Missing Assets

Exploring the Source of Data Gaps in Global Cross-Border Holdings of Portfolio Equity

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Abstract

Estimates of cross-border portfolio equity liabilities are substantially larger than the corresponding cross-border claims (some $4 trillion in 2021, about 4% of world GDP). Resolving this discrepancy would strengthen the understanding of the cross-border implications of changes in asset prices, an important element in maintaining financial stability, and would shed light on whether unreported assets are properly covered by domestic tax systems. We show that the equity discrepancy arises primarily from equity holdings in Ireland, Luxembourg, and the United States whose ownership is not reflected in partner countries' positions. Using data from these countries' surveys of portfolio liabilities and the IMF's Coordinated Portfolio Investment Survey, we show that an important share of unidentified equity holdings (close to $3 trillion in 2021) reflects transactions through intermediaries based in the United Kingdom. This likely reflects some underestimation of U.K. portfolio equity holdings as well as holdings of foreign equity on behalf of nonresident investors not captured by their countries' statistics. Reducing data gaps would require stronger data collection in financial centers, including provision of information on securities' holdings through domestic custodians also for cases where neither the issuer nor the ultimate holder of the security is a resident of the country.

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I. Introduction

Data availability on cross-border financial transactions and especially cross-border financial positions has improved enormously over the past three decades. The number of countries reporting international investment position data now exceeds 160, and a variety of sources, such as the Bank of International Settlements and the International Monetary Fund, provide data on bilateral cross-border positions for financial instruments such as bank loans and deposits, portfolio equity and debt, and foreign direct investment. Broader data availability has stimulated burgeoning research on various aspects of international financial integration.

With increasingly broad data coverage, we are also better able to identify global trends in cross-border holdings and creditor and debtor positions and explore the extent to which data on global cross-border assets and liabilities are broadly consistent, identifying discrepancies. In turn, increased availability of bilateral data allows us to better understand the potential origins of such discrepancies. The External Wealth of Nations database developed by Lane and Milesi-Ferretti (2001, 2007, 2018) provides estimates of external assets and liabilities for over 210 economies and is a natural vehicle for such an exercise. As discussed in Lane and Milesi-Ferretti (2007), Zucman (2013), and most recently in Milesi-Ferretti (2023), there is a large global discrepancy in estimates of portfolio equity: estimates of global portfolio equity liabilities exceed those of portfolio equity assets by a substantial margin (some $4 trillion in 2021) and have done so for many years.

In this paper we investigate the likely sources of this discrepancy and provide evidence on where data collection efforts can help us identify the residence of holders of portfolio equity instruments which are currently unaccounted for in the asset-side data. Improving the quality of financial and external accounts by addressing this problem would have benefits going well beyond more reliable statistics. It would support financial stability analysis by strengthening the understanding of the cross-border implications of changes in asset prices and would allow an assessment as to whether such assets are properly covered by domestic tax systems. With regard to financial stability, the 2022 turmoil in the U.K. gilts market provides a good example. Sales of gilts by so-called Liability-Driven Investment (LDI) funds—used by pension funds as a hedging strategy—played a key role. As documented by Dunne et al. (2023), sterling denominated LDI funds resident in Ireland accounted for a 30% share of net sales of gilts by such entities during the crisis period. With regard to public finance aspects, a burgeoning literature including Zucman (2013) discusses unrecorded cross-border holdings and their tax implications.

During the past 30 years, portfolio equity has become an increasingly important category in global cross-border assets and liabilities. Since 2019, portfolio equity liabilities account for over a fifth of total external liabilities and over 40% of global GDP. Furthermore, with the vast majority of cross-border portfolio equity reflecting listed shares or investment fund shares, valuation issues are relatively straightforward, especially in comparison with foreign direct investment.[1] Finally, as we document in the paper, the size of the global discrepancy is material (close to $4 trillion in 2021, roughly the size of

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1. Since FDI affiliates are unlisted, reporting countries use a variety of methodologies to value them (book value, market value, current cost, historical cost) which complicates the task of aggregating and comparing cross-country data. Even for bonds, some countries report data at face value and others at market value.

Germany) and concentrated geographically: it overwhelmingly reflects claims on Ireland, Luxembourg, and the United States for which we don't know the ultimate residence of the investor.

The paper's main findings can be summarized as follows. A substantial part of the global portfolio equity discrepancy—equity liabilities not reported as holdings by investor countries—is managed in the United Kingdom, with a smaller share held in custody accounts in Switzerland. We present evidence suggesting that part of these shares managed in the United Kingdom reflect under-reported holdings by U.K. residents, while the largest part reflects holdings by international investors (including "retail" holdings by wealthy household investors) whose residence is difficult to establish. Narrowing the discrepancy would require improved reporting on so-called third-party holdings (claims on nonresidents held by other nonresidents through resident institutions), a long-standing item in discussions of international statistical reporting.[2]

The analysis in this paper for Ireland and Luxembourg is closely related to the fund-level evidence presented in Beck et al. (2024), who re-cast euro area portfolio holdings on a nationality basis, including by "seeing through" investment fund holdings. In that endeavor, they also examine the characteristics of Irish and Luxembourg investment funds reported to be held by euro area investors, contrasting them with those that are not, to assess the likelihood that euro area investor holdings of such shares are significantly under-reported.

We start in Section II with a brief description of data sources. Section III characterizes the size of the global discrepancy, relating it to available bilateral data. Section IV makes use of bilateral data to show in which countries most unrecorded assets are held, as well as in which countries such assets are likely held in custody or traded. Section V concludes.

II. Data Sources

The main data sources for the paper are:

- The Coordinated Portfolio Investment Survey, conducted since 2001 under the auspices of the IMF. It currently covers over 80 economies, including the vast majority of large investors in portfolio instruments. The survey provides a destination-country breakdown for portfolio investment in equity and debt instruments, as well as, for some countries, a survey of portfolio liabilities by residence of the asset holder. It also includes a parallel survey on securities held as central bank reserves and assets of international organizations (SEFER-SSIO) which reports aggregate holdings of portfolio instruments on a country of counterparty basis;[3]
- Bilateral surveys of portfolio equity liabilities beyond the few reported as part of the CPIS. These additional surveys include the one conducted annually by the United States and a survey of investment fund liabilities conducted by Ireland on an immediate counterparty basis;

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2. See, for instance, Balance of Payments Committee (2003) and Sanchez Muñoz and Israël (2007).

3. This survey is helpful in reconciling asset and liability figures because shares held by central banks in their reserves would not be reported as portfolio equity assets by investor countries but are included in portfolio equity liabilities by destination countries.

- Data on portfolio equity assets and liabilities from countries' international investment positions, as published by the IMF in its Balance of Payments and International Investment Position Statistics;
- The External Wealth of Nations (EWN) database, developed by Lane and Milesi-Ferretti (2001, 2007, 2018), with the latest vintage described in Milesi-Ferretti (2024). The database provides estimates of external assets and liabilities for over 210 economies for the period 1970-2022. It relies heavily on international investment position data reported by the IMF for recent years, but also includes other estimates from national authorities. Importantly, it constructs estimates for countries not reporting international investment position statistics (such as the United Arab Emirates, Qatar, the British Virgin Islands) and provides estimates differing from official International Investment Position (IIP) figures for economies where the latter are based on incomplete data coverage or are not in line with other evidence (for instance Bermuda, the Cayman Islands, and Kuwait). These additional estimates rely on partner-country data published by the IMF, the BIS, and national authorities, as well as a variety of other data sources. The global coverage of the database makes it easy to check for global discrepancies.

