Redrawing the Map of Global Capital Flows: The Role of Cross-Border Financing and Tax Havens

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Abstract

Global firms finance themselves through foreign subsidiaries, often shell companies in tax havens, which obscures their nationality in aggregate statistics. We associate the universe of traded securities with their issuer's ultimate parent and restate bilateral investment positions to better reflect the true financial linkages connecting countries around the world. We find that portfolio investment from developed countries to firms in large emerging markets is dramatically larger than previously thought. The national accounts of the United States, for example, understate the U.S. position in Chinese firms by nearly 600 billion dollars, while China's official net creditor position to the rest of the world is overstated by about 50 percent. We additionally show how taking account of offshore issuance is important for our understanding of the currency composition of external portfolio liabilities, the nature of foreign direct investment, and the growth of financial globalization.

Keywords: International Debt Issuance, FDI, China, Variable Interest Entities.

JEL Codes: E01, E44, F21, F23, F32, F34, G11, G15, G32.

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Global firms often access capital markets by issuing securities through cross-border affiliates. For example, due to the incentive to minimize taxes and withholding, to avoid capital controls and other regulations, and to access different investors, the corporate sector globally raises nearly 8 percent of its equity and 10 percent of its bond financing via foreign subsidiaries located in tax havens. Standard national and international statistics associate such offshore securities with the location of the issuing affiliates, rather than the country of their ultimate parents, so they offer a highly distorted view of global portfolios.

In this paper, we combine a new algorithm that matches foreign subsidiaries to their parents with a security-level dataset on global fund holdings and restate bilateral investment positions to reflect the true financial linkages across countries. We find that the scale of portfolio investment from developed countries to emerging market companies is vastly understated when foreign issuance is not taken into account. Further, we demonstrate how the pervasive use of corporate subsidiaries to raise money overseas is important for assessing the scale of global imbalances, the currency composition of emerging markets' external liabilities, the nature of foreign direct investment (FDI), and the growth of financial globalization.

We start in Section 1 by developing an algorithm that combines information from seven main commercial sources to associate subsidiaries with their ultimate parent firm and with their ultimate parent firm's country. Each source uses its own methodology to form these matches and to assign firms to particular countries, and we establish majority and priority rules to resolve disagreements across sources. Further, our procedure compares and combines the different sources in a way that leaves the integrated data more useful for our purposes than the sum of its parts.[1] Our final dataset covers the universe of traded securities – bonds and equities – globally. Our algorithm is transparent, replicable, adaptable, and is available online for download and use at globalcapitalallocation.com.

Next, we introduce this subsidiary-parent mapping into the dataset of global mutual fund and exchange traded fund (ETF) holdings provided by Morningstar and assembled in Maggiori et al. (2019a, henceforth MNS). For each position in the data, we establish the residency (the country of incorporation) of the security's immediate issuer and, using our mapping, can also link the security to its ultimate parent issuer. For example, in the Morningstar data, we observe billions of dollars of U.S. holdings of securities issued by Petrobras International

[1]For example, consider the corporate ownership chain for China National Petroleum Corporation (CNPC), which has two subsidiaries in Bermuda with names that are variants of "Kunlun Energy Company." One of our data sources links the two subsidiaries to each other but not to the parent, while another of our sources only links one of the two subsidiaries to CNPC. Only when combining both sources, therefore, can we link all three entities and associate all the relevant Bermudian securities with China.

Finance Company (PIFCO), a Cayman Islands-based subsidiary of Brazil's largest energy company. Most international financial statistics