{27}\)For the recent sample from 2014 onwards, the positions estimated with the IIP methodology align well with those directly measured in the SHS data.
portfolio share:

$$\omega_{j,-j,t}^E = \frac{x_{j,-j,t}^{E,Direct} + x_{j,-j,t}^{E,Indirect}}{x_{j,-j,t}^{E,Direct} + x_{j,-j,t}^{E,Indirect} + x_{j,j,t}^{E,Direct} + x_{j,j,t}^{E,Indirect}},$$

(17)

where $x_{j,-j,t}^{E,Indirect}$ and $x_{j,j,t}^{E,Indirect}$ correspond, respectively, to indirect equity holdings through OOFc funds of foreign and domestic equity securities. As compared to the naive methodology in equation (14), 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 $x_{j,-j,t}^F$ that is invested in domestic and non-domestic equities is constant over time. That is, we estimate the indirect positions as

$$x_{j,-j,t}^{E,Indirect} = \phi_{j,-j}^E \cdot x_{j,j,t}^F,$$

$$x_{j,j,t}^{E,Indirect} = \phi_{j,j}^E \cdot x_{j,j,t}^F,$$

(18)

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 EHB$_{EA,t}$ additionally adjusts the weighting 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 2.3). 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 enormous 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.\(^{28}\)

**Estimation results.** The solid lines in Figure 10 show the picture that emerges when estimating home bias using the previously standard methodology, with foreign portfolio shares computed as in equation (14), and without adjusting for RoW investors’ holdings in OOFc funds. The solid red line displays EHB$_{EA,t}$, the average degree of home bias for Euro Area countries. The solid blue line displays equity home bias for the United States, estimated using an analogous IIP methodology, which serves as a 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.XV for an average for non-EA developed economies).

The Euro Area, however, even in the context of this broad-based decline in home bias, displayed extraordinary dynamics, which have been often noted in the literature. After the introduction of the euro, Euro Area home bias falls exceptionally rapidly: while it started at levels comparable to...
Figure 10: 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.

those of the United States around 1955, 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 Section 4.3, 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-à-vis the rest of the world.

The dashed lines in 10 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 (17), 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. 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.

4.2 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:

\[
BHB_{j,t} = 1 - \frac{\omega_{j,-j,t}^B}{m_{j,-j,t}^B}, \quad BHB_{EA,t} = \sum_{j \in EA} s_j^B BHB_{j,t}, \quad s_j^B = \frac{x_{j,t}^B}{\sum_{j' \in EA} x_{j',t}^B}, \quad (19)
\]

where all the relevant quantities are defined analogously as in Section 4.1, but in the context of countries’ bond portfolios. Prior to any corrections, the foreign portfolio share \( \omega_{j,-j,t}^B \) for each country \( j \) is given by

\[
\omega_{j,-j,t}^B = \frac{x_{j,-j,t}^B}{x_{j,-j,t}^B + x_{j,j,t}^B}, \quad (20)
\]

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:

\[
\omega_{j,-j,t}^B = \frac{x_{j,-j,t}^B + x_{j,j,t}^B}{x_{j,-j,t}^B + x_{j,j,t}^B} \cdot \frac{x_{j,-j,t}^B + x_{j,j,t}^B}{x_{j,-j,t}^B + x_{j,j,t}^B}, \quad (21)
\]

which accounts for indirect holdings of domestic and foreign bonds via OOFCC 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:

\[
x_{j,-j,t}^B = \text{IIP Bond Assets}_{j,t}, \quad x_{j,j,t}^B = \text{Bonds Outstanding}_{j,t} - \text{IIP Bond Liabilities}_{j,t}. \quad (22)
\]

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

\[
x_{j,-j,t}^B = \phi_{j,-j}^B \cdot x_{j,j,t}^F, \quad x_{j,j,t}^B = \phi_{j,j}^B \cdot x_{j,j,t}^F. \quad (23)
\]
Figure 11: The dynamics of bond home bias in the Euro Area

Notes: The red lines display the time series for average bond home bias for Euro Area countries, $\text{BHB}_{\text{EA,}t}$. 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.