III. Global Discrepancies in Portfolio Equity Securities

Evidence from EWN, discussed in Lane and Milesi-Ferretti (2007) and most recently in Milesi-Ferretti (2023), highlights that during the past three decades, global portfolio equity represented the major source of global discrepancy between external financial assets and liabilities (Figure 1).[4]

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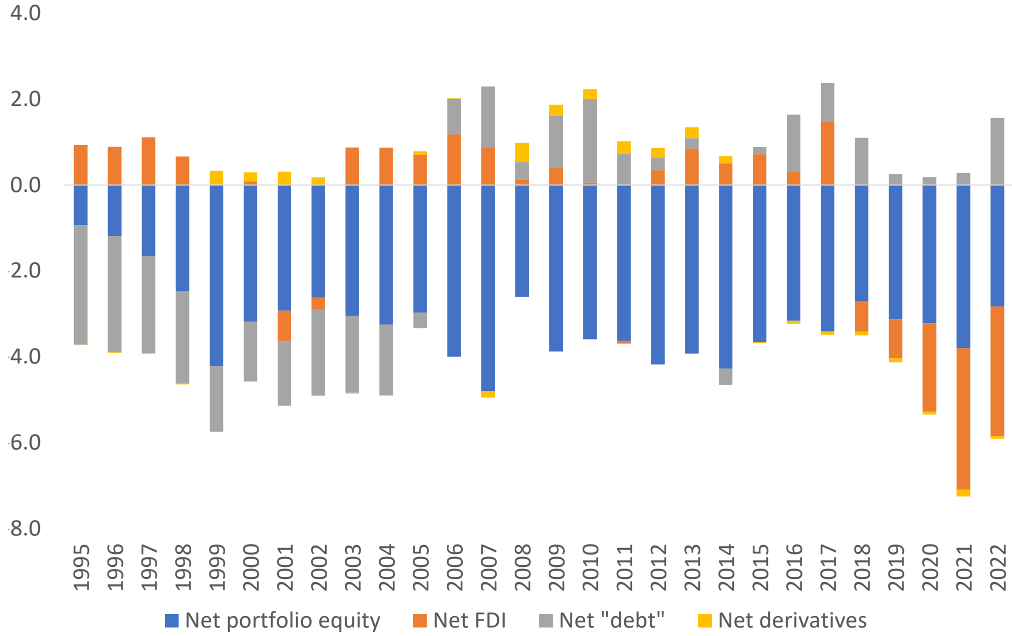
4. As discussed in Milesi-Ferretti (2023), the rising FDI discrepancy since 2017 is likely related to the methodology for valuing U.S. FDI liabilities. In U.S. statistics published by the Bureau of Economic Analysis, the value of foreign affiliates in the U.S. is assumed to rise in line with U.S. equity prices, which have increased very sharply since then. Partner-country data, however, does not display the same pattern, suggesting different valuation methodologies.

Figure 1. Global IIP discrepancy (percent of world GDP)



Note: The chart shows the difference between global external assets and liabilities for different financial instruments. Net FDI is the difference between global FDI claims and liabilities, and net derivatives are the difference between global derivatives claims and liabilities. Net portfolio equity equals global portfolio equity assets (from the External Wealth of Nations), plus holdings of equity reported by central banks to the SEFER-SSIO survey, run in parallel to CPIS, minus global portfolio equity liabilities. Net debt is the global sum of portfolio debt assets, other investment assets, and foreign exchange reserves net of the equity claims mentioned above, minus the global sum of portfolio debt liabilities and other investment liabilities.
Source: External Wealth of Nations database.

Rising global portfolio equity prices, increased international portfolio diversification, and the concentration of the investment fund industry in financial centers such as Ireland, Luxembourg, and the Cayman Islands have raised the importance of portfolio equity holdings in global financial holdings across borders. While reporting has improved, statisticians still find it challenging to fully capture household holdings of foreign shares, especially if these are not channeled through domestic financial intermediaries or held through domestic custodians. These holdings can in principle be an important source of asset under-reporting and hence the global portfolio equity discrepancy.

To gain a better understanding of this discrepancy, we start from the bilateral data from portfolio surveys mentioned above. The CPIS is particularly useful because it provides a quite comprehensive 'match' between portfolio equity assets and liabilities, by identifying the residence of the issuer of shares held by portfolio equity investors. Furthermore, the reported holdings by CPIS countries are generally identical to or in line with those reported in their IIP. If measurement was accurate and participation to the survey was full, the portfolio equity liabilities reported by country X should be equal to the sum of portfolio equity holdings in country X by investors from other countries (which we call derived portfolio equity liabilities). In practice, however, participation to the survey is not full, and some economies participating in the survey report data that only partially cover their portfolio holdings.[5] We proceed by first highlighting headline global figures on assets reported by the CPIS, their shortfall relative to global portfolio equity liabilities, and the extent to which additional data can close the gap between the two. Subsequently, we compare portfolio equity holdings reported by investor countries in a specific destination with the portfolio equity liabilities reported by that destination to get an indication of where unreported assets are likely held.

Table 1 provides a preview of the orders of magnitude involved for the year 2022.

Table 1. Global portfolio equity gaps, 2022 (billion US$)

Global portfolio equity liabilities	43,426
Portfolio equity liabilities derived from CPIS reporting 1/	36,901
Difference	6,524
Of which:	
United States	2,815
Luxembourg	1,805
Ireland	1,659
Other countries (net)	245
Global portfolio equity assets	40,602
Portfolio equity assets reported in CPIS 2/	37,294
Difference	3,308
CPIS non-reporters	1,622
of which:	
United Arab Emirates	655
Taiwan	319
Qatar	271
British Virgin Islands	141
Gap for CPIS reporters	1,686
of which:	
Cayman Islands	742
Kuwait	423
Global portfolio equity liabilities - global portfolio equity assets	2,824

1/ Excludes confidential and non-allocated holdings.

2/ Excludes portfolio equity assets held by central banks (classified as reserves).

Note: Global portfolio equity assets and liabilities are calculated from the EWN database (December 18, 2023 vintage). Derived portfolio equity liabilities are calculated from the IMF's Coordinated Portfolio Investment Survey (excluding holdings for which no destination country is reported). CPIS portfolio equity assets exclude holdings by central banks classified as foreign exchange reserves ($408 billion). Liabilities derived from CPIS reporting do not include the unallocated and confidential component of assets ($712 billion) and holdings of equity in international organizations ($90 billion).

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5. In addition, there are other factors that need to be considered when comparing estimates of global portfolio equity assets and liabilities, including shares held by central banks in their foreign exchange reserves and holdings by and in international organizations.

Its bottom line is that estimates of global portfolio equity liabilities ($43.4 trillion) exceed global portfolio equity assets by over $2.8 trillion (with the corresponding figure for 2021 around $4 trillion). The upper part of Table 1 compares portfolio equity liabilities with those derived aggregating by destination the holdings reported by CPIS participants. For these, the starting point are the $37.3 trillion of portfolio equity claims reported in the December 2022 CPIS by individual economies, plus around $400 billion of equity holdings by central banks and international organizations measured in a parallel survey.[6] From this figure we net out $711 billion of portfolio equity holdings for which the counterpart is not specified, and hence not included among the derived liabilities. The country-by-country comparison shows that Ireland, Luxembourg, and the United States are the destinations that explain almost the entire difference between reported liabilities and those derived from reported holdings.

The bottom part of the table shows the extent to which alternative sources of data can increase estimates of global portfolio equity assets beyond those reported in the CPIS, by considering estimates of portfolio equity assets held by non-reporters as well as some clear cases of incomplete reporting of assets in the CPIS.

Incomplete country participation to CPIS

The largest holders of portfolio equity assets that do not participate to the CPIS are the United Arab Emirates (UAE), Taiwan, Qatar, and the British Virgin Islands (BVI). Using reported IIP data for Taiwan and financial flows, estimates from the Sovereign Wealth Funds Institute, and partner country data (particularly from the United States) for the other 3 economies, their collective holdings in 2022 are estimated to be close to $1.4 trillion, out of total estimated holdings for CPIS non-reporters of $1.6 trillion (Table 1). There are wide margins of uncertainty around the holdings of the UAE and Qatar, and the estimate for the BVI is most likely a lower bound because it is put together from identified holdings by partner countries.

Assets reported to CPIS based on incomplete sectoral coverage

The identification of these economies is based on a comparison of database estimates for their portfolio equity assets with the total reported by the CPIS, and hence subject to notable margins of uncertainty. The two most important and clear-cut cases of incomplete CPIS reporting are the Cayman Islands and Kuwait (see Table 1).

