Consolidated foreign wealth of nations: Nationality-based measures of international exposure[*]

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Abstract

This study presents novel estimates of foreign holdings using a consolidated-by-nationality approach for a sample of 14 developed countries over multiple years. This approach provides an alternative for policymakers and researchers to analyse international exposure that complements the existing approach based on residence-based data. Two main advantages of the nationality-based approach are that it looks through corporate structures of multinational enterprises and considers local positions. The resulting novel data show that aggregate international financial integration is larger than residence-based data indicate for the sample. These data are used to analyse (i) profit-shifting activities and (ii) spillovers from United States monetary policy shocks. This study presents evidence suggesting that nationals of relatively high-tax countries may shift assets to low-tax countries in ways not fully captured in residence-based statistics. It also shows that a tightening in United States monetary policy is associated with a decline in foreign asset holdings by non-financial multinational enterprises using the consolidated-by-nationality approach. These findings underscore the relevance of using the consolidated-by-nationality approach to evaluate policy-relevant questions.

Keywords : consolidated-by-nationality statistics, financial globalization, international financial integration, policy spillovers, residence-based statistics, tax differentials

JEL classification codes : F21, F23, F36, F41, F42

1. Introduction

How can policymakers assess the exposure that a country's households and firms have to international risk factors? The conventional approach uses data on countries' foreign holdings. These data are collected using the residence of economic agents as the key criterion. For any given country, its external assets (or liabilities) represent claims (or liabilities) its residents have with respect to non-residents. It follows that only cross-border positions are recorded in residence-based statistics. Furthermore, this approach does not consider ties between entities within the same corporate group. Thus, using this approach, the local positions held by the affiliate of a multinational enterprise (MNE) operating abroad may not be considered part of the foreign holdings of its home and host countries.

These two features of the residence-based approach pose a challenge, given the growing importance of MNEs. These corporate groups have affiliates operating in multiple host countries. The local assets held by these affiliates in these countries represent investments made by an MNE away from its home country. Yet they may be recorded in foreign balance sheets of host and home countries only if cross-border transactions are involved. If these investments are funded by raising resources with local agents, no exposure is recorded for either home or host country.

For an example, consider a United States automaker MNE that has a local entity in a foreign country. This local entity decides to build factories and fund those investments by getting loans from banks of that foreign country. These factories represent investments made by a United States company in a foreign country. Yet these investments will not be recorded in the United States residence-based foreign balance sheet or in the foreign country's foreign balance sheet because they are local transactions happening in a foreign country. Now suppose

that this United States automaker decides to reduce its offshore operations and end its production in this foreign country. This decision will affect employment and income in that country. Focusing only on residence-based data could lead policymakers to overlook this international exposure. In this example, such international exposure is not accounted for as the residence-based approach considers only cross-border positions, and the loan taken by the affiliate is a local transaction between two entities resident in the foreign country – yet they have ultimate counterparts of different nationalities.

This example illustrates how decisions made by MNEs can affect employment and production in foreign countries that host MNEs' affiliates. Blomstrom and Kokko (1998) provide evidence of these spillovers from MNEs' activities. Avdjiev et al. (2020) have shown how monetary policy changes in the home country of multinational banks affect conditions in foreign countries that host bank affiliates. These studies point to the need to develop measures that can capture these international linkages more comprehensively. In this sense, Lane (2021) notes the importance of establishing a consolidated accounting framework to complement the residence-based one. Borio (2013) also points to the importance of creating a database using the consolidated-by-nationality approach to provide a more precise description of the decision-making units.

The alternative used in this study is a consolidated-by-nationality approach to computing foreign assets and liabilities. Under this approach, assets and liabilities held by affiliates operating abroad are consolidated with those of the parent group. This approach considers both local and cross-border positions, sorting them according to the nationality of the ultimate owners of such investments.[1] Accounting for all positions and consolidating positions held by affiliates produces a more nuanced view of countries' international exposure.

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[1] Once the ultimate owner of a given entity is identified, the holdings of that entity are attributed to the country of the ultimate owner. Section 3 presents the methodology in detail.

The recent literature on nationality-based foreign holdings has revealed important stylized facts. Coppola et al. (2021) show that China's net foreign assets position is substantially smaller when viewed from a nationality-based perspective. Their approach focuses on categorizing cross-border portfolio investment on a nationality basis. In contrast, this study focuses on consolidating local and cross-border positions of affiliates to their parent company and sorting international exposure on the basis of the nationality of the parent companies. Bénétrix and Sanchez Pacheco (2023) show that the United States economy is more financially integrated with the rest of the world than would appear using conventional residence-based data. They also provide a review of the literature on the multiple usages of nationality-based data in assessing exposure to financial risks and control. Despite recent progress, no current data set contains information on the entire foreign balance sheet of countries from a consolidated-by-nationality approach.

This study presents estimates of foreign assets and liabilities from a consolidated-by-nationality perspective for a group of 14 developed countries. The estimates are made using multiple data sources, including the United States Bureau of Economic Analysis (BEA), the International Monetary Fund (IMF), the Bank for International Settlements (BIS) and Orbis Europe. Section 3 describes the methodology used in constructing the data set.

The main data contribution of this study is about how to construct estimates of consolidated-by-nationality foreign holdings for non-bank MNEs using these sources. To the best of the author's knowledge, this is the first study to produce consolidated-by-nationality estimates for the non-bank sector. A second data contribution comes from combining these new estimates with existing data from the BIS and IMF to produce yearly estimates for the foreign balance sheet of 14 developed countries for the period between 2012 and 2019. It is the first data set of nationality-based estimates of foreign holdings for any group of countries.

These novel data on foreign holdings are compared with the residence-based data in Lane and Milesi-Ferretti's external wealth of nations database.[2] A key variable in this analysis is the index of international financial integration (IFI), which measures the relative size of a country's foreign balance sheet. IFI is equal to the sum of a country's foreign assets and liabilities divided by its gross domestic product (GDP).

One relevant stylized fact that emerges from the analysis is that in the aggregate these 14 countries present a larger foreign balance sheet from a nationality-based perspective than from a residence-based one. This result indicates that these economies are more financially integrated internationally than previously thought. The difference is associated with the fact that the consolidated-by-nationality approach considers both local and cross-border positions, whereas the residence-based approach considers only the latter.

Most – but not all – countries present a larger consolidated-by-nationality foreign balance sheet than a residence-based one. Countries with a sizeable presence of foreign companies that engage in international financial intermediation tend to have larger residence-based foreign balance sheets. These companies' cross-border holdings inflate their host country's residence-based foreign balance sheet. In contrast, using the consolidated-by-nationality approach, these holdings are instead consolidated to their parent country. Most notably in our data set, Ireland stands out as having a substantially larger balance sheet using the residence-based approach, in line with Sanchez Pacheco (2022). Lane (2019) argues that the presence of these financial intermediaries makes opaque the positions held by Irish nationals in the residence-based data. In this sense, the nationality-based approach provides a clearer view of the international exposure these agents have.

[2]   Available at www.brookings.edu/research/the-external-wealth-of-nations-database (accessed 2 January 2024).

These novel data are used to study two macroeconomic issues. The first is profit shifting from high-tax countries to low-tax countries. Wier and Zucman (2022) estimate that about 37 per cent of profits earned by MNEs are shifted to tax havens. Dischinger and Riedel (2011) have shown that multinational firms tend to shift their intangible assets to affiliates located in low-tax countries. This study uses consolidated-by-nationality estimates of foreign holdings and residence-based data to focus on the relationship of the two approaches with differences in corporate income tax rates. A key variable in this analysis is the difference between the consolidated-by-nationality and residence-based measures of foreign holdings, which is a proxy of the foreign holdings not captured by the residence-based approach.

This study finds that in a sample of low-tax countries the difference between these two measures of foreign holdings is negatively correlated with corporate income tax differentials. In contrast, the coefficient estimate is positive when estimated in a sample of high-tax countries. These results provide indirect evidence that nationals from high-tax countries may shift assets and profits to low-tax countries in ways that are not entirely captured by the residence-based approach. This finding is in line with Bénétrix and Sanchez Pacheco (2023) and points to the relevance of consolidated-by-nationality data to analysis of profit-shifting activities and factors influencing the locational choices made by MNEs for international investments.

The second macroeconomic issue is spillovers of United States monetary policy shocks to MNEs. Bergant et al. (2023) show that a tightening in United States financial conditions is associated with a decline in global cross-border mergers and acquisitions. This study analyses the relationship between United States monetary policy shocks and foreign asset holdings by non-financial MNEs. It shows that tightening policy is correlated with a decrease in foreign asset holdings by non-financial MNEs under the consolidated-by-nationality approach. This result is robust with respect to alternative estimation methods for these policy shocks. This result suggests that a tightening in United States monetary policy generates short-term spillovers that are associated with MNEs reducing their foreign asset holdings.

More broadly, these two sets of results indicate that consolidated-by-nationality estimates of foreign holdings can be useful in tackling important questions in international macroeconomics. As noted by Lane (2021), the consolidated-by-nationality approach should complement the residence-based approach, given that each offers advantages depending on the question at hand.

2. Nationality- and residence-based statistics

In two main data dimensions the consolidated-by-nationality approach differs from the residence-based approach. The first dimension relates to the set of positions that are considered when estimating foreign assets and liabilities. In residence-based statistics, external holdings are recorded when there is an exposure of a resident economic agent relative to a non-resident economic agent. As a consequence, the residence-based approach focuses exclusively on cross-border positions. Local positions that represent exposures between resident agents of different nationalities within the same country are not captured by this approach. In contrast, the consolidated-by-nationality approach takes into consideration both local and cross-border positions.