Estimation results. Figure 11 shows our results for bond home bias. The solid blue line plots home bias for the United States for comparison (other non-EA developed economies followed a very similar trend, as shown in Appendix Figure A.XV). The solid red line shows average Euro Area bond home bias, $\text{BHB}_{\text{EA,}t}$, before our adjustments. The short-dashed red line show $\text{BHB}_{\text{EA,}t}$ 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. 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 an astonishingly larger decline which unadjusted data would place at 40 percentage points, but in reality is closer to 30 percentage points.

4.3 Decomposing the Home Bias Dynamics

To interpret the implications of the results documented in the present section, it is helpful to formally assess whether the observed dynamics of home bias are accounted for by an intra-EA component or by increasing measured integration with the rest of the world. To do this, we consider the following
decomposition. Generalizing our notation, we let HB\textsuperscript{A}_{j,t} be a home bias index for asset class a, such that HB\textsuperscript{B}_{j,t} = BHB\textsubscript{j,t}, and HB\textsuperscript{E}_{j,t} = EHB\textsubscript{j,t}. We can decompose the index as follows:

\[
HB_{j,t} = 1 - \frac{\omega_{j,EA-j,t}}{m_{j,EA-j,t}} \cdot \frac{m_{EA-j,t}}{m_{j,t}} \cdot \frac{m_{j,EA-j,t}}{m_{j,t}} - \frac{\omega_{j,EA-j,t}}{m_{j,EA-j,t}} \cdot \frac{m_{j,EA-j,t}}{m_{j,t}} \cdot \frac{m_{RoW-j,t}}{m_{j,t}},
\]

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

Figure 12: Decomposing the observed drop in home bias

(a) Equity home bias
(b) Bond home bias

Notes: We decompose the time series of average Euro Area equity (panel A) and bond (panel B) home bias, EHB\textsubscript{EA,t} and BHB\textsubscript{EA,t}, using the methodology of Section 4.3. The decomposition, which splits the series into components reflecting the intra-EA and RoW contributions to home bias, is applied to the series prior to our adjustments.

This decomposition clarifies that home bias is generated by two distinct sources. The first one comes from the term labeled “intra-EA bias” in the expression above, which represents the degree to which the country tilts its portfolio away from foreign securities, conditionally on remaining within the Euro Area. The second source corresponds to the term labeled “RoW bias”, which represents the bias away from non-EA securities. These two bias terms enter linearly into the overall home bias index, weighted by the respective shares of EA and RoW assets in the portfolio of non-domestic securities (which sum to one). While this decomposition highlights the two distinct sources of home bias, its empirical implementation does not require us to know each of the objects in equation (24), since the weighted bias terms simplify as such:

\[
\frac{\omega_{j,EA-j,t}}{m_{j,EA-j,t}} \cdot \frac{m_{EA-j,t}}{m_{j,t}} = \frac{\omega_{j,EA-j,t}}{m_{j,EA-j,t}} \cdot \frac{m_{j,EA-j,t}}{m_{j,t}} \cdot \frac{m_{RoW,t}}{m_{j,t}} = \frac{\omega_{j,EA-j,t}}{m_{j,EA-j,t}} \cdot \frac{m_{j,EA-j,t}}{m_{j,t}} \cdot (1 - \omega_{j,EA-j-j,t}),
\]

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

\[
HB_{j,t} = 1 - \underbrace{\frac{\omega_{j,\neg j,t}^a \cdot \omega_{j,EA-j|\neg j,t}^a}{m_{\neg j,t}^a}}_{\text{Intra-EA Contribution}} - \underbrace{\frac{\omega_{j,\neg j,t}^a \cdot (1 - \omega_{j,EA-j|\neg j,t}^a)}{m_{\neg j,t}^a}}_{\text{RoW Contribution}}.
\]

We measure the sufficient statistic \( \omega_{j,EA-j|\neg j,t}^a \) directly using CPIS data, including the pilot survey conducted in 1997, to empirically implement this decomposition.\(^{29}\) Figure 12 presents the results, applied to the average EA equity and bond home bias series, \( \text{EHB}_{EA,t} \) and \( \text{BHB}_{EA,t} \), prior to our adjustments. The dashed red lines in the figure’s two panels show the home bias time series without the RoW contribution term, so that the gaps between the horizontal lines at one and the dashed red lines correspond to the intra-EA contribution in equation (25), while the gaps between the dashed and solid red lines correspond to the RoW contribution. For both equities and bonds, the observed excess decline in home bias following the introduction of the euro is primarily attributable to the intra-EA component. For equities, the excess decline turns out to be altogether an artifact of OOFC activities. For bonds, it reflects true increasing financial integration within the currency union.