- For the Cayman Islands, the CPIS covers the banking sector in full and (in value) less than 70% of holdings by investment funds and insurance companies, according to the published metadata. Other sectors (in particular nonfinancial corporations) are not included. Investment funds are by far the largest holders of equity assets. According to the U.S. portfolio liability survey, equity holdings in the U.S. by entities incorporated in the Cayman Islands amounted to over $1.4 trillion, while the Cayman Islands report U.S. holdings of around $700 billion. While under-reporting is likely to be relevant for the Cayman holdings in other countries as well, we don't have

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6. Central bank holdings are generally classified as foreign exchange reserves while international organizations (whose holdings of equity instruments are small) are not included in the EWN database.

data like the U.S.-source survey to support additional precise upward revisions to the portfolio equity assets of the Cayman Islands.[7]

- For Kuwait, reporting excludes most general government holdings, and in particular those of the large sovereign wealth fund (the Kuwait Investment Authority). Kuwaiti holdings are very substantial: around $240 billion in the United States alone in 2022 (according to the U.S. liability survey), compared to $1.7 billion reported in CPIS, and an estimated global total exceeding $430 billion.

Overall, these two economies account for about $1.2 trillion of under-reported assets. Under-reporting for other countries (about $500 billion in total) is more limited. In the database it is assumed to be substantial for Saudi Arabia. There is no metadata information on the compilation of the CPIS for Saudi Arabia, and hence it is difficult to assess its comprehensiveness. The reported estimate falls short of what can be estimated by cumulating portfolio equity outflows with valuation adjustments.

Other data issues

As noted above, the CPIS database also includes data for which no country counterpart is identified (between 1% and 2% of total holdings for the period 2001-2022). Hence, the aggregation of country-level liabilities derived from CPIS will fall short of assets. CPIS data also includes equity held in international organizations (a much smaller amount than the previous category) which would also not be matched in the derived liability data. Both factors reduce derived liabilities relative to assets by some $800 billion in 2022.

In contrast, holdings of equity by central banks and international organizations are also reported by CPIS on a geographical destination basis, thanks to the SEFER-SSIO survey mentioned in the previous section. These holdings, which reflect primarily central bank reserves, amounted to over $400 billion in 2022. They are included in derived (and reported) portfolio equity liabilities, but on the asset side they are classified as foreign exchange reserves, and hence they drive a wedge between global portfolio equity assets and liabilities.[8]

Overall, integrating the information from the CPIS with the estimates for under-reporters and non-reporters narrows the gap between assets and liabilities by about $3 trillion. To better understand the remainder of the gap, we turn in the next section to a country-by-country comparison of portfolio equity liabilities in the EWN database with those that can be derived from asset holdings reported to CPIS.

IV. Understanding the equity discrepancy: Bilateral evidence

In most countries, reported portfolio equity liabilities are larger than those derived from investor country reporting, as expected given the incomplete coverage of CPIS. But as Table 1 highlights, it is striking to see how 3 countries account for the lion's share of the global gap: the United States, Ireland, and

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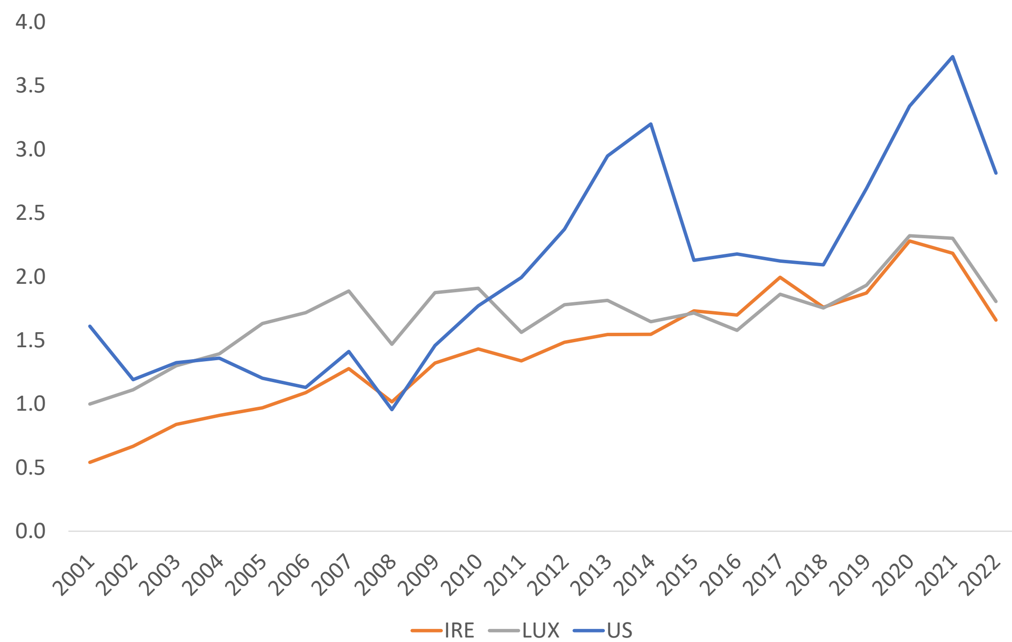
7. The Cayman Islands also publishes IIP statistics, but these do not include offshore activities, which are the dominant component of the economy's gigantic external balance sheet.

8. No information is provided on participation by central banks to the SEFER-SSIO holdings. However, based on the disclosure policies of individual central banks and on the overall size of securities' holdings documented by the survey, it is reasonable to infer that advanced economies' central banks are participating to the survey while the Central Bank of China is not.

Luxembourg. This is not merely a reflection of portfolio size (countries with larger portfolio equity liabilities would be expected to have proportionally larger gaps): the share of total liabilities that cannot be explained by reported CPIS holdings largely exceeds the global average of 15% (23% for the US, 33% for Luxembourg, and 39% for Ireland). Moreover, the discrepancies for these countries are persistent (Figure 2). Measurement error on portfolio equity liabilities is unlikely to be an explanation. The United States undertakes a detailed portfolio equity liability survey, and for Ireland and Luxembourg domestic holdings of fund shares are well identified and relatively small compared to the multi-trillion size of total fund shares outstanding, implying that the measurement of fund shares held by nonresidents is likely to be quite accurate.

Figure 2. Global portfolio equity discrepancies (percent of world GDP)



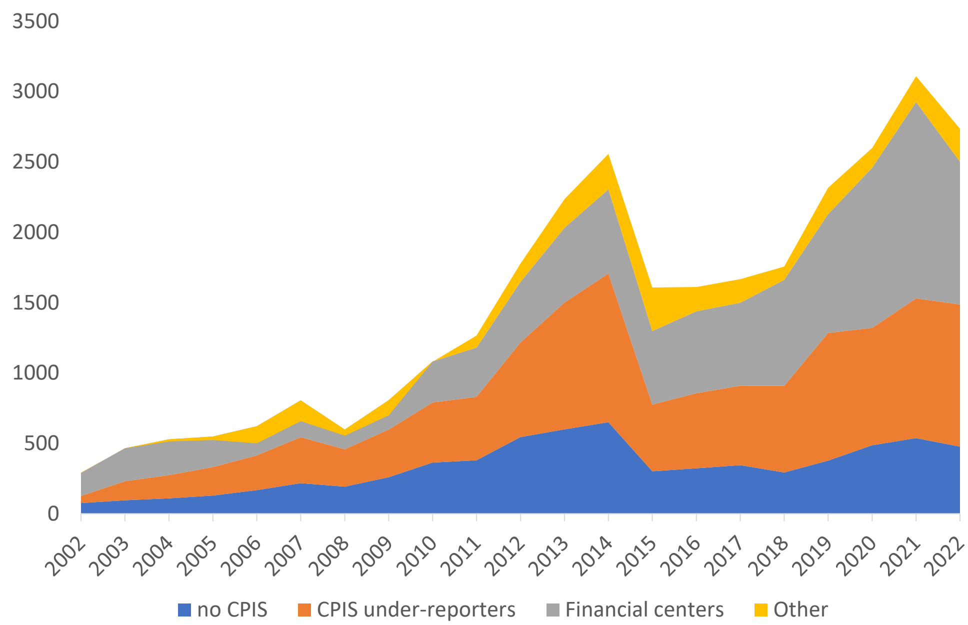
Note: The chart shows the difference between portfolio equity liabilities for Ireland, Luxembourg, and the United States (as reported in their IIP) and aggregate claims on these countries as reported by participants to the IMF's Coordinated Portfolio Investment Survey. Data are scaled by world GDP.
Source: Author's calculations based on the IMF's Coordinated Portfolio Investment Survey and IMF, Balance of Payments and International Investment Position statistics.