The second difference relates to how entities within the same corporate group are treated under each approach. In residence-based statistics, an affiliate of a foreign MNE operating in a given host country is seen as a resident of that country. There is no direct linkage between such an entity and the corporate group to which it belongs. Cross-border assets and liabilities held by the affiliate are recorded as external holdings of the host country even if the company is

controlled by foreign agents. Meanwhile, the consolidated-by-nationality approach consolidates the assets and liabilities held by the affiliate to the parent company.

An example can illustrate how these differences affect the measurement of foreign assets and liabilities. Consider an affiliate of a foreign MNE from country A that operates in host country B. Through this affiliate, the MNE wants to buy a factory in country B worth $5 million. That investment is financed entirely by taking a loan from a local bank in country B.

Under the consolidated-by-nationality approach, this factory is an asset that the foreign MNE owns in country B. Therefore, it would be recorded as a foreign asset of country A and a foreign liability of country B. Meanwhile, the loan undertaken by the affiliate to finance this investment represents a liability that the MNE from country A has relative to a bank from country B. This loan would be recorded as a foreign liability of country A and a foreign liability of country B. In this example, both foreign assets and foreign liabilities of countries A and B rise by $5 million because of this investment.

Under the residence-based approach, no exposure would be recorded. The affiliate operating in country B is not seen as a foreign entity. There is no cross-border transaction as the investment made by the foreign MNE is funded locally. Crucially, this international exposure that a foreign MNE from country A takes in country B would not be recorded in residence-based statistics. Similarly, the exposure that the local bank B has relative to a foreign MNE would also not be recorded.

These two data differences are associated with a set of issues raised in the international finance literature. The first one relates to the identification of the ultimate exposure to financial risks. Under the residence-based approach, the foreign affiliate of country A's MNE is treated as a separate entity. Its local exposure is not captured in external residence-based statistics. As a result, relying exclusively on residence-based

data poses a challenge for policymakers in country A in identifying the exposure of its MNEs. In contrast, country A's consolidated-by-nationality foreign balance sheet would capture local and cross-border positions held by this and other affiliates relative to foreign agents. This feature makes it easier for policymakers to evaluate the ultimate exposure that their agents have. In this context, Borio (2013) points to the need for constructing consolidated statistics to assess the exposure that global firms have to different risk factors, countries and sectors.

A second issue relates to the triple coincidence literature, as noted in Avdjiev, McCauley and Shin (2016) and Avdjiev, Everett et al. (2018). In the standard international finance models, the decision-making unit coincides with the GDP area and the currency area. In reality, though, MNEs make decisions in their home countries that affect production in foreign countries where their affiliates operate. These affiliates may be spread across different currency areas. Treating each entity separately according to its residence fails to capture this complex decision-making and production structure. In contrast, the consolidated-by-nationality approach provides a more nuanced view of these global corporate structures.

When considering the ultimate exposure to financial risks, the consolidated-by-nationality approach offers an advantage relative to the residence-based approach. It also provides a more detailed view of the global footprint of MNEs. This is particularly useful given their greater relevance over the past decades. However, this approach also has some relative disadvantages. Unlike for the residence-based approach, there is no unified manual on how national authorities should collect consolidated-by-nationality data. In this sense, Lane (2021) notes that the consolidated-by-nationality approach should complement rather than replace the residence-based framework. Deciding which approach to use depends on the question at hand.

Another important relative disadvantage of the consolidated-by-nationality approach is that there is no data set containing estimates of foreign holdings from a nationality perspective for multiple countries, as in Lane and Milesi-Ferretti (2001, 2007 and 2018). This study seeks to fill this gap by producing the first data set of estimates of consolidated-by-nationality foreign holdings for a group of countries over multiple years. Where Coppola et al. (2021) focus on portfolio investment, this study presents estimates for the entire foreign balance sheet of countries.

3. Data

Consolidated-by-nationality estimates of foreign holdings for a group of 14 countries are constructed using data from the United States BEA,[3] the IMF, the BIS and Orbis Europe.[4] Foreign assets and liabilities are divided into similar functional categories as in BIS (2015) and Sanchez Pacheco (2022). More specifically, foreign assets and liabilities are divided into four categories: holdings related to the activities of national companies operating abroad, holdings related to activities of foreign companies operating in the country, portfolio investment and official assets. Furthermore, holdings are divided according to the MNEs' activities into three sectors: banks, financial non-banks and non-financial companies. The main data contribution of this study is to produce consolidated-by-nationality estimates of foreign holdings for non-bank entities using Orbis Europe and United States BEA data. Data on the banking sector comes from the BIS and data on the rest of the foreign balance sheet from the IMF.

Recent research has focused on using firm-level data to construct aggregate measures. Kalemli-Ozcan et al. (2024) describe how Orbis can be used to construct nationally representative firm-level data. While that approach provides information on a more granular level, it is possible that samples extracted from Orbis are not nationally representative. Countries in Europe require firms to report financial and ownership information to national business registers. This legal requirement potentially reduces the scope for a substantial mismatch between the reported firm-level data and aggregate statistics. Indeed, Kalemli-Ozcan et al. (2024) show that Orbis data covered, on average, 78 per cent of the gross output of the manufacturing sector. In this study, Orbis data are used to construct the consolidated-by-nationality foreign assets and liabilities of non-bank companies in a set of 14 European countries.

The data set covers the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States. For most, data are available from 2012 to 2019; for some, the first observation starts later because of data limitations. Data for Ireland are taken from Sanchez Pacheco (2022), and data for the United States are taken from Bénétrix and Sanchez Pacheco (2023).[5]

Section 4 compares these novel nationality-based data with conventional residence-based data. As noted earlier, residence-based estimates of foreign assets and liabilities come from Lane and Milesi-Ferretti's external wealth of nations data set.[6] It is important to note that the consolidated-by-nationality data presented in this study are estimates from multiple data sources. Currently, no such official data are compiled by statistical offices or international institutions.

3.1 Bank-related holdings

Consolidated-by-nationality estimates of foreign holdings related to the banking sector are constructed using data from the BIS. The methodology follows that

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[3]   Available at https://www.bea.gov/data/economic-accounts/international (accessed 21 March 2022).

[4]   Available at https://orbiseurope.bvdinfo.com (accessed 26 May 2022).

[5]   The data set is publicly available and can be accessed at www.aspacheco.com/research (accessed 15 March 2024).

[6]   Available at www.brookings.edu/research/the-external-wealth-of-nations-database (accessed 22 September 2022).

employed in BIS (2015), Bénétrix and Sanchez Pacheco (2023) and Sanchez Pacheco (2022). Bank-related holdings are associated with the activities of both national banks and foreign banks.

For any country I, foreign assets related to national banks are equal to the claims held by them relative to all counterparts except those with the same nationality. Foreign assets of country i related to foreign banks operating in it are the local liabilities of such banks relative to country i nationals.

Foreign liabilities of country i related to its national banks are estimated as the local liabilities of these banks operating abroad plus their cross-border liabilities, excluding those to related offices. Foreign liabilities related to foreign banks are equal to the total claims of foreign banks on nationals of country i.

3.2 Non-financial MNEs

3.2.1 Foreign MNEs

The holdings associated with foreign MNEs operating in European countries are computed using Orbis Europe. For a given country i, financial, employment and ownership data were downloaded for all entities operating in it that have foreign nationals as their ultimate owners. Similarly, data on company status indicating whether they are active or have been liquidated were used. Companies are sorted according to their four-digit NACE code into two groups: financial non-banks and non-financial MNEs.[7] Companies identified as banks were excluded from the sample, as the assets and liabilities related to that sector are computed using BIS data.

The financial data used in this study are companies' total asset holdings and shareholders' equity. These data may contain reporting gaps. Whenever there is a reporting gap, this study follows the procedure used in Sanchez Pacheco (2022). If a company is active, a reporting gap in

period T would be filled with data from period $T-- z$ where $z > 0$ is the smallest possible. If a company's status is not listed as active, then a reporting gap in period T would be filled with data from $T-- z$ only if there is at least one future period $T + k$, $k > 0$ in which financial information is available. If no financial information is available for subsequent periods, it is assumed that the company became inactive in period T. Therefore, its total assets and shareholders' equity will be set to zero for all $t \geq T$. This decision rule generates inputted data whenever there is a reporting gap in the sample.

Nationality-based foreign liabilities of country i related to foreign non-financial MNEs operating in it are estimated as the sum of these companies' total assets. Meanwhile, nationality-based foreign assets related to these companies are computed as the sum of their total assets minus their shareholders' funds. Given the data limitations, such calculations imply that the estimates of foreign holdings presented in this study represent an upper bound. More specifically, these calculations imply that all asset holdings of foreign MNEs operating in country i have country i nationals as counterparts. They also imply that the financing these companies receive, other than shareholders' funds, comes from country i nationals. As these assumptions may not always hold for all companies, the estimates related to the activities of foreign MNEs represent upper bounds.

3.2.2 National MNEs operating abroad

Consolidated-by-nationality foreign assets and liabilities related to national MNEs operating abroad are computed using data from Orbis Europe and the United States BEA. These data sources contain information on multinational activities in Europe and the United States. It is possible that many MNEs from a given country operate outside of these two areas, so this coverage limitation would pose a challenge

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7   The NACE codes used to identify financial non-banks are all of those included in group K "Financial and Insurance" activities, excluding the codes 6411 and 6419.

when computing assets and liabilities related to these companies. Therefore, the first step taken is to construct a proxy of how well the two data sources cover the activities of MNEs, using the IMF Coordinated Direct Investment Survey.