### 4.4 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 4.3). 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.

\(^{29}\)An important caveat is that CPIS offers an incomplete panel in its early years. See Appendix Section B for details.
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).

5 The Rest of the World in the OOF Cs

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. 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.

5.1 The Missing Wealth: €3.2trn.

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. At the same time, Ireland and Luxembourg also report foreign portfolio equity liabilities of €624bn and €47bn, respectively. All other countries combined, however, report owning only €2.0trn and €3.3trn of portfolio equity and fund shares in Ireland and Luxembourg, respectively. Hence, at the end of 2020 there are holdings of approximately €1.6trn

30As in the ECB’s Statistical Data Warehouse for Ireland and Luxembourg (retrieved on March 1, 2023).
31As in the ECB’s Statistical Data Warehouse for Ireland and Luxembourg (retrieved on March 1, 2023).
32According to BPM6 criteria fund shares are classified as equity since they are a claim to the equity (net asset value) of the funds. Consequently, international investment statistics often report holdings of equity and fund 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).
of fund shares and equity unaccounted in each of Ireland and Luxembourg, a staggering amount that has attracted the attention of academics, policy markers, and statisticians.

In principle this should not happen since for every country that registers an asset somewhere else in the world, another country should correspondingly register a liability by the same amount, while the statistical recording on both sides should follow the IMF’s Balance of Payments Manual. In practice, however, it is well-known that globally net foreign asset positions (NFAs) do not sum to zero, which is to a large extent driven by portfolio investment equity. There are several possible explanations for this missing wealth.

First, a part of the gap between global portfolio investment equity liabilities and assets may be accounted for by countries that do not report any data on portfolio investment assets. Second, there may be discrepancies in the statistical compilation methods used by various countries. Third, and likely most importantly, there may be an incomplete coverage of asset ownership, especially for households and non-financial corporations (Gervais and Bui-Quang 2019). In particular, this could occur because of hidden wealth in tax havens that goes unrecorded in official statistics. Zucman (2013) attributes the gap to this latter source and provides evidence that the underlying investors are wealthy residents of the EA and USA. Another possibility is that not all equity being held is recorded as portfolio investment, as some could be recorded as foreign direct investment (FDI). For example, if an entity owns fund shares that account for more than 10% of the outstanding fund shares of a specific fund, then this position may be reported as FDI. Unfortunately, FDI statistics do not separate out fund shares, making it difficult to analyze the relevant breakdown. For the broader category of FDI equity there is evidence that global assets exceed liabilities (Angulo and Hierro 2017) which may suggest that some of the globally unrecorded portfolio equity assets are in fact recorded in FDI equity (Schmitz 2021).

International financial statistics differ in the criteria used for recording the asset and liability side of the external balance sheet of countries due to the different information available to a country about its assets and liabilities. While some countries do not have any information available on the residency of the foreign holders of the securities issued in their country, other countries report liabilities based on the residency of the immediate counter-party. Consider the case of a bank in London holding a fund share issued by a fund domiciled in Ireland. The Irish statisticians register a fund share liability in portfolio investment for Ireland toward the UK. Indeed, all that the Irish statisticians may know is that the immediate counterpart is based in the UK. UK statisticians, however, have more information on who the actual holder of the fund share is. In particular, international financial statistics are built, on the asset side, based on the residency of the holder (a distinct concept from the residency of the issuer as discussed earlier in this paper). UK statisticians record the position very differently depending on whether the holder of the security is a UK resident or a non-resident. If the holder is a UK resident, e.g. a UK resident household owns an account at the bank which purchased the fund share on her behalf, then the UK statisticians record a UK asset in the form of a portfolio investment (or FDI if the holding is above the 10% threshold) in fund shares.