United States

The U.S. stock market is by far the largest in the world and the one that attracts most foreign investment. Hence holdings in the U.S. are likely to be an important share of equity assets of CPIS non-reporters and also represent an important share of the assets under-reported to CPIS. Furthermore, some central banks hold part of their reserves in equity, with the U.S. being a likely destination for some of those holdings. If the central bank in question participates in the SEFER survey, run in parallel to the CPIS, those holdings would be part of U.S. equity liabilities derived from CPIS, even though they would not be attributed to the country of that central bank. But if the bank does not participate, such holdings would not be captured in CPIS statistics.

In Figure 3, we break down the difference between reported and derived U.S. portfolio equity liabilities into different country groups. These include: 1) economies not reporting to the CPIS (for which the difference equals their holdings as reported by the U.S.); 2) economies with incomplete reporting to the CPIS (specifically the Cayman Islands, Kuwait, Bahamas, and Saudi Arabia); 3) financial centers reporting to the CPIS; and 4) the remainder of CPIS reporters. Because for the aggregate of euro area countries U.S.-reported holdings line up well with those reported by the CPIS, we don't include euro area financial centers (Ireland, Luxembourg, Netherlands, Cyprus, Malta) in the financial centers group. The figure shows that over half of the U.S. discrepancy on average can be explained by holdings of non-reporters or a few large cases of CPIS under-reporting. The remainder of the discrepancy is concentrated in financial centers and hence more difficult to attribute to ultimate holders.

Figure 3. US: Gap between reported and derived equity liabilities (billions US$)



Note: The chart shows the difference between U.S. portfolio equity liabilities (as reported by the U.S. portfolio liability survey) and portfolio equity holdings in the U.S. reported in the IMF's Coordinated Portfolio Investment Survey. For countries not reporting to CPIS (in blue), the chart shows the sum of claims in the U.S. as reported by the U.S. liability survey. CPIS under-reporters include the Cayman Islands, Kuwait, Saudi Arabia, and the Bahamas. Financial centers include Bermuda, Curacao, Gibraltar, Guernsey, Jersey, Macao, Mauritius, Panama, Singapore, Switzerland, and the United Kingdom. The "Other" category includes all other CPIS reporters.
Source: Author's calculations based on U.S. Treasury, U.S. portfolio liability survey, and IMF, Coordinated Portfolio Investment Survey.

To shed further light on the discrepancy, Table 2 provides a list of the largest country-specific differences between the claims that countries report to be holding in the U.S. and liabilities to that country identified by the U.S. survey. The list is dominated by financial centers. The economy with the largest discrepancy in 2021-22 is the United Kingdom, and its magnitude is quite large.[9]

Table 2. Differences between reported U.S. equity liabilities and CPIS-reported claims on the U.S. (2021 and 2022, billion US$)

	2021	**2022**
United Kingdom 1/	595	416
Switzerland	503	351
Canada	262	273
France	204	169
China	158	153
Singapore	125	98
Hong Kong	101	79
Luxembourg	93	72
Bermuda	71	63

1/ Includes Guernsey and Jersey.

Note: The table reports the difference by country between U.S. portfolio equity liabilities (reported in Department of the Treasury et al for end-June of each year and updated to end-December with adjustments for stock price changes and net equity transactions) and portfolio equity claims on the U.S. reported by participants to the IMF's CPIS Survey.

Source: U.S. Treasury, IMF, Coordinated Portfolio Investment Survey.

The second largest discrepancy is for Switzerland, another financial center. In this case the discrepancy is likely to reflect in part the equity holdings of the Swiss National Bank. These are classified as foreign exchange reserves and hence not reported as Swiss holdings in CPIS, but rather as holdings of central banks and international organizations. Data reported on the SNB website indicates that holdings of equity by the SNB amounted to about 50% of total portfolio equity holdings of central banks and international organizations over the period. If the ratio of U.S. holdings to total holdings for the SNB is assumed to be the same as for the holdings of all CBs and IOs reporting to the IMF survey, this would add over $120 billion to Swiss holdings (Table 3), and hence reduce the Swiss discrepancy by about 1/3. Custody accounts in Swiss institutions belonging to nonresidents are another potential reason for the discrepancy. These accounts' holdings of non-Swiss shares on behalf of nonresidents amounted to over $600 billion, and holdings of non-Swiss investment fund units over $900 billion.

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9. The discrepancy for the United Kingdom is even larger than the one reported in Table 2 but is partly offset by discrepancies of the opposite sign for Guernsey and Jersey. The table report the sum of those discrepancies.

Table 3. Holdings of portfolio equity in the United States by central banks (billion US$)

		2017	2018	2019	2020	2021	2022
Holdings by central banks and international organizations	World	322	269	351	429	501	408
	U.S.	164	138	176	223	285	237
Holdings by Swiss National Bank	World	160	140	160	203	238	212
	U.S. (estimated)	82	72	80	105	135	123

Note: The holdings by the SNB in the United States are estimated by assuming they are the same ratio of global holdings as for the holdings by all CB and IOs reporting to the IMF survey.
Sources: IMF, Coordinated Portfolio Investment Survey (holdings by central banks and international organizations) and Swiss National Bank (global holdings of portfolio equity as reserves).

A few countries on the list are not international financial centers. For Canada, the discrepancy could reflect direct purchases of U.S. stocks and investment funds by Canadian households, which would not be captured by surveys of financial institutions and custodians in Canada.[10] In turn, this would imply some under-estimation of Canadian portfolio equity assets in the published IIP. For China, part of the discrepancy could reflect holdings of equity by the central bank, analogously to the case of Switzerland. But in (likely) contrast to the SNB, the central bank of China does not participate in the SEFER-SSIO survey, and hence its holdings would not be captured. For France, the discrepancy is also positive and large, in contrast with other large euro area economies such as Germany, Italy, and Spain, and less likely to reflect the international financial intermediation role of the country, compared for instance to the United Kingdom or Switzerland.[11]

In summary, U.S. source data provides valuable information on holdings by countries that do not report an IIP or that are likely to be missing part of their residents' equity holdings in their official IIP statistics. While over half of the discrepancy with data from the CPIS can be explained by these cases, there remains an important component which reflects holdings through financial centers—particularly the United Kingdom—which is difficult to attribute to final investors.

Ireland

Ireland is an important financial center, which reported around $4.3 trillion of portfolio equity liabilities in 2022. In contrast, CPIS participants reported about $2.6 trillion in holdings of Irish equity for that same year. Ireland's portfolio equity liabilities have three components. The largest one is investment fund shares (excluding money market funds) held by nonresidents, amounting to $2.8 trillion in in 2022, with the remainder consisting of common shares and money market funds.

Ireland provides statistics on the major holders of its portfolio equity liabilities for investment funds and money market funds on an immediate counterparty basis. The data are less reliable than the U.S.

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10. I am grateful to Carol Bertaut for this suggestion.

11. Among euro area countries the discrepancy is positive and large for financial centers such as Ireland and Luxembourg, but as mentioned in the text, aggregate euro area holdings reported by the U.S. are close to those reported in CPIS.

liability survey data for the purpose of identifying ultimate holders of investment fund shares, but still provide very useful information on potential counterparts. As already done for the United States, we compare these data to holdings in Ireland reported to CPIS. In interpreting the findings, we need to take into account that holdings of common shares of Irish companies (mostly U.S. companies that undertook tax inversions) are included in the CPIS total but not in the Irish data, which is limited to funds.