For country i and year y, the first measure computed is the share of outbound FDI to countries in Europe and the United States relative to the total outbound FDI from country i. Tax haven countries outside of the European Union were excluded from this analysis.[8] Then the average of these shares in the sample countries is computed for the period between 2009 and 2020. A share equal to one would indicate that these two areas receive all the FDI from country i. A share equal to zero would indicate that all FDI from country i is received by countries outside of Europe and the United States. The highest average share value in our sample is for Ireland, at 95 per cent. The lowest share is for the United Kingdom, at 78 per cent. Even at this lower bound, the two areas represent the destinations of the bulk of the direct investment made from the United Kingdom. Although the regional coverage could pose a challenge, it does not appear to do so for the countries included in the data set, given the high average coverage share across countries.

Foreign holdings related to affiliates of country i companies operating in Europe are constructed using Orbis Europe. The first step is to download financial and sectoral data on all companies that have country i as the country of their ultimate owner. Companies located in country i are excluded, as the focus is on companies located elsewhere in the region. Then the same procedure described in the preceding subsection is used to fill any reporting gaps. It is possible that the ultimate owners of

some of these companies are not from country i but rather have redomiciled there for tax-related purposes. In such cases, Orbis Europe will inaccurately indicate that these affiliates have country i as the country of their ultimate owner. To correct this, the Bloomberg Tax Inversion Tracker from Mider (2017) is used to identify companies that have redomiciled. If an ultimate owner is identified as having redomiciled from country j to country i, the countries of its affiliates are changed from j to i in the data set.

Country i's consolidated-by-nationality foreign assets related to its companies operating in Europe are computed as the sum of its total asset holdings. Its foreign liabilities related to these entities are calculated as the sum of the difference between total asset holdings and shareholders' funds.

Consolidated-by-nationality foreign assets related to country i's non-financial MNEs are equal to the sum of country i's foreign assets related to these companies operating in the United States and in Europe. Similarly, country i's foreign liabilities related to its non-financial MNEs are equal to the sum of its foreign liabilities related to these companies operating in these two locations.

3.3 Financial non-bank holdings

3.3.1 Foreign financial non-banks

Consolidated-by-nationality foreign assets and liabilities related to foreign financial nonbanks operating in European countries are computed using Orbis Europe. For country i, the focus is on the group of companies whose NACE code is associated with financial non-banking activities, as described in subsection 3.2.1. The same procedure described there is used to fill any reporting gaps.

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[8] For country i, the share is computed as the sum of outbound FDI position to all countries in the Orbis Europe database plus the United States divided by the total outbound FDI position of that country, excluding FDI in tax havens that are not members of the European Union. The countries included in Orbis Europe are Albania, Andorra, Austria, Belarus, Belgium, Bosnia and Herzegovina, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Greenland, Hungary, Iceland, Italy, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Montenegro, the Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, the Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye, Ukraine and the United Kingdom. The non-European Union tax havens are Bermuda, Cayman Islands and Jersey.

Before computing aggregate holdings, an additional step is taken to address the potential presence of special purpose entities (SPEs) in the sample. These financial non-bank companies often engage in cross-country financing, as documented by Galstyan et al. (2021). Their presence inflates the residence-based foreign balance sheet of host country *i* but they have virtually no economic ties to country *i* nationals or firms. As a result, when estimating the consolidated-by-nationality foreign holdings related to foreign financial non-banks, these companies must be identified and removed. The procedure adopted in this study follows that in Sanchez Pacheco (2022): a financial non-bank is removed from the sample if it has never reported a number of employees or it has last reported having zero employees.

Once potential SPEs are removed, country *i*'s consolidated foreign assets related to foreign financial non-banks operating in it are calculated as the sum of the difference between their total asset holdings and their shareholders' funds. Analogously, country *i*'s foreign liabilities are given by the sum of these companies' total asset holdings.

3.3.2 National financial non-banks operating abroad

Foreign holdings related to country *i*'s financial non-banks operating abroad are constructed using data from Orbis Europe and the United States BEA. The procedure adopted is akin to that used in section 3.2. We separately estimate the foreign holdings that result from the activities of these companies in Europe and those that result from activities in the United States.

For country *i*'s companies operating in Europe, its foreign holdings related to its financial non-banks are computed using the procedure described in subsection 3.2.2. Accordingly, ultimate owners that are identified as having redomiciled to country *i* are excluded from the sample.

Country *i*'s consolidated foreign assets related to its financial non-banks operating in Europe are equal to the sum of country *i*'s total asset holdings. Its foreign liabilities related to these companies are equal to the sum of the difference between their total asset holdings and shareholders' funds.

3.4 Portfolio investment

Data from the IMF Coordinated Portfolio Investment Survey are used when estimating foreign assets and liabilities. Notwithstanding the important contribution by Coppola et al. (2021), relatively little is known about the nationality of the ultimate owners of global portfolio investments. As a result, residence-based estimates of portfolio holdings are used when constructing the consolidated-by-nationality balance sheet of countries. For a given country, its foreign portfolio assets are equal to the total investment assets from the IMF survey, and its foreign liabilities are equal to the total investment liabilities from the survey.

3.5 Official assets

Official assets are equal to the official reserve assets from the IMF International Reserves and Foreign Currency Liquidity database.[9] For the United States, official assets are equal to the United States reserve assets in its international investment position as released by the United States BEA.[10]

4. Stylized facts

This section describes key stylized facts that emerge from the novel data on consolidated-by-nationality foreign holdings. It compares the novel data with the residence-based data. Subsection 4.1 focuses on the aggregate dynamics of IFI under both approaches. Subsection 4.2 focuses on the country-specific dynamics and differences relative to the residence-based data for each country in the sample.

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[9] Available at https://data.imf.org/?sk=2DFB3380-3603-4D2C-90BE-A04D8BBCE237 (accessed 21 July 2022).

[10] Available at https://www.bea.gov/data/intl-trade-investment/international-investment-position (accessed 5 March 2022).

4.1 Aggregate dynamics

To assess broad dynamics, aggregate indices of IFI are constructed using both the consolidated-by-nationality approach and the residence-based approach. For any given year, the aggregate index is calculated as the sum of foreign assets and liabilities of selected countries divided by the sum of their GDP. The countries included in computing the aggregate index are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States. Denmark is removed from the sample because its nationality-based data starts in 2016. This index is computed for the period between 2013 and 2019 using both approaches.

Figure 1 shows the evolution of this aggregate IFI under the nationality-based and residence-based approaches for the period between 2013 and 2019.

It reveals that the aggregate IFI under the consolidated-by-nationality approach is larger than under the residence-based approach for all years in this period. This stylized fact indicates that these developed economies are more financially integrated with foreign agents than resident-based measures suggest. This results because the consolidated-by-nationality approach takes into account both cross-border and local positions, whereas the residence-based approach focuses exclusively on the former. As such, an important part of the international exposure of countries is not captured by the residence-based approach.

Figure 2 shows the difference between the nationality-based and the residence-based aggregate IFI over time. It reveals that not only is nationality-based IFI larger than residence-based IFI but also that the difference between the two increased between 2013 and 2019.

Figure 1

Aggregate international financial integration, 2013–2019
(Percentage of GDP)
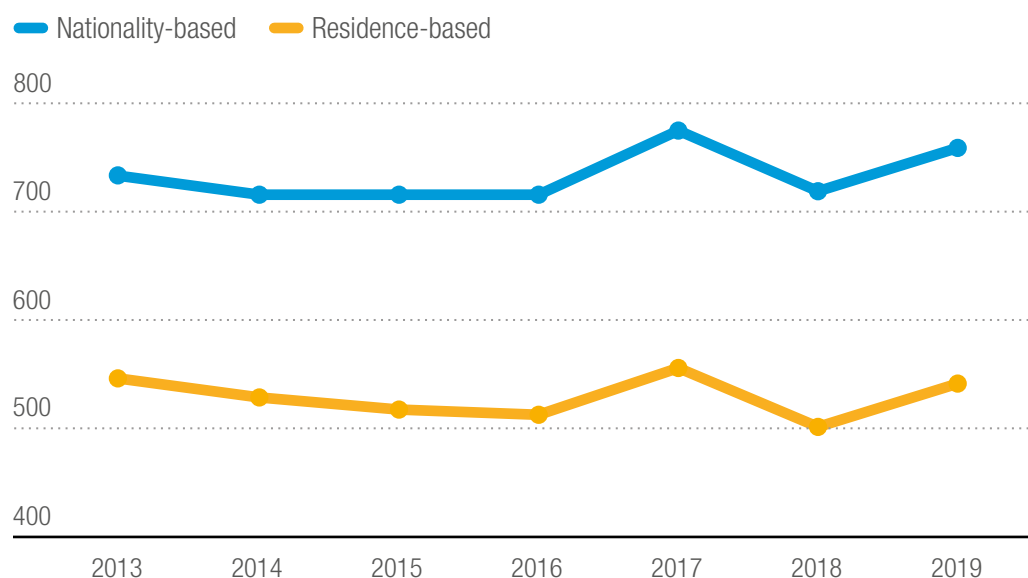
Source: Author's calculation based on Lane and Milesi-Ferretti's external wealth of nations database.
Note: This figure shows the aggregate international financial integration under the consolidated-by-nationality and residence-based approach. For a given year, the aggregate index is calculated as the sum of foreign assets and liabilities of selected countries divided by their GDP. The countries included are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Kingdom of the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.
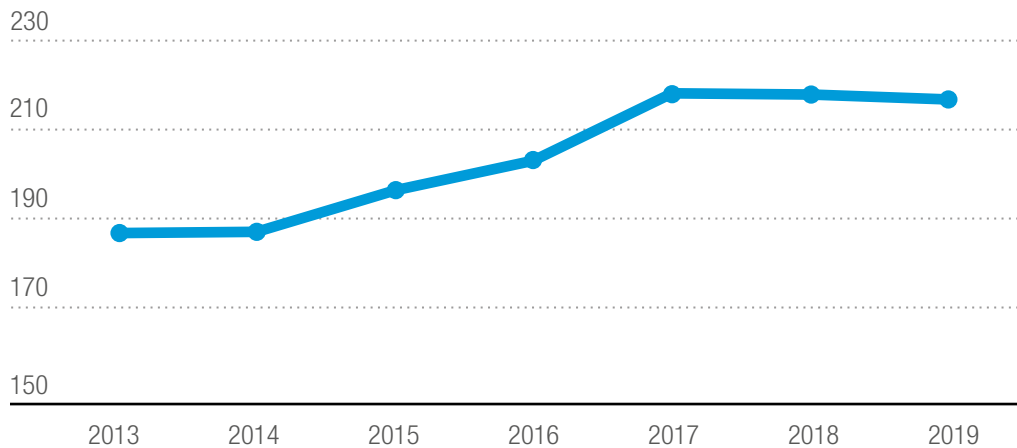
➤ **Figure 2**

Difference between the aggregate nationality- and residence-based IFI, 2013–2019

(Percentage of GDP)

Source: Author's calculation, based on Lane and Milesi-Ferretti's external wealth of nations database.
Note: This figure shows the difference between the aggregate IFI under the consolidated-by-nationality approach relative to the residence-based approach. The countries included to construct the aggregated are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Kingdom of the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.