\footnote{See Paragraph 593 of the OECD Benchmark Definition of Foreign Direct Investment, Fourth Edition.}
shares in Ireland. If the holder is determined to be a non-resident, e.g. a non-resident household with a bank account in London, then the UK statisticians record no asset at all: in principle, the country of residency of that household records the asset.

The problem is that principle and practice can differ substantially. The two tend to coincide, for example, in situations when automatic exchanges of information are available. A prominent example is the construction of SHS statistics itself. Within the EA each national central bank provides information about assets held by its domestic financial institutions (mainly custodians) on behalf of residents of other EA countries, and the assets are then recorded by the appropriate country of residency.\(^{34}\) Principle and practice are very different in the case of hidden wealth: the country of residency of the investor might never know that she has a bank account in London in which she holds fund shares in Ireland. This is obviously the case for wealth that goes unrecorded to tax authorities and is stashed away in tax havens.

Understanding the source of missing wealth has important ramification in many areas. In international macroeconomics, it affects both the gross and the net balance sheet of countries. In attributing the missing wealth to EA and USA residents, Zucman (2013) concludes that these countries are much larger creditors (or less of a debtor) to the rest of the world than previously understood. In finance, Luxembourg and Ireland are among the largest owners of securities in the world but little is known about the underlying investors and their preferences. In public finance, the source of the missing wealth affects estimates of inequality: if the missing wealth belongs to individuals at the top of the wealth distribution, recording it correctly can substantially increase inequality (Alstadsæter et al. 2018).

### 5.2 Who Accounts for the Missing Wealth?

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 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 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 A.XII, 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

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\(^{34}\)In order to avoid double reporting, only assets held in custody for non-financial investors (mainly households and non-financial corporations) are included in SHS.
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 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.

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.

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 14: Transition from Switzerland to the UK in ownership of Luxembourg funds

Notes: We use additional data from the Luxembourg Commission de Surveillance du Secteur Financier (CSSF) providing a decomposition of the ownership of Luxembourg funds by immediate counterparty over a longer time series, highlighting the shift in ownership away from Switzerland and towards the UK.

Based outside of Luxembourg. In the case of Luxembourg, this large position most likely represents the large custodial positions of the country. 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) that 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.

The prominence of the UK in accounting for the wealth in the OOFcs has emerged gradually over the past two decades. Figure 14 uses a longer time series, provided by CSSF, which decomposes the ownership of Luxembourg funds going back to 1998. This longer time series reveals a secular shift in ownership away from Switzerland and towards the UK. While Switzerland used to account for a dominant share of assets in Luxembourg funds back in the late ’90s and early 2000s, it has now been overtaken by the UK, demonstrating the changing nature of the investor base behind the European financial centers.

5.3 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 regulators have told us 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 15, 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 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,
Figure 15: **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.
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 results in Table 2 further point to the importance of the UK as an ultimate investor. There, we see that while 33.6% of Irish fund bond holdings are denominated in British pounds, only 7.6% of the matched holdings of Euro Area investors that we identify in the data are. By contrast, 39.6% of the unaccounted-for bond holdings of Irish funds are denominated in pounds. 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. In ongoing work, we are exploring the characteristics of these funds that are not declared to be owned by Europeans in the SHS data in order to shed further light on who the ultimate investors are.\textsuperscript{36}

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.

The Euro Area, Switzerland, and tax havens. At present this questions remains unsettled, but we note that 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 2, the portfolio of securities held by 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

\textsuperscript{36}In Appendix Figure A.VIII, 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.
to explain such marked differences in investment preferences for these two investment routes by the same investors.

Despite the clear importance of the UK, there is still much we can learn from the other positions in Figure 15. 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). 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.

5.4 Is the “Rest of the World” Actually the Rest of the World?

In this section we use new data 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 by 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.

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37 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 16: **Home bias via Luxembourg funds: immediate counterparty data**

![Bar chart showing share invested in different destinations by Domestic Investors (red) and Other Investors (blue).]