The results are shown in Table 4. For 2022, total nonresident holdings in Irish funds exceed holdings of all portfolio equity in Ireland reported by CPIS by close to $1 trillion. The most striking finding concerns again the United Kingdom: on an immediate counterparty basis, holdings of Irish investment fund shares exceed $1.7 trillion, vis-à-vis holdings by U.K. residents reported in CPIS of $420 billion (Milesi-Ferretti, 2023 and Beck et al, 2024 highlight the same issue). There are much smaller but still meaningful discrepancies in the same direction for financial centers such as Luxembourg, the Netherlands, and the Cayman Islands, but not for Switzerland, despite the importance of custody accounts highlighted earlier. One country where CPIS figures exceed substantially those reported by Irish funds is the United States. Here, however, there is a clear explanation. The U.S. portfolio asset survey indicates that the lion's share of U.S. reported holdings of Irish portfolio equity in 2022 (close to $600 billion out of $678 billion) are common shares. The nationality data constructed by Bertaut, Bressler, and Curcuru (2019) shows that these U.S. holdings in Ireland are concentrated in companies that are not Irish. These are primarily U.S. companies (many from the pharmaceutical sector) that have undertaken corporate inversions to move the residence of their headquarters to Ireland. The holdings of funds by U.S. investors reported by Ireland instead exceeds those reported in the U.S. survey by over $100 billion.

Table 4. Holders of Irish funds (immediate counterparty basis) and holdings of Irish equity reported in CPIS, 2022 (billion US$)

	Investment funds and money market funds	CPIS
United Kingdom	1,726	402
Luxembourg	329	203
Netherlands	328	103
United States	207	672
Germany	114	251
Italy	99	186
Cayman Islands	96	59
Switzerland	48	115
Other euro area	244	172
Other countries	369	451
Global total	**3,561**	**2,615**

Sources: Central Bank of Ireland, investment fund statistics, and International Monetary Fund, Coordinated Investment Survey.

Overall, aggregate holdings reported by other euro area countries in Ireland are in line with the liabilities reported by Irish investment funds vis-à-vis other euro area countries on an immediate counterparty basis. Beck et al. (2024) investigate in detail the extent to which holdings of Irish fund shares by euro area investors could account for a sizable share of holdings for which the CPIS does not identify the investor country (and hence, given the immediate counterparty pattern of Irish funds data, shares held through United Kingdom intermediaries). On the basis of fund-level evidence, they conclude that this is unlikely to be the case. We discuss their findings and their consistency with those reported in this paper in the section on the United Kingdom below.

Luxembourg

Data on the residence of holders of Luxembourg investment fund shares, even on an immediate counterparty basis, are not generally available. Here we make use of data kindly shared by the Commission de Surveillance du Secteur Financier (CSSF) on the countries where Luxembourg investment fund shares are commercialized, which is likely to be broadly in line with the immediate counterparty concept.[12] These data cover the vast majority of Luxembourg non-money market investment fund shares—they only exclude shares of those alternative investment funds which are not regulated by the CSSF (some $350 billion in 2021, or about 5% of total investment fund shares). Similar data are used in a recent study by Ciccone and Morhs (2023). As the authors note, these data do not provide accurate estimates of the residence of the holders of such shares. Indeed, for euro area investors one can obtain more precise estimates using the security-by-security SHS database of the European Central Bank. For countries outside the euro area, we do not have this information, and we hence provide a simple comparison of data of countries of commercialization with equity claims on Luxembourg reported by the same countries to the CPIS.

Following Ciccone and Morhs (2023), Table 5 compares investor country data on holdings of portfolio equity instruments in Luxembourg reported in the CPIS (which is based in principle on the entire set of portfolio equity liabilities of Luxembourg) with data on the country of commercialization of funds domiciled in Luxembourg covered in the study.[13] Despite the a priori broader coverage of CPIS, the Luxembourg-source data report much larger holdings, especially for the United Kingdom (over $700 billion), with much smaller but still meaningful gaps for other financial centers such as Switzerland, Hong Kong, and Singapore.

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12. I am greatly indebted to Bruno Dawance and Johan Marigny for providing the data.

13. The analogous table in Ciccone and Morhs is based on a slightly different sample of investment funds and calculation method. The results we obtain with our data are very much in line with theirs.

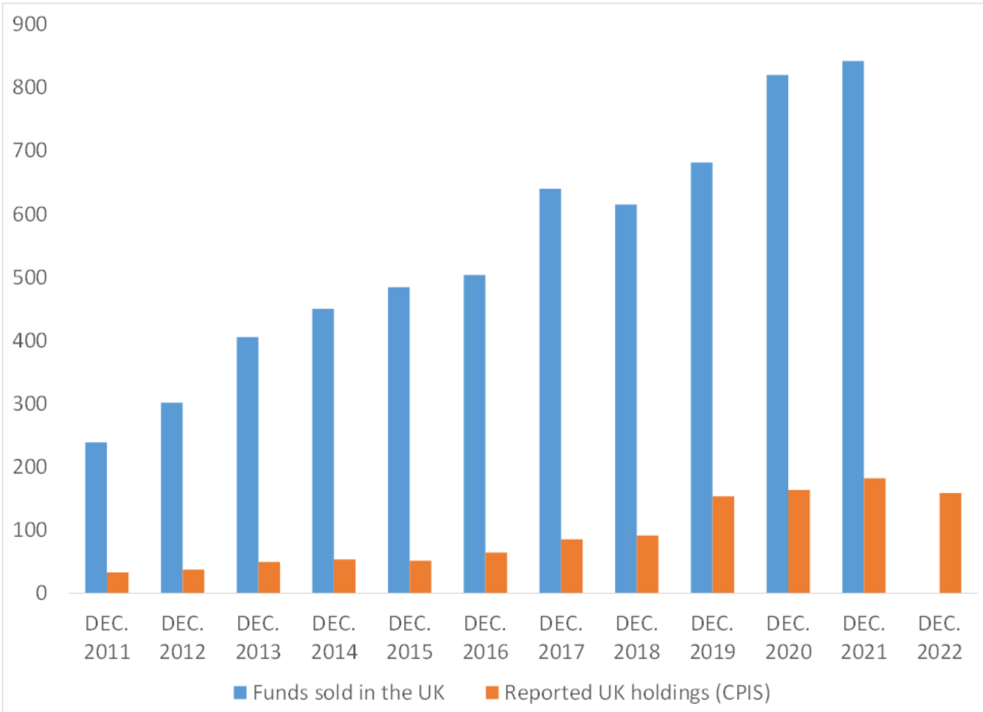
Table 5. Luxembourg Investment Funds: Countries of commercialization and reported holdings, 2021 (billion US$)

	Luxembourg fund data 1/	CPIS
United Kingdom	843	182
Switzerland	400	290
United States	217	155
Sweden	175	150
Japan	105	103
Hong Kong	95	56
Singapore	89	32
Taiwan	80	n.a.
Cayman Islands	70	25

1/ The data refer to the country of commercialization of Luxembourg investment funds (excluding money market funds and unregulated alternative investment funds).
Source: Commission de Supervision du Secteur Financier (CSSF) and CPIS.

Figure 4 provides a time series comparison for U.K. holdings, highlighting the size and persistence of the gap between the data on commercialization of funds and reported U.K. holdings. As for the case of Ireland, we discuss the fund-level evidence on ownership of Luxembourg fund shares by euro area investors versus those owned by the rest of the world in the next sub-section.