There is an important increase in the difference between 2014 and 2017, and then it remained largely unchanged until 2019.

Taken together, the stylized facts shown in figures 1 and 2 are consistent with the complex ownership structure of MNEs detailed in UNCTAD (2016). These figures illustrate how looking through such ownership structures when sorting foreign assets and liabilities produces different results in terms of IFI and its trend relative to residence-based data. As noted in UNCTAD (2016), accounting for such differences between the residence and the nationality of ultimate owners is an important element for policymakers when evaluating the application of rules on foreign ownership of investments.

4.2 Country-level analysis

Figure 3 shows IFI under both the nationality-based and residence-based approaches by country for 2019. It reveals that most countries have greater consolidated-by-nationality

IFI than the IFI that appears on the residence-based balance sheet. This result is expected, as the consolidated-by-nationality approach considers both cross-border and local positions, whereas the residence-based approach considers only cross-border positions.

The two exceptions are Greece and Ireland. In addition, in 2019, in the Netherlands and Switzerland, the nationality-based foreign balance sheets were approximately the same size as the residence-based balance sheets. In general, a country will have a relatively smaller consolidated-by-nationality foreign balance sheet if it is host to a proportionally relevant number of foreign-owned entities whose activities involve holding cross-border assets and liabilities. These holdings inflate the size of the host country's residence-based foreign balance sheet. Yet, under the nationality-based approach they are identified as being foreign-owned and therefore do not appear in the host country's consolidated-by-nationality foreign balance sheet.

> **Figure 3**

Consolidated-by-nationality and residence-based IFI, 2019

(Percentage of GDP)
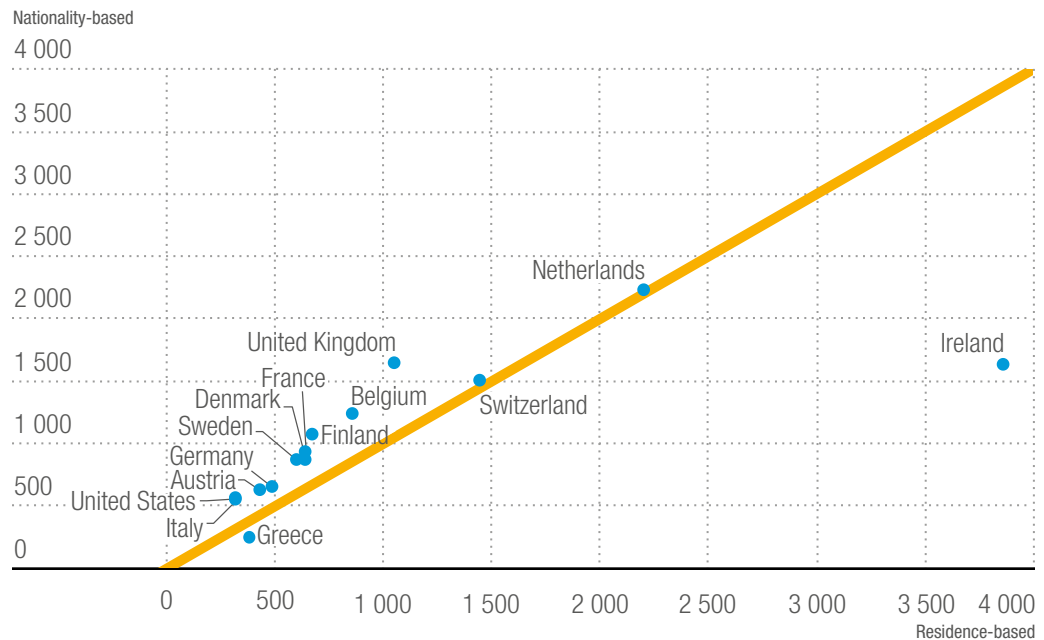
Source: Author's calculation, based on Lane and Milesi-Ferretti's external wealth of nations database.

Note: This figure shows the consolidated-by-nationality and residence-based IFI for all countries in the data set for 2019. Data are computed as the sum of foreign assets and liabilities divided by GDP. Countries above the line presented a larger consolidated-by-nationality foreign balance sheet in 2019 than residence-based foreign balance sheet.

Ireland stands out as having a substantially smaller nationality-based foreign balance sheet relative to its residence-based one. Galstyan (2019) and Sanchez Pacheco (2022) discuss how the extensive presence of SPEs in Ireland inflates its residence-based balance sheet. These companies have virtually no economic ties to Irish agents and are often involved in international financial intermediation. Their relatively large cross-border holdings enter Ireland's residence-based foreign balance sheet and make opaque the positions held by Irish nationals, as noted by Lane (2018). In contrast, these holdings do not enter Ireland's consolidated-by-nationality foreign holdings.

Figure 4 shows the evolution of the consolidated-by-nationality and residence-based IFI for all countries over the sample period. The two measures are positively correlated across countries,

but the difference between them is not constant over time. Bénétrix and Sanchez Pacheco (2023) show that the time-varying difference between consolidated-by-nationality and residence-based IFI for the United States is positively correlated with tax differentials between the United States and the rest of the world. In sections 5 and 6, these data on multiple countries are used in a panel setting to study the macroeconomic issues of profit shifting and of spillovers of United States monetary policy shocks.
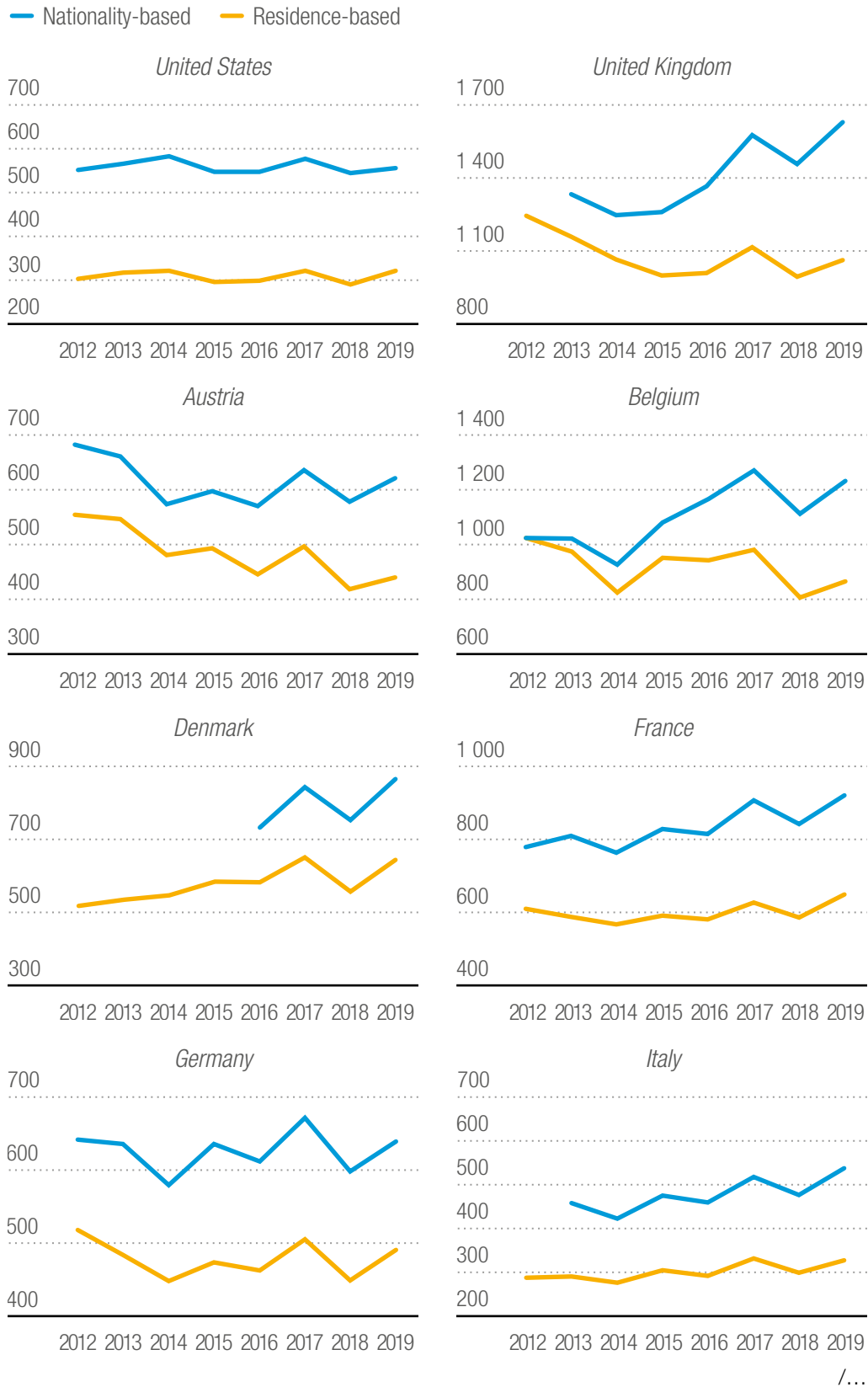
Figure 5 shows the evolution of consolidated-by-nationality foreign assets and liabilities by country over time. In general, consolidated-by-nationality foreign assets and liabilities move in tandem; however, the difference between foreign assets and liabilities in Belgium, Greece and Italy moved in important ways during the sample period.