**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.

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 (Maggiori et al. 2020; 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 16. 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 ultimate investors in Luxembourg by examining the broader portfolio, rather than focusing only on round-tripping. In Figure 17, 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. If the UK were intermediating funds for the Euro Area, 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. 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). Importantly, 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.

If not the Rest of the Euro Area and Switzerland, whose portfolio does the UK’s look like? While being overweight the UK indicates that some of the investment is on behalf of its own residents, the pattern of being overweight the United States and Rest of World while being underweight the Euro Area looks like the investment of non-Europeans. In our sample, we find that the United States,
Figure 17: Composition of portfolios via Luxembourg funds, by immediate counterparty

(a) United Kingdom

(b) Rest of Euro Area

(c) Luxembourg

(d) All Other Countries

(e) USA

(f) Switzerland

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

The Rest of Europe, the Offshore Financial Centers (Cayman Islands, Bermuda, among others), and all other countries in the world (that includes Russia, Saudi Arabia, Brazil, and others) behave quite similarly to the investment position of the UK, other than each investor’s home bias. While at present we cannot split what share of the UK’s investment on an immediate counterparty basis
Figure 17: Composition of portfolios via Luxembourg funds, by immediate counterparty (continued)

(g) Rest of Europe

(h) Offshore Financial Centers

(i) Japan

(j) Rest of Asia

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

belongs to each non-European investor 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 means that the investment we ascribe to the “Rest of the World” in Sections 1 through 3 is likely to actually be coming from the Rest of the World.

6 The Allocative Effects of OOFC Use Among Firms

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

Figure A.XIII looks at the cross-section of bonds issued by Euro Area ultimate parent firms, and it shows a dramatic divergence in the likelihood that domestic investors (those whose residency corresponds to the firms’ nationality) hold bonds issued in the firms’ domestic resident jurisdictions versus via financing vehicles resident in OOFCs.\(^{38}\) The blue density shows a kernel estimate of the distribution of the domestically held share for the former bonds (those held domestically), while the red density shows a kernel estimate for the latter type (those issued in OOFCs). The red distribution is clearly much more concentrated towards its lower boundary, implying that most bonds issued in OOFCs are not held by domestic investors, in contrast with domestically issued bonds. The average domestically held share is 23 percent in the red distribution, while it is 44 percent in the blue distribution, nearly twice as large.

Figure 18: **Bonds issued in OOFCs are held much more widely across borders**

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

Bonds issued in European OOFCs are therefore held far more widely across borders, so that European financial integration is concentrated in firms that have OOFC financing subsidiaries. This pattern could in principle be due to both selection and treatment effects: while it might be that if a bond is issued in a European OOFC, that causes the bond to be relatively more attractive to

\(^{38}\)To achieve a clear distinction between domestic issuances and OOFC issuances, this figure excludes ultimate parent firms with nationality corresponding to Luxembourg, Ireland, or the Netherlands.
non-domestic investors, it may also be simply the case that non-domestic investors prefer firms with unobserved characteristics that also independently make those firms more likely to raise capital through OOFCs. To resolve this, we turn to within-firm variation, comparing bonds that are issued by the same firms but in different residencies.

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

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

\[
\theta_{k,i,t} = \exp \{ \alpha_t + \gamma_k + X_{k,i,t} \beta \} + \varepsilon_{k,i,t},
\]

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

Table A.VIII reports the estimates from the PPML estimator applied to the specification in equation (A.6), using the full panel of observations for the years 2014 through 2020. We restrict the sample to Euro-denominated bonds, as foreign-currency denominated bonds are often not targeted towards Euro Area investors’ holdings. We show the estimated marginal effects, \( \hat{m} = e^\hat{\beta} - 1 \), as we vary the extent of fixed-effects saturation in the empirical specification. The estimated marginal effect in the saturated specification is \( \hat{m} = -0.33 \); given the specification, the marginal effect takes on a semi-elasticity interpretation, implying that being issued by an entity in an OOFC jurisdiction causes on average a 33 percent reduction in the share of the bond that is held domestically.