Figure 4. Luxembourg Funds: Reported U.K. holdings and Funds sold in the United Kingdom (billion US$)



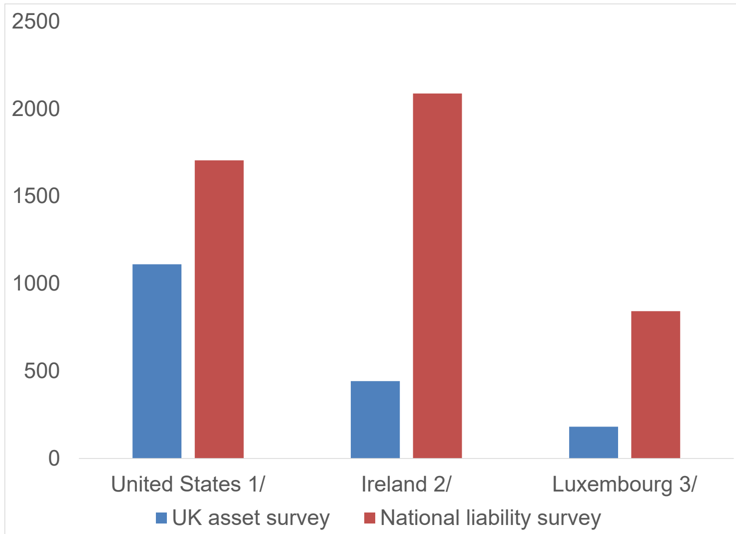
Source: IMF, Coordinated Portfolio Investment Survey and Commission de Surveillance du Secteur Financier.

United Kingdom

In the discussion of the liability surveys of the United States, Ireland, and Luxembourg, we have provided evidence on the size of their equity intermediated in the United Kingdom. Figure 5a summarizes that evidence, already reported in Tables 2, 4, and 5, for the year 2021. The difference between the liabilities vis-à-vis U.K.-based investors or intermediaries and the portfolio equity claims reported by the U.K. on these three countries is close to $3 trillion dollars, over 5% of global portfolio equity liabilities.

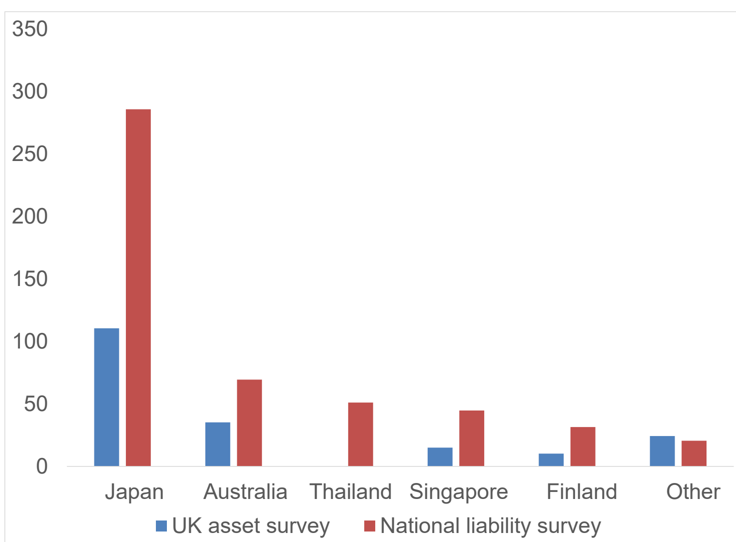
Figure 5. United Kingdom: Reported and derived portfolio equity assets, 2021 (billion US$)

A. Claims vis-à-vis Ireland, Luxembourg, and the United States



1/ Includes Guernsey and Jersey. The U.S. survey is as of June 30. Values for end-December are estimated using July-December flows and stock market valuation changes.
2/ Ireland liability survey includes investment funds and money market funds, while CPIS also includes other equity claims.
3/ Luxembourg data refers to the country of commercialization of investment fund shares. CPIS data also includes holdings in alternative investment funds.

B. United Kingdom claims and reported liabilities to United Kingdom, selected countries



Note: The chart shows portfolio equity claims reported by the U.K. on the indicated destination countries, as well as holdings by U.K. investors reported by destination countries in their portfolio liability surveys.
Source: CPIS, portfolio asset survey and portfolio liability survey.

Figure 5b adds statistics from the 21 CPIS participants that publish a portfolio equity liability survey (highlighting the largest destinations for portfolio equity investment: Japan, Australia, Singapore, Finland, and Thailand).[14] The CPIS data shows the same general pattern as the data depicted in Figure 5a. Namely, liabilities vis-à-vis the U.K. are much larger than the U.K.-reported claims on these countries. This is not surprising, since portfolio liability surveys have a custodial bias: countries will report larger liabilities vis-à-vis financial centers that act as global financial intermediaries because they cannot establish whether financial centers' holdings are on behalf of clients from other jurisdictions. With the exception of Singapore, CPIS-reported claims on these economies are reasonably close to these economies' reported liabilities, differently from the cases of Ireland, Luxembourg, and the U.S., and hence there is no strong evidence of large under-reporting. The data for Switzerland shows a similar pattern as for the U.K., with reported bilateral liabilities exceeding derived liabilities, but the absolute amounts are smaller and the ratio of derived to reported liabilities is higher.

In order to infer the potential ownership of "missing assets" managed in the United Kingdom, we follow two related lines of inquiry. The first consists of comparing the portfolio equity assets reported by the United Kingdom with partner-country data from Ireland and Luxembourg as well as data from a report on asset management in the United Kingdom (Investment Association, 2023), to identify potential under-reporting. The second line of inquiry consists of examining available data on asset management in the United Kingdom on behalf of nonresident investors, from the same report by the Investment Association (IA). Specifically, the report documents how in 2022 investment managers belonging to the IA managed from the U.K. some $10.6 trillion in assets, of which over $5 trillion on behalf of overseas investors. An additional $1.6 trillion is estimated to be managed in the U.K. by investment managers not belonging to the IA.[15]

UK portfolio investment abroad

The United Kingdom reported holdings of around $400 billion in Irish equity instruments at the end of 2022. However, several sources suggest that these holdings may be materially higher. The vast majority of money market fund shares in the U.K. are issued by funds incorporated in Ireland and Luxembourg (Tyrer, 2018; Investment Association, 2023). While there are no current published statistics on money market fund shares held by U.K. institutions, ONS (2018) estimates that U.K. investors held close to $300 billion in money market fund shares at the end of 2016, with over 90% of the funds in question domiciled abroad. Irish money market funds report holdings by U.K. investors on an immediate counterparty basis of roughly the same amount in 2016, rising to over $400 billion by end-2022.

In addition, a recent paper by the Central Bank of Ireland (Dunne, Ghiselli, Ledoux, and McCarthy, 2023) finds that some $360 billion of Irish Liability-Driven Investment (LDI) funds were held by U.K. institutions in the fall of 2022. Finally, Irish statistics on non-money market investment funds (which would include the just-mentioned LDI funds) indicate holdings in the U.K. on an immediate counterparty

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14. Other economies include Bangladesh, Bolivia, Bulgaria, Cyprus, Czechia, Estonia, Iceland, Indonesia, Israel, Latvia, Lithuania, Malaysia, Mongolia, New Zealand, Romania, and West Bank and Gaza.

15. Firms not belonging to the IA specialize in alternative investments including hedge funds, private equity funds, commercial property management, discretionary private client and private debt management, and natural resource management firms. See Investment Association, 2023, p. 23.

basis totaling $1.3 trillion at the end of 2022.[16] Even if most of these Irish funds (excluding the LDI component) were ultimately held by non-UK investors, the data on money market funds and LDI funds suggest a substantial undercount of holdings by U.K. investors in Irish funds. This undercount may occur because the funds in question often have a U.K. manager and may hold claims on U.K. residents (such as holdings of U.K. government bonds for LDI funds)—they could therefore be considered by reporting institutions as domestic funds. If this is the case, the under-reporting of U.K. portfolio equity assets may go together with some under-reporting of U.K. liabilities (namely, the claims on U.K. residents held by these funds).

The CPIS metadata for the United Kingdom also highlights that coverage of portfolio asset holdings is incomplete. It notes that coverage for other financial corporations (excluding insurance companies, pension funds, and money market funds) and nonfinancial corporation is below 70%, and that households are not separately included in the survey (although presumably holdings by households through domestic financial institutions or custodians are captured). In the financial accounts for the United Kingdom published by the U.K. Office for National Statistics (ONS), reported holdings by households of investment fund shares issued by nonresident entities are tiny (around $30 million in 2022), although additional holdings may be captured by holdings of “shares and other equity” ($214 billion) not identified separately as fund shares. In contrast, statistics from Investment Association (2023) suggest that retail holdings by U.K. investors of funds domiciled outside the U.K. totaled $275 billion at the end of 2022, and this amount excludes the increasingly popular Exchange-Traded Funds (ETFs), often domiciled outside the United Kingdom, as well as holdings of non-fund shares. Overall, these figures suggest a likely undercount of household holdings of foreign equity in the U.K., in addition to the likely undercount in institutional holdings highlighted above.