Figure 4
Nationality-based and residence-based IFI, 2012–2019
(Percentage of GDP)

— Nationality-based   — Residence-based

/...

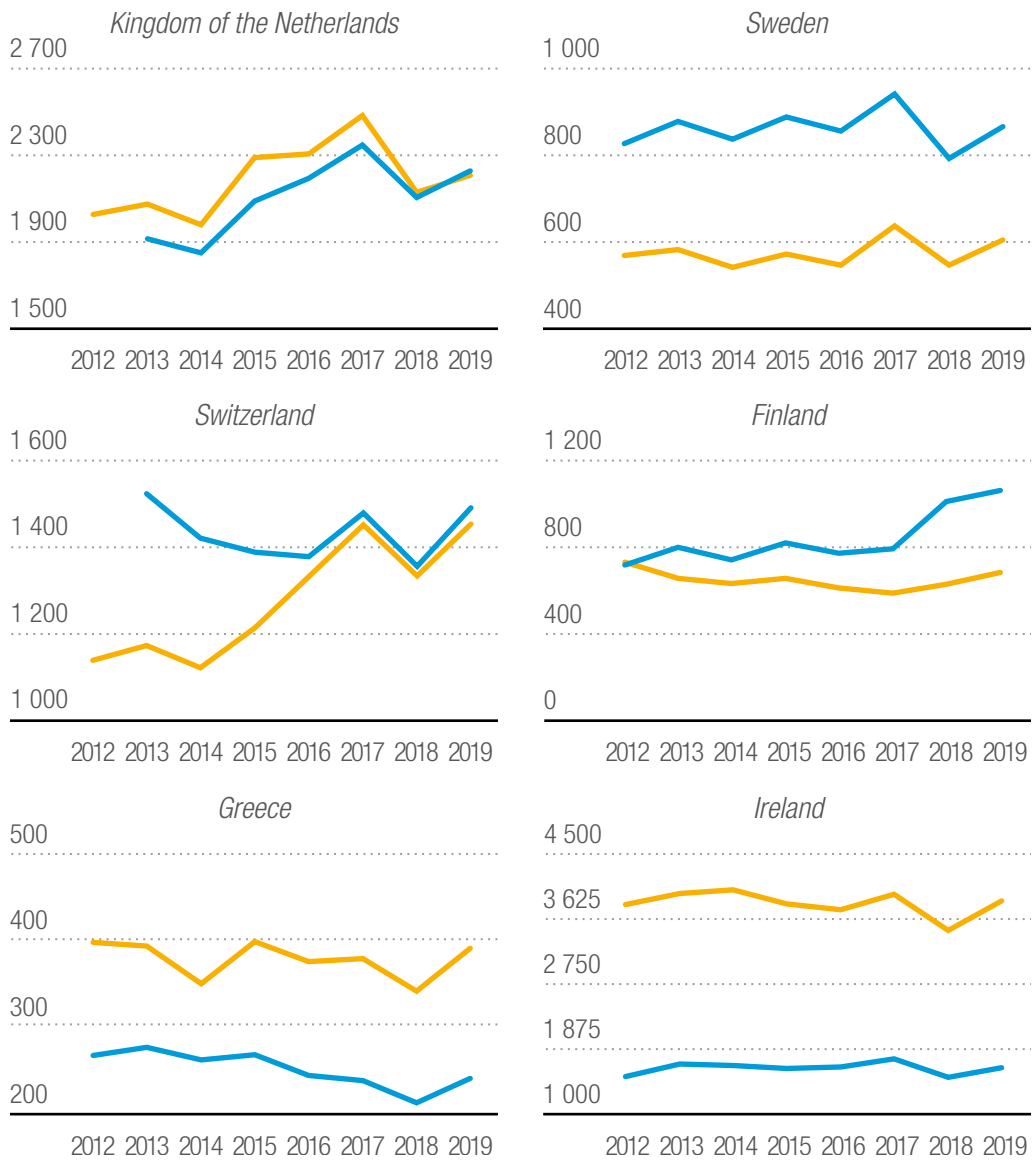**Figure 4**

Nationality-based and residence-based IFI, 2012–2019

(Percentage of GDP) (Concluded)

— Nationality-based — Residence-based

Kingdom of the Netherlands

Sweden

Switzerland

Finland

Greece

Ireland

Source: Author's calculation, based on Lane and Milesi-Ferretti's external wealth of nations database.

Note: This figure shows IFI under both the consolidated-by-nationality and the residence-based approach. It is computed as the sum of a country's foreign assets and liabilities divided by GDP.
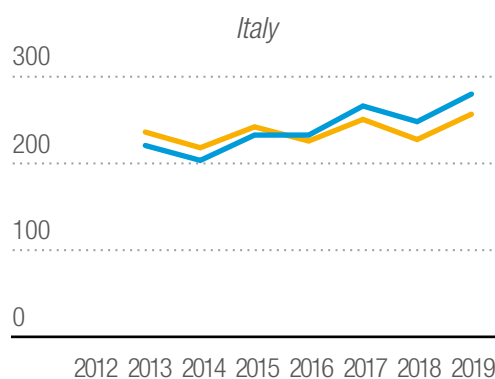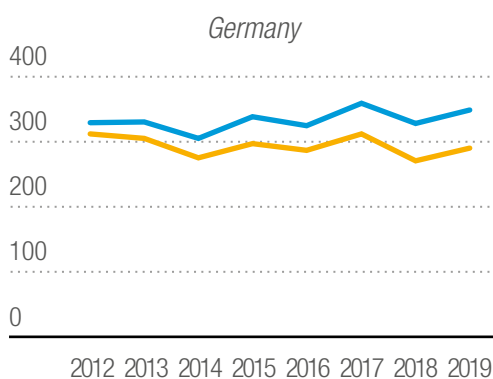
Figure 5

Consolidated-by-nationality foreign assets and liabilities

(Percentage of GDP)

━━ Nationality-based ━━ Residence-based

/...
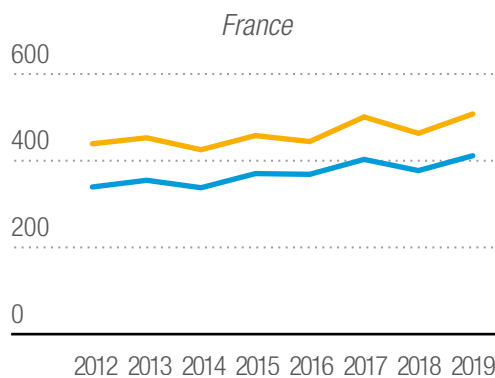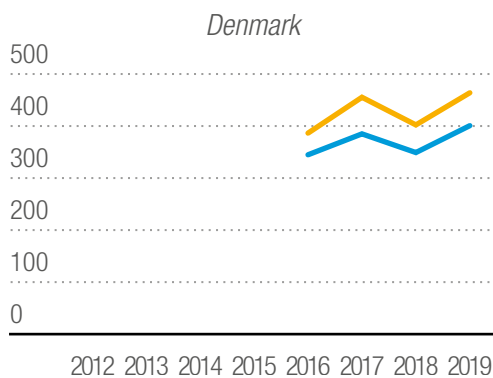
➤ ## Figure 5

Consolidated-by-nationality foreign assets and liabilities
(Percentage of GDP) (Concluded)

— Nationality-based — Residence-based

Source: Author's calculation.