To better understand these magnitudes, consider that the average domestic share \( \theta_{k,i,t} \) in the sample for German and Italian firms is, respectively, 45 and 61 percentage points: therefore the estimated multiplicative 33 percent marginal effect from the homogeneous-effects model would imply a reduction in the domestic share of 15 percentage points for German firms, and of 20 percentage points for Italian firms. Importantly, the estimates are similar (although naturally somewhat larger
Table 9: **Within-firm allocative effects**

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**Notes:** We estimate the specification in equation (A.6), which regresses the domestically held share \(\theta_{k,i,t}\) of Euro-denominated bonds by firm \(k\) issued in residency \(i\) in year \(t\) on dummies capturing issuance location categories. We show the estimated marginal effect for the OOFC dummy, and the specification also includes dummies for residency \(i\) in the rest of the Euro Area (excluding the firm’s domestic jurisdiction) and the rest of the world. The excluded category corresponds to domestically issued bonds. We include fixed effects for ultimate parent firm, year, and ultimate parent firm nationality. All specifications use the Poisson pseudo-maximum likelihood (PPML) estimator, as in Silva and Tenreyro (2006), and they are weighted by the log of the total amount outstanding for bonds in a given \((k,i,t)\) category. Standard errors for the estimated PPML coefficient \(\hat{\beta}\) are clustered at the firm level, and they are converted to standard errors on marginal effects \(\hat{m} = \exp(\beta) - 1\) via the delta method. Ultimate parent firms with nationality in Luxembourg, Ireland, or the Netherlands are excluded. \(^{\dagger}p < .1,^{\star}p < .05,^{\star\star}p < .01\)

in magnitude) when we exclude the firm fixed effects, with a point estimate of \(\hat{m} = -.48\) in the non-saturated specification. This evidence is consistent with the interpretation that the aggregate pattern seen in Figure A.XIII is in large part due to treatment rather than selection: the legal, regulatory, and withholding tax environment in OOFCs makes foreign investors more likely to hold securities issued in these jurisdictions. Figure 19 shows the estimated marginal effects when we estimate the same specification year-by-year: the estimates remain large and negative throughout the time series, with a slight upward trend in the last two years of the sample, although we cannot formally reject the hypothesis that the treatment effect is constant across the sample.

Disaggregating the estimates shown in Table A.VIII further reveals interesting heterogeneity in this treatment effect across countries. We display this heterogeneity in Figure A.XIV, where we plot the estimates, again done year-by-year, separately for German firms (in red) and for Italian firms (in blue). The heterogeneous-treatment estimates for Italy are much larger in magnitude than those for Germany: issuance in a European OOFC lowers the domestically share of Italian firms’ bonds by a large amount, about 70 percent on average, while the corresponding effect for German firms is about 20 percent on average. This form of heterogeneity may reflect investors’ economic rationales. While we cannot conclusively prove this, it may be the case that foreign investors are particularly averse to the legal environment surrounding bonds issued domestically in Southern European countries such as Italy. For example, investors outside of Italy may be especially wary of potential bankruptcy proceedings in Italian courts, preferring instead the bankruptcy regulations associated with Dutch-resident issuing entities, while being less cautious of the better-functioning
Figure 19: Within-firm allocative effects: estimates by year

Notes: We plot the estimated marginal effects for the same specification as in Table A.VIII, inclusive of firm fixed effects, but with the estimation repeated separately for each year. We show point estimates and the corresponding 95% confidence band. Standard errors for the estimated PPML coefficient $\hat{\beta}$ are clustered at the firm level, and they are converted to standard errors on marginal effects $\hat{m} = e^{\hat{\beta}} - 1$ via the delta method. Ultimate parent firms with nationality in Luxembourg, Ireland, or the Netherlands are excluded.

German courts.

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

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. Our estimates of Euro Area investment reveal a number of salient patterns. The Euro Area is less financially integrated than it appears, both with 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, this pattern only remains true for bond portfolios, while it is artificially generated by OOFC activities for equity portfolios, providing support for models of international financial integration which can generate these observed asymmetric dynamics across asset classes. Within the Euro Area, the extent of financial integration that does occur is tilted towards those firms that raise capital through OOFC financing vehicles, which help these firms overcome prominent biases—including home bias and North-South bias by Euro Area investors. 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.

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