The fund-level evidence presented in Beck et al. (2024) corroborates this view. In particular, the authors find that 40% of the bond positions of Irish funds not reported to be held by euro area investors are denominated in British pounds (versus less than 5% for the bond positions of funds reported by euro area investors). This is consistent with the evidence on LDI funds and money market funds discussed above and, given the presumably modest weight of investment in British pounds for non-U.K. investors outside the euro area, suggests that holdings of Irish fund shares by U.K. residents are likely underestimated. Beck et al. also present evidence on the geographical pattern of investment by Luxembourg-based funds distributed in different jurisdictions, including the United Kingdom, the euro area, and other countries, which shows that funds commercialized in the United Kingdom hold more U.K. assets and have an investment pattern more similar to the one for those commercialized outside the euro area. In turn, this suggests that funds commercialized in the United Kingdom are more likely to be held by U.K. investors as well as other investors outside the euro area.

It is more complicated to assess which holdings of shares through U.K. managers by nonresident investors are not currently captured in IIP statistics. Data from Investment Association (2023) suggests that over $5 trillion in assets held by nonresident investors were managed in the United Kingdom at the end of 2022. From a geographical perspective, investors are from the European Economic Area (which includes European Union countries as well as Iceland, Liechtenstein, and Norway) accounted for about 50% of the total, with most of the remainder attributable to investors from the United States, the Asia-Pacific region, and the Middle East. But to determine the likelihood that such assets are missed by the statistics of investor countries, it is important to distinguish between institutional and retail holdings.

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16. This figure is broadly consistent with figures from the Investment Association report, which point to some $1.6 trillion of Irish funds (including money-market funds) being managed in the United Kingdom at the end of 2022.

To do so, we make use of data published in the appendix of the cited Investment Association report. The data include total assets managed in the United Kingdom, broken down into institutional, retail, and private client holdings, as well as data on the assets managed on behalf of U.K. institutions (including those managed for such institutions outside the U.K.). The data are shown in Figure 6 where we consider retail and private holdings jointly, the latter accounting for less than 5% of the joint total. To derive the split between institutional and retail holdings for both resident and nonresident investors, we assume that 90% of assets managed on behalf of U.K. institutions are managed from the U.K. Given total assets managed in the U.K. on behalf of U.K. and foreign investors respectively, this allows us to get separate estimates for institutional and retail holdings, including by nonresidents.[17] Foreign institutional holdings include some $700 billion in public sector holdings, likely investments on behalf of sovereign wealth funds, as well as holdings by non-UK pension funds (around $1.2 trillion). These assets, together with most other corporate holdings, are more likely to be reported in the holding country's IIP statistics or in estimates of sovereign wealth fund holdings for nonreporters. However, this leaves a substantial component of "retail" holdings (shares of investment funds) held by nonresidents (most likely households): around $1.4 trillion, which may not be reflected in the statistics of the countries of residence of investors given that they are managed and held in custody outside their borders. Unfortunately, we cannot reliably establish the country or region of holders of such shares, since the figures on the regional breakdown of nonresident investors cited above include the larger institutional holdings.[18]

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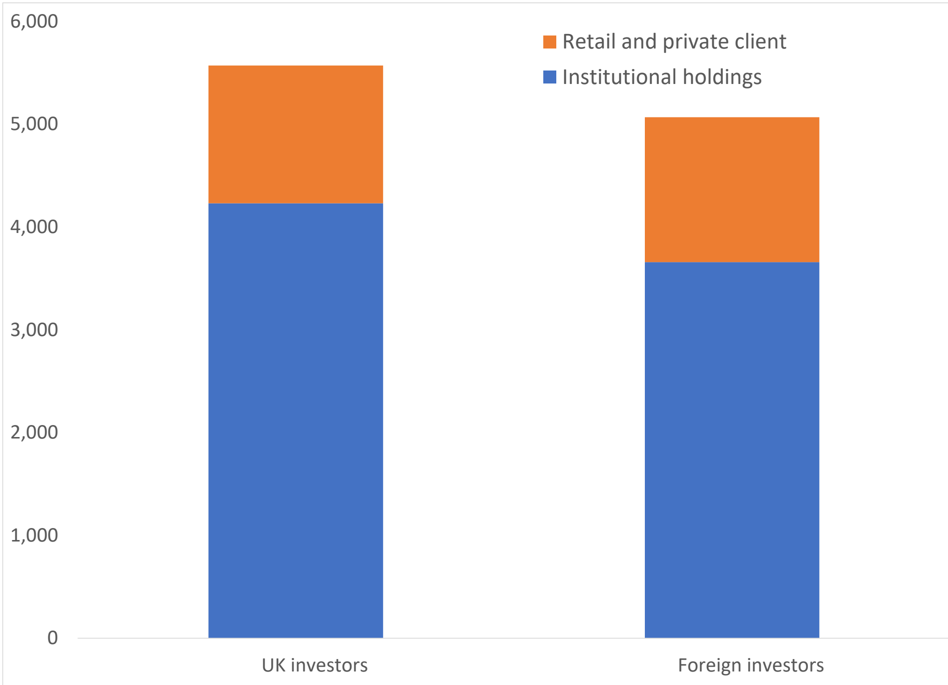
17. Note that a higher figure for U.K. institutional holdings managed in the U.K. would reduce our estimate of U.K. retail holdings and raise our estimate of foreign retail holdings.

18. As mentioned above, Beck et al. (2024) argue that the characteristics of Irish and Luxembourg funds held in the U.K. are different from those that euro area investors hold, and hence that those asset holders are likely to originate from outside the euro area. Of course, this does not rule out that some holders are indeed euro area investors since the aggregate asset allocation of such funds will reflect the portfolio of the entire geographical range of unidentified investors.

Figure 6. United Kingdom: estimates of assets under management, 2022 (billion US$)



Note: The chart shows assets under management in the United Kingdom on behalf of domestic and foreign investors based on data reported by the Investment Association (IA). IA (2023) reports total assets under management in the U.K. on behalf of domestic and foreign investors separately, as well as the split between institutional, retail, and private client holdings for the sum of domestic and foreign holdings. Estimates for U.K.-managed institutional holdings on behalf of domestic institutions assume that 90% of assets managed by IA members on behalf of U.K. institutions are managed in the U.K., with the remainder categories determined residually. Total holdings of private client assets are relatively modest (around $120 billion).
Source: Investment Association (IA, 2023, Appendices 1-2) and author's calculations.

Furthermore, as mentioned earlier, another $1.8 trillion of assets are managed in the U.K. by entities which are not Investment Association members (including hedge funds and ETF operators). Of this total, over $800 billion are managed on behalf of private clients, likely wealthy households. Part of these assets will reflect cross-border claims by international investors not reflected in IIP statistics.