5. Tax differentials and foreign holdings
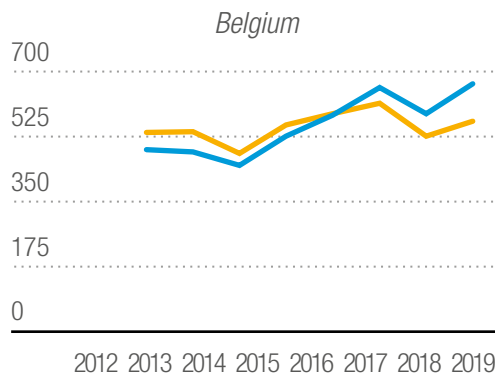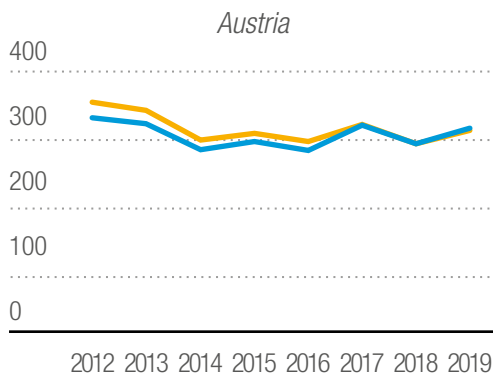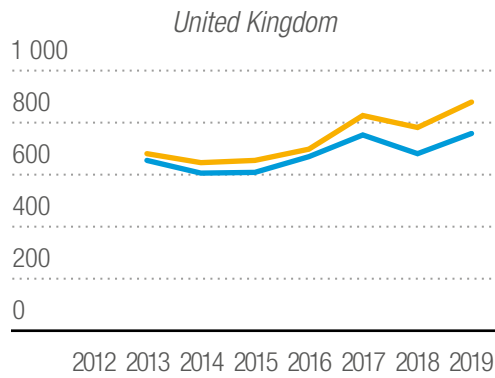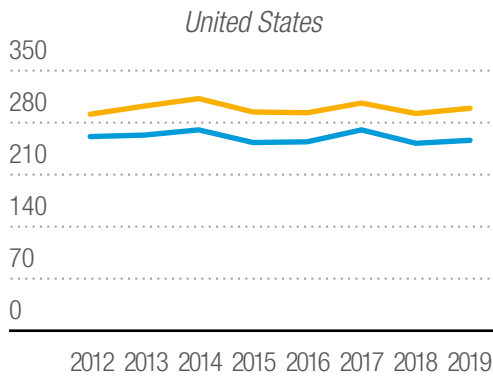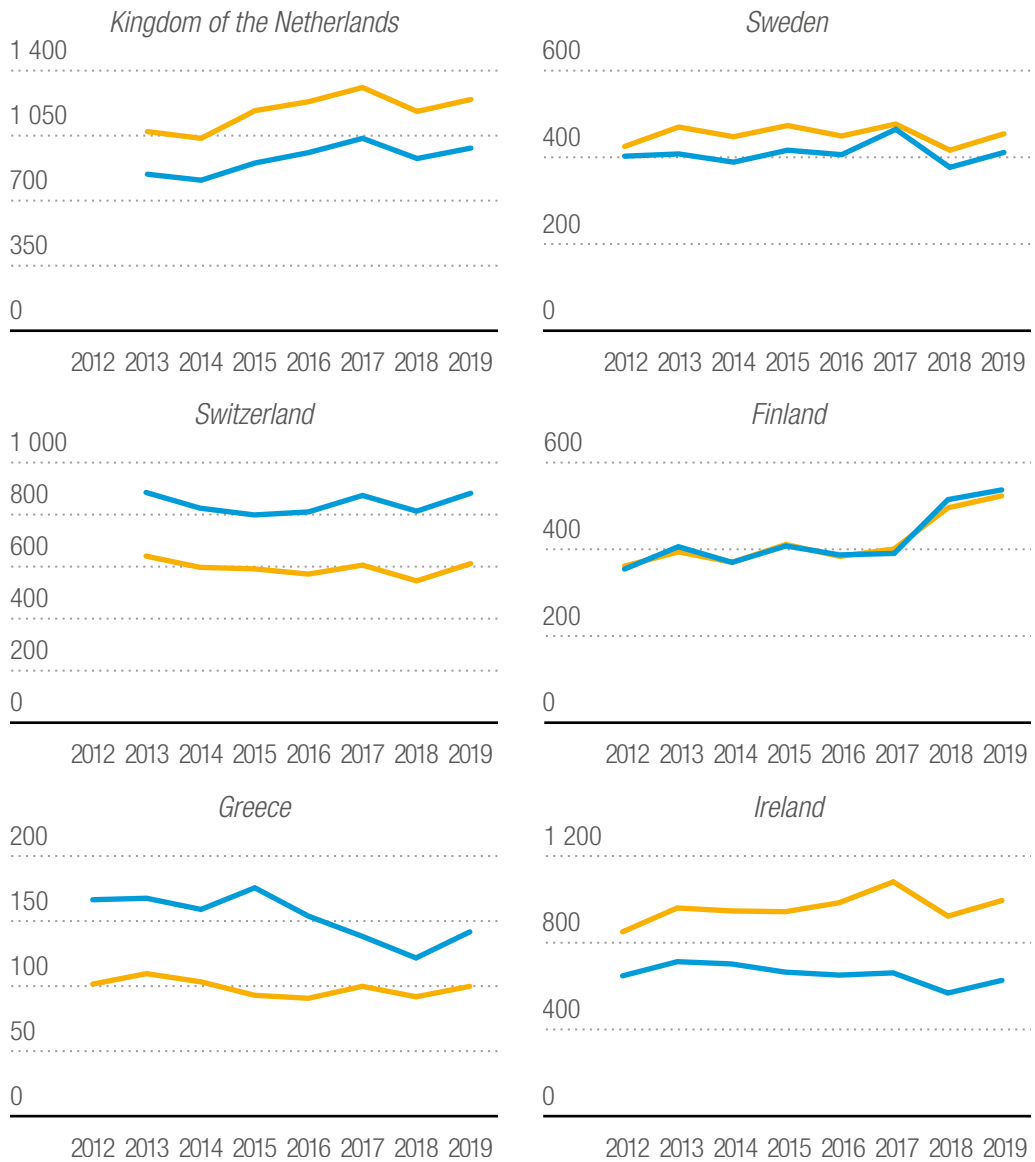
MNEs have an incentive to shift assets and profits to affiliates located in low-tax countries. Dischinger and Riedel (2011) document that the lower an affiliate's corporate tax rate is relative to other subsidiaries within the same group, the higher the level of intangible assets held by the affiliate. Wier and Zucman (2022) estimate that 37 per cent of profits earned by such companies were booked in tax havens in 2019. That compares to only 2 per cent in the 1970s, according to their estimates.

Using data for the United States, Bénétrix and Sanchez Pacheco (2023) provide indirect evidence that asset-and-profit-shifting activities by United States MNEs may extend beyond what residence-based statistics can capture as local positions are also considered in the consolidated approach.

This section examines whether consolidated-by-nationality foreign assets are associated with corporate income tax differentials, using a panel of 14 developed countries. The analysis examines the relationship between foreign holdings and corporate income tax differentials. This analysis is done using both residence-based data and the novel consolidated-by-nationality data. Then the focus turns to the difference between the two measures of foreign holdings to assess whether these time-varying differences are also associated with tax differentials. This difference is a proxy for the foreign exposure of countries that is not captured by the residence-based approach. The regressions also include control variables that have been documented, such as GDP per capita and trade openness, as in Lane and Milesi-Ferretti (2001).

Data on GDP per capita come from the World Bank. Trade openness data also come from the World Bank, measured as a country's trade in goods and services divided by GDP. The difference in the corporate income tax rate for country i is computed as its statutory corporate income tax rate minus the median statutory tax rate from the set of countries included in the tax database of the Organisation for Economic Co-operation and Development (OECD).[11]

These empirical relationships are examined through panel regressions, as shown in equation 1. The dependent variables $Y_{i,t}$ used are foreign assets, liabilities and IFI under both the consolidated-by-nationality and the residence-based approach. Furthermore, this regression is estimated using the difference between the two measures as dependent variables as well. The panel data set includes observations on 14 developed countries over the period between 2012 and 2019.

$$Y_{i,t} = \alpha_i + \beta_1 * GDPpc_{i,t} + \beta_2 * Open_{i,t} + \beta_3 * TaxDiff_{i,t} + \epsilon_{i,t} \qquad (1)$$

The coefficient α_i captures country i's fixed effect. $GDPpc_{i,t}$ is the GDP per capita of country i at time t, $Open_{i,t}$ is country i's trade in goods and services as a percentage of GDP at time t. $TaxDiff_{i,t}$ is the difference between country i's statutory corporate income tax rate at time t minus the median corporate tax rate from the OECD tax database for the same year.

Table 1 shows the regression results using data for all countries in the sample. The coefficient estimate associated with income per capita is positive and statistically significant at the 5 percent level for nationality-based foreign assets, liabilities and IFI. This result is in line with Lane and Milesi-Ferretti (2001), which shows a positive correlation between income per capita and foreign assets in a cross-section analysis using residence-based data.

Importantly, this table shows that the difference between the nationality- and residence-based measures is also positively

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[11] The median corporate income tax rate is strongly correlated to the average corporate income tax rate in the OECD database (0.96 correlation coefficient).

> **Table 1**
> **Regression results using full sample of countries**

	Assets			Liabilities			International financial integration		
	Nationality	Residence	Difference	Nationality	Residence	Difference	Nationality	Residence	Difference
GDP (percentage)	2.52** (1.19)	-0.95 (1.05)	3.94*** (1.07)	2.59** (1.12)	-1.34 (0.98)	4.10*** (1.00)	5.11** (2.19)	-2.29 (2.01)	8.04*** (1.94)
Open	-1.31 (1.03)	0.06 (0.94)	-1.50 (0.93)	0.50 (0.97)	0.45 (0.88)	0.06 (0.87)	-0.82 (1.90)	0.51 (1.81)	-1.44 (1.69)
Tax diff	0.09 (2.05)	1.27 (1.89)	-0.75 (1.85)	0.09 (1.94)	0.83 (1.77)	-0.32 (1.73)	0.18 (3.78)	2.10 (3.62)	-1.06 (3.35)
R²	0.19	0.23	0.31	0.44	0.30	0.12	0.00	0.00	0.03
Observations	105	112	105	105	112	105	105	112	105

Source: Author's estimations.

Note: This table shows regression results of foreign assets, liabilities and international financial integration under two approaches: consolidated by nationality and residence based. Dependent variables are expressed as a percentage of GDP. Independent variables are GDP per capita, trade as a percentage of GDP and the difference between the statutory corporate income tax rate and the median for a large set of countries. All regressions include country fixed effects. Statistics in brackets are estimated standard errors. The number of observations varies because of missing data for some country-year pairs in the consolidated foreign wealth of nations data set. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

correlated with income per capita. The coefficient estimates in the regressions that use the difference between the two approaches are positive and statistically significant for foreign assets, liabilities and IFI. This result indicates that the time-varying difference between foreign holdings using these two alternative approaches is related to macroeconomic factors rather than orthogonal to them.

The coefficient estimates associated with corporate income tax differentials are not statistically significant across specifications. At first glance, this result seems to be at odds with Bénétrix and Sanchez Pacheco (2023), who show a positive correlation between the difference in United States nationality- and residence-based IFI and United States corporate income tax differentials.

One possibility for this result is that the sample used in table 1 includes both high- and low-tax countries. Consider a high-tax country A and a low-tax country B. Nationals of country A want to benefit from lower taxes in country B; thus, they shift holdings

to that country. If country A nationals shift assets and profits to low-tax country B, there would be a positive relationship between country A's tax rate and its foreign holdings. Yet, there would be a negative relationship between country B's tax rate and its foreign holdings. Therefore, including high-tax country A and low-tax country B in the same sample could result in coefficient estimates that are not statistically significant.

To overcome this challenge, the countries are divided into two groups: a relatively high-tax group and a relatively low-tax group. A country *i* will be in the relatively high-tax group if its statutory corporate income tax rate is greater than the median tax rate from the OECD database for most years in the sample. Conversely, it will be in the relatively low-tax group if its statutory corporate income tax rate is less than the median tax rate for most years in the sample.

This criterion puts Austria, Belgium, Denmark, France, Greece, Italy, the Netherlands, Sweden and the United States into the relatively high-tax group. Finland, Germany, Ireland, Switzerland

and the United Kingdom are in the relatively low-tax group. Regression 1 is then estimated by focusing on the difference between nationality- and residence-based measures of foreign holdings for the country subsamples.

If MNEs shift profits in response to differences in taxation, the coefficient β_3 should be positive for high-tax countries and negative for low-tax countries. Consider an economy with a high-tax country A and low-tax country B with respective corporate income tax differentials $TaxDiff_A$ and $TaxDiff_B$. As country A has a relative higher tax rate, $TaxDiff_A > 0$ and $TaxDiff_B < 0$.

Consider then a tax cut in country B. The reduction increases $TaxDiff_A$ for country A while $TaxDiff_B$ for country B becomes more negative. If this tax cut encourages companies in country A to shift profits and holdings to country B, the increase in $TaxDiff_A$ should be multiplied by a positive coefficient β_3 to increase

the dependent variable that measures foreign holdings for country A (Y_A). In a sample of relatively high-tax countries, a positive β_3 would be consistent with profit shifting away from these countries.

The tax cut in country B makes $TaxDiff_B < 0$ more negative. Crucially, the decision by companies in country A to shift holdings to country B following the tax cut implies an increase in foreign holdings in both countries A (Y_A) and B (Y_B). This can be achieved only if $\beta_3 < 0$ when estimated in a sample of low-tax countries. Therefore, profit shifting would be consistent with $\beta_3 > 0$ when estimated in a sample of high-tax countries and $\beta_3 < 0$ when estimated in a sample of low-tax countries.

Table 2 shows the regression results for the difference between the nationality- and residence-based foreign assets, liabilities and IFI estimated using these subsamples. The coefficient estimates associated with $TaxDiff$ are negative and statistically

Table 2

Regression results of the difference between nationality- and residence-based measures

	Difference in assets			Difference in liabilities			Difference in international financial integration		
	Full sample	High-tax	Low-tax	Full sample	High-tax	Low-tax	Full sample	High-tax	Low-tax
GDP (percentage)	3.94*** (1.07)	5.93*** (1.31)	5.00** (1.82)	4.10*** (1.00)	4.14*** (0.84)	6.89*** (1.78)	8.04*** (1.94)	10.07*** (1.93)	11.89*** (3.43)
Open	-1.50 (0.93)	-0.75 (1.23)	-1.82 (1.41)	0.06 (0.87)	-0.42 (0.78)	-0.37 (1.38)	-1.44 (1.69)	-1.18 (1.80)	-2.18 (2.66)
Tax diff	-0.75 (1.85)	1.06 (1.45)	-24.04*** (9.60)	-0.32 (1.73)	1.77* (0.92)	-35.13*** (9.36)	-1.06 (3.35)	2.83 (2.13)	-59.17*** (18.10)
R²	0.31	0.10	0.06	0.12	0.50	0.19	0.03	0.41	0.04
Observations	105	66	39	105	66	39	105	66	39

Source: Author's estimations.

Note: This table shows regression results of the difference in foreign assets, liabilities and international financial integration between the consolidated-by-nationality approach and the residence-based approach. Statistics in brackets are estimated standard errors. Regressions are estimated using (i) the full sample of countries, (ii) a sample of relatively high-tax countries and (iii) a sample of relatively low-tax countries. Relatively high-tax countries are Austria, Belgium, Denmark, France, Greece, Italy, the Kingdom of the Netherlands, Sweden and the United States. Relatively low-tax countries are Finland, Germany, Ireland, Switzerland and the United Kingdom. The independent variables are GDP per capita, trade as a percentage of GDP and the difference between a country's statutory corporate income tax rate and the median for a large sample of countries. All regressions include country fixed effects. * p < 0.10, ** p < 0.05, *** p < 0.01.

significant in the regressions focused on relatively low-tax countries. Meanwhile, the coefficient estimates are positive – albeit not statistically significant – in the regressions focused on relatively high-tax countries.

Taken together, these results are consistent with the notion that nationals of relatively high-tax countries shift holdings to relatively low-tax countries in a way that is not completely captured by conventional residence-based data. A policy implication of this finding is that there could be more asset- and profit-shifting activities than policymakers would observe if they focused only on residence-based data. Similarly, tax differentials may generate an even more significant incentive for agents to shift assets than analysis relying on residence-based data would suggest.

6. United States monetary policy spillovers and non-financial MNEs

The dominant role that the United States dollar plays in international finance indicates that monetary policy in the country can generate spillover effects for economic agents in other countries. Miranda-Agrippino and Rey (2020) demonstrate how monetary policy shocks in the United States generate co-movements in international financial variables. They also show that a tightening in United States monetary policy generates a decline in global capital flows to both banks and non-banks.

Focusing on the banking sector, Avdjiev, Koch et al. (2018) show that an easing in United States monetary policy boosts cross-border bank lending. Similar results were found by Bruno and Shin (2015) in an analysis of spillovers to cross-border capital flows in the banking sector. In this sense, an easing in United States monetary policy would be associated with an increase in foreign asset holdings by global banks.

Recent research has also focused on United States monetary policy spillovers to non-bank MNEs. Arbatli-Saxegaard et al.

(2022) examine channels through which United States monetary policy shocks affect companies' investments in foreign countries. They find that such shocks have a larger effect on firms that have a higher share of debt denominated in foreign currency and on firms that are more leveraged. Bergant et al. (2023) document spillover effects from United States financial conditions on cross-border merger and acquisition activities.

This section investigates whether United States monetary policy shocks are associated with changes in consolidated-by-nationality foreign assets by non-financial MNEs. The novel data on such assets for the sample group of developed countries are used in a panel regression setting.

The analysis proceeds by estimating the following panel regression of the change in foreign assets held by these companies to a series of United States monetary policy shocks identified by Bu et al. (2021), as well as some control variables. These variables include the real exchange rate, the home country's monetary policy rate and an index of United States financial conditions. In the robustness checks, different series of United States monetary policy shocks based on alternative estimation methodologies are used.

$$\Delta FA^{MNES}_{i,t} = \alpha_i + \beta * USMP_t + \gamma * USFCI_t + \delta \Delta REER_{i,t} + \theta * HomeMP_{i,t} + \epsilon_{i,t} \quad (2)$$

The dependent variable $\Delta FA^{MNES}_{i,t}$ is computed as the first difference in consolidated-by-nationality foreign asset holdings by country i's non-financial MNEs as a percentage of GDP between year t and $t-1$. $USMP_t$ captures changes in United States monetary policy. In the baseline specification, it is equal to the sum of the unified United States monetary policy shocks estimated by Bu et al. (2021) in year t. An alternative specification is presented in which $USMP_t$ is equal to the average United States effective federal funds rate for any given year t. $USFCI_t$ is the average United States National Financial Conditions Index, computed by the Federal

Reserve Bank of Chicago.[12] $\Delta REER_{i,t}$ is the percentage change in the real exchange rate of country i between years t and $t - 1$. $HomeMP_{i,t}$ represents the average monetary policy rate in country i at year t, and α_i captures country fixed effects.[13]

Table 3 shows the regression results for the baseline specification shown in column 3 as well as alternative specifications. The coefficient estimates associated with $USMP_t$, defined as the unified monetary policy shocks, are negative and statistically

> **Table 3**

Regression results of the first difference in foreign assets related to national non-financial MNEs
(Percentage of GDP)

	1	2	3	4	5	6	7
U.S. monetary policy shock	-0.579**	-0.510**	-0.923***				
Standard error	(0.070)	(0.251)	(0.256)				
U.S. FCI			-0.420***	-0.162	-0.249**	-0.231**	
Standard error			(0.111)	(0.107)	(0.108)	(0.107)	
U.S. federal funds						-0.128*	-0.142**
Standard error						(0.070)	(0.071)
Real exchange rate		-0.011*	-0.015*		-0.018***	-0.015**	-0.012**
Standard error		(0.006)	(0.006)		(0.006)	(0.006)	(0.006)
Home monetary policy		0.052	0.019		-0.080	0.066	0.134
Standard error		(0.122)	(0.113)		(0.118)	(0.141)	(0.141)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.07	0.10	0.23	0.03	0.10	0.15	0.09
Observations	91	91	91	91	91	91	91

Source: Author's estimations.