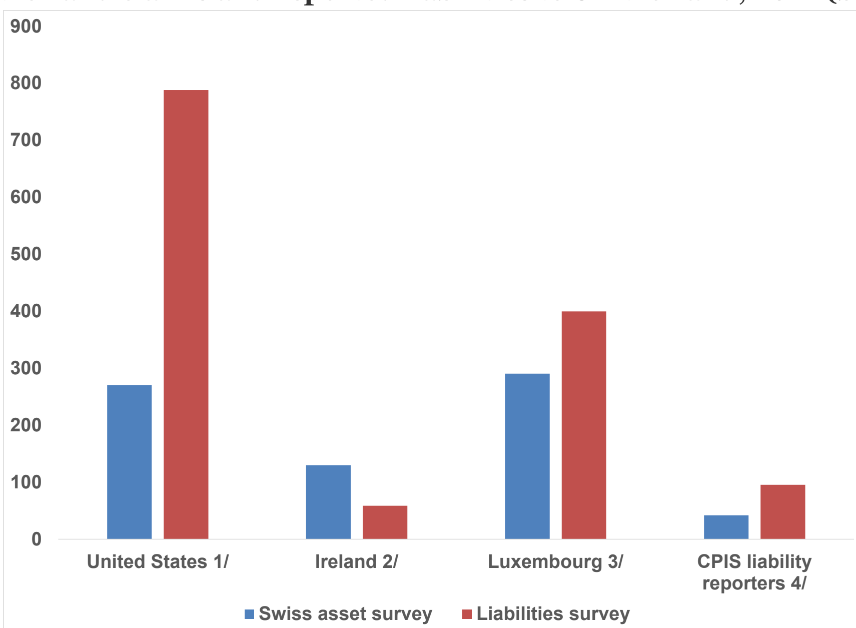
Overall, this analysis highlights how the role of the United Kingdom as a key location for international asset management relates to the difficulty in establishing ownership of cross-border portfolio equity assets in international statistics. While the data from the Investment Association provide a very useful perspective on U.K. asset management, there is room to strengthen official statistics both in terms of measuring portfolio equity assets held by U.K. residents abroad and in terms of reporting assets managed in the United Kingdom for nonresident investors broken down by country of origin. This would go a long way towards reducing global discrepancies in portfolio equity statistics.

Switzerland

Switzerland is another financial center where asset management and custody services for nonresidents play an important role. Zucman (2013) emphasized its role in intermediating and holding offshore assets belonging to the wealthy in advanced economies and not properly captured by international accounts.

Figure 7 provides a comparison of portfolio equity claims reported by Switzerland on the U.S., Ireland, Luxembourg, and a group of other destination countries for 2021, together with the portfolio equity liabilities to Switzerland reported by such countries in their liability surveys (analogously to figures 5a and 5b for the United Kingdom). The largest discrepancy by far is the one vis-à-vis the United States, followed by Luxembourg, while for Ireland reported Swiss claims are actually higher than the liabilities of Irish investment funds to Switzerland. As noted by Beck et al (2024), Switzerland played a larger role in the commercialization of Luxembourg investment fund shares prior to the global financial crisis, but the difference between reported Swiss holdings and fund shares sold in Switzerland has fallen since then.

Figure 7. Switzerland claims and reported liabilities to Switzerland, 2021 (billion US$)



Note: The chart shows portfolio equity claims reported by Switzerland on the indicated destination countries, as well as holdings by Swiss investors reported by destination countries in their portfolio liability surveys.
Sources: CPIS, portfolio asset survey and portfolio liability survey; U.S. survey of portfolio liabilities: Irish survey of investment fund shares by immediate counterparty; Luxembourg data on the country of commercialization of investment fund shares (from CSSF).
1/ The U.S. survey is as of June 30. Values for end-December are estimated using July-December flows and stock market valuation changes.
2/ Ireland liability survey includes investment funds only (excluding money market funds, for which data is not reported separately for Switzerland). CPIS also includes other equity claims.
3/ Luxembourg data refers to the country of commercialization of investment fund shares. CPIS data also includes holdings in alternative investment funds.
4/ Australia, Bangladesh, Bolivia, Bulgaria, Cyprus, Czech Republic, Estonia, Finland, Iceland, Indonesia, Israel, Japan, Latvia, Lithuania, Malaysia, Mongolia, New Zealand, Romania, Singapore, Thailand, West Bank and Gaza.

Switzerland financial institutions hold "custody accounts" on behalf of nonresident investors and provide statistics on security holdings in such accounts—including both securities portfolios which are managed and those which are simply held in custody.[19] The statistics include shares as well as investment fund shares.

We focus first on shares held in custody by nonresidents. The majority of those shares (over 60%) are issued by Swiss entities. Total non-Swiss shares held by nonresidents were about $830 billion in 2021. Of these, some $365 billion were denominated in U.S. dollars. If these were shares of U.S. firms, the custody figures, together with the central bank holdings (Table 3), would explain the difference between the portfolio equity assets reported by Switzerland and the liabilities reported by the United States.[20] Swiss data also indicates that over 80% of custody holdings of shares are on behalf of foreign institutions, with private holdings at about 10%. This makes it more likely that such holdings are reported in the IIP statistics of the foreign institution's country.

Over 90% of the investment fund shares held in custody for nonresidents ($1.2 trillion at the end of 2021) are instead issued outside Switzerland. Private holdings are more important than in the case of ordinary shares, accounting for about a quarter of the total. Investment fund shares denominated in dollars ($625 billion) are about twice the size of those denominated in euros. While Figure 7 shows that Luxembourg fund shares commercialized in Switzerland are much larger than Swiss holdings and hence likely to account for part of this total, the size of these custody holdings suggests that they also include fund shares sold elsewhere on an immediate counterparty basis. Unfortunately, the lack of information on the country of origin of nonresident investors for security custody accounts makes it impossible to check for a potential undercount of portfolio equity investment in their national IIP statistics.

V. Concluding remarks

We have highlighted a sizable global discrepancy between portfolio equity assets and liabilities at the global level, of around $4 trillion in 2021 and close to $3 trillion in 2022. Using data on IIP and bilateral portfolio surveys, we have shown how this global discrepancy reflects primarily our lack of knowledge on the residence of investors in equity instruments issued in the United States, Ireland, and Luxembourg. The U.S. survey on foreign holders of U.S. portfolio instruments, Irish investment fund data on their share ownership by immediate counterparty, and Luxembourg data on the countries of commercialization of their investment funds provide useful information to reduce these gaps but leave substantial areas of uncertainty given the difficulty of liability surveys in identifying the ultimate owners of securities.

An analysis of bilateral data shows that a substantial part of these "unallocated liabilities" are equity instruments sold through intermediaries in the United Kingdom, while a smaller part likely reflects securities held in custody in Switzerland. For Ireland's investment funds, the liability position vis-à-vis the United Kingdom in 2022 exceeds reported holdings of Irish equity instruments by U.K. residents by over $1.3 trillion, and the difference for the United States for the same year exceeds $400 billion. Data for Luxembourg shows a U.K. discrepancy for 2021 exceeding $650 billion. In turn, U.K.-source data suggests that CPIS-reported portfolio equity assets held by U.K. residents (particularly money market funds) may be underestimated. This may occur in particular for funds whose shares are held may have U.K. managers and invest in U.K. assets, which may lead custodians or holding entities to report them as

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19. See Notes – Banks | SNB data portal.

20. The U.S.-reported portfolio equity liabilities towards Switzerland are mostly in common stock.

domestic assets. But assets held through U.K. asset managers by nonresident investors are likely to account for the majority of holdings in the U.K. identified in Irish and Luxembourg statistics, given the importance of the United Kingdom in asset management for international clients. Unfortunately establishing the likely residence of non-U.K. holders of Irish and Luxembourg fund shares not reportedly held by CPIS participants remains difficult. The fund-level evidence presented by Beck et al. (2024) suggests that euro area investors are unlikely to be major holders of such shares, but in light of the data on overseas clients presented by the Investment Association, some under-reporting of household holdings is clearly possible.

Improving estimates of cross-border positions will require more comprehensive financial sector data from the United Kingdom, including holdings of money market fund shares, an item currently on the agenda of the Office of National Statistics. Importantly, this would also require improving data collection on international investors from the financial institutions in the United Kingdom undertaking intermediation activities on these stocks and investment fund shares. For Switzerland, a geographical breakdown of nonresident investors holding Swiss security custody accounts would help reduce these data gaps. More generally, collecting data on third-party holdings (claims on nonresidents held by other nonresidents through resident institutions) is essential to gain a more accurate picture of the geography of international investment, all the more so given the increasing ease of investing directly across borders. Proposals in this direction are discussed in Balance of Payments Committee (2003) and Sanchez Muñoz and Israël (2007), who highlight, in particular, the difficulty that existing statistical surveys face in identifying assets held with foreign custodians by the household sector, especially high net-worth individuals. Unfortunately progress on this front appears to have stalled. The findings of this paper suggest that it is high time to reconsider.

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