Note: This table shows regression results of first difference in foreign assets related to national non-financial MNEs as a percentage of GDP. The independent variables are (i) the unified measure of United States monetary policy shocks by Bu et al. (2021); (ii) the United States National Financial Conditions Index from the Federal Reserve Bank of Chicago (available at https://www.chicagofed.org/research/data/nfci/current-data, accessed 14 February 2023); (iii) the United States Effective Federal Funds Rate (available at https://fred.stlouisfed.org/series/FEDFUNDS, accessed 14 February 2023); (iv) the real exchange rate for the home country from the International Monetary Fund (available at https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b, accessed 15 February 2023); and (v) the monetary policy rate from the home country. For Euro Area countries, the monetary policy rate is the European Central Bank's deposit rate (available at https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html, accessed 15 February 2023). For Switzerland, the rate is the Swiss overnight average rate (available at https://www.snb.ch/en/the-snb/mandates-goals/statistics/statistics-pub/current_interest_exchange_rates#t00, accessed 16 February 2023). For Sweden, it is the Swedish effective repo rate (available at https://www.riksbank.se/en-gb/statistics/interest-rates-and-exchange-rates/policy-rate-deposit-and-lending-rate, accessed 15 February 2023) For the United Kingdom, the monetary policy rate is the Bank of England's official bank rate (available at https://www.bankofengland.co.uk/boeapps/database/Bank-Rate.asp, accessed 15 February 2023). For Denmark, the policy rate is the Danish repo rate (available at https://www.nationalbanken.dk/en/what-we-do/stable-prices-monetary-policy-and-the-danish-economy/official-interest-rates, accessed 15 February 2023). All regressions include country fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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[12] Available at www.chicagofed.org/research/data/nfci/current-data (accessed 14 February 2023).

[13] For Euro Area countries, the policy rate is the European Central Bank's deposit rate. For Denmark, it is the Danish repo rate. For Sweden, it is the Swedish effective repo rate. For Switzerland, it is the Swiss overnight average rate. For the United Kingdom, the policy rate is the Bank of England's official bank rate.

significant at the 5 per cent level across specifications. Similarly, the coefficient estimates associated with the United States effective federal funds rate is also negative. These results suggest that a tightening shock in United States monetary policy is associated with a decrease in foreign asset holdings by non-financial MNEs. This finding stands even when United States financial conditions are incorporated in the regression analysis.

Furthermore, these regression results suggest that the home country's monetary policy is not correlated with changes in foreign asset holdings by non-financial MNEs. They also indicate that there is a negative correlation between changes in the real exchange rate of the home country and the change in foreign assets.

Taken together, these results can be interpreted as indicating that United States monetary policy appears to be a relevant factor in the decision-making of non-financial MNEs. Tighter or easier United States monetary policy is associated with a decrease or increase in the consolidated-by-nationality foreign assets of these companies.

This finding complements the well-documented spillovers of United States monetary policy on global financial firms. Using firm-level data, this study provides evidence that United States monetary policy shocks also produce spillovers for non-financial MNEs.

The empirical strategy adopted in this subsection does not allow for the disentanglement of the underlying channels through which a tightening policy shock is associated with a reduction of foreign holdings by non-financial MNEs. Such a tightening is often associated with rising costs of funding. It is possible that non-financial MNEs react to such tightening by reducing investment and/or shedding assets abroad.

It is also possible that a part of this reduction in foreign assets is driven by valuation effects. A tightening in United States monetary policy is associated with lower asset prices, which could potentially explain the decline in foreign assets. Further research is needed to better understand the channels through which United States monetary policy shocks affect investment decisions by non-financial MNEs.

It is possible that the negative and statistically significant coefficients associated with United States monetary policy shocks may be related to the estimation method adopted to compute these shocks. Therefore, a robustness check is done using different measures of United States monetary policy shocks when estimating equation 2. One such measure is the United States monetary policy news shocks from Nakamura and Steinsson (2018). The other measures are the target and path policy shocks from Gurkaynak et al. (2005). These updated series are taken from Acosta (2023). For each year, the monetary policy shocks used in the regression are equal to the sum of the respective shocks that took place during that year.

Table 4 shows the regression results for equation 2 using these different measures of policy shocks. The results show that these alternative measures of United States monetary policy shocks are also negatively correlated with changes in foreign asset holdings by non-financial MNEs. They indicate that the association between these shocks and changes in foreign assets is not related to the specific identification strategy used by Bu et al. (2021). Rather, such negative correlation also emerges once different estimation methodologies are adopted.

In sum, this analysis finds evidence that a tightening shock in United States monetary policy is associated with a decrease in foreign asset holdings by non-financial MNEs. Such negative correlation is robust with respect to different identification strategies used to determine United States monetary policy shocks.

> **Table 4**
>
> **Regression results of the first difference in foreign assets related to MNEs using alternative measures of policy shocks**

	1	2	3
BRW - Unified policy shock	-0.923***		
Standard error	(0.256)		
NS - Policy News shock		-1.277**	
Standard error		(0.561)	
GSS - Target shock			-0.910*
Standard error			(0.458)
GSS - Path shock			-0.579**
Standard error			(0.265)
U.S. Financial Conditions Index	-0.420***	-0.427***	-0.458***
Standard error	(0.111)	(0.131)	(0.139)
Real exchange rate	-0.011*	-0.015**	-0.016**
Standard error	(0.006)	(0.006)	(0.006)
Home monetary policy	0.019	-0.001	0.033
Standard error	(0.113)	(0.120)	(0.130)
Country fixed effects	Yes	Yes	Yes
R²	0.23	0.16	0.17
Observations	91	91	91

Source: Author's estimations.

Note: This table shows regression results of first difference in foreign assets related to national non-financial MNEs as a percentage of GDP. Three measures of United States monetary policy shocks are used. The baseline specification uses the unified monetary policy shocks from Bu et al. (2021). Another specification uses the policy news shock from Nakamura and Steinsson (2018). The third specification uses the target and path United States monetary policy shocks from Gürkaynak et al. (2005). The independent variables are (i) a measure of United States monetary policy shock, (ii) the United States National Financial Conditions Index from the Federal Reserve Bank of Chicago, (iii) the United States Effective Federal Funds Rate, (iv) the real exchange rate for the home country from the International Monetary Fund and (v) the monetary policy rate from the home country. For Euro Area countries, the monetary policy rate is the European Central Bank's deposit rate. For Switzerland, the rate is the Swiss overnight average rate. For Sweden, it is the Swedish effective repo rate. For the United Kingdom, the monetary policy rate is the Bank of England's official bank rate. For Denmark, the policy rate is the Danish repo rate. The statistics in brackets are the estimated standard errors. All regressions include country fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

7. Conclusions and policy implications

Consolidated-by-nationality data on foreign holdings can be particularly helpful for policymakers to identify the ultimate exposure that its national economic agents have to several risk factors. This approach also provides a more detailed view of the decision-making units, as affiliates operating abroad are consolidated with their ultimate parent. This study presents novel estimates of consolidated-by-nationality foreign holdings for non-bank entities. These novel data are combined with existing data sources to produce the first data set containing nationality-based estimates of foreign holdings for a group of developed economies over time. This data set should complement the residence-based data from the seminal external wealth of nations project by Lane and Milesi-Ferretti (2001, 2007 and 2018).

These novel data reveal that these developed economies are on aggregate more financially integrated internationally

than is shown in the residence-based data. This difference comes from the fact that all positions are taken into account when constructing consolidated-by-nationality data. In contrast, in residence-based statistics only cross-border positions are considered. The country-level data reveal that most – but not all – countries present a larger foreign balance sheet in the consolidated-by-nationality perspective than in the residence-based approach. Countries with a significant presence of SPEs – most notably Ireland – can have a smaller consolidated-by-nationality balance sheet. This result arises because the cross-border holdings related to these foreign entities do not enter the host country's nationality-based balance sheet but do appear in the residence-based one. These stylized facts underscore the importance of taking into account and looking through the complex ownership structures of MNEs when sorting foreign assets and liabilities, as noted in UNCTAD (2016). The data set is used in this study to analyse two international macroeconomic issues: profit shifting and spillovers from United States monetary policy shocks on non-financial MNEs.

For a sample of low-tax countries, the empirical analysis shows a negative correlation between corporate income tax differentials and the difference between their consolidated-by-nationality foreign assets minus their residence-based foreign assets. Meanwhile, a positive coefficient estimate emerges in the same panel regression on a sample of high-tax countries. These two results are consistent with the notion that agents in high-tax countries have an incentive to shift assets and profits to low-tax countries. A policy implication that emerges from such findings is that profit-shifting activities might extend beyond what is captured by residence-based statistics, consistent with the findings of Bénétrix and Sanchez Pacheco (2023) based on United States data.

The second application of these novel data is on the analysis of spillovers of United States monetary policy shocks on foreign asset holdings by non-financial MNEs.

The study finds a negative correlation between tightening shocks and changes in consolidated-by-nationality foreign assets of these companies. A policy implication is that United States monetary policy shocks might generate spillovers that are associated with international investment decisions by non-financial MNEs. This study provides an alternative way for policymakers to analyse the international exposure of countries based on a consolidated-by-nationality approach. Relative to the residence-based data, the main advantages of this approach are that (i) it considers both local and cross-border positions, and (ii) it attributes assets and liabilities to their ultimate counterparts. In doing so, it looks through the corporate structure of MNEs and provides a more nuanced view of international exposures. Therefore, the approach and data presented in this study can help guide policymakers in better assessing the exposure of a particular economy relative to different countries and/or sectors. The study offers two examples of policy-relevant usage of these new data. The first one focuses on the interaction between differences in corporate taxation and profit- or asset-shifting activity. The second one focuses on the international spillovers of United States monetary policy shocks through MNEs.

This study has some important limitations. First, the lack of available and representative data on nationality-based portfolio holdings poses a key challenge in determining the overall size of the consolidated-by-nationality foreign balance sheets. Second, the novel data set is used in the empirical analysis to study the correlation between nationality-based measures of foreign holdings and relevant policy variables such as tax differentials and monetary policy shocks. However, these data are not detailed enough to allow for a study of causal relationships between these variables. Therefore, collecting more granular nationality-based data of foreign holdings remains a relevant challenge for future research and for statistical offices.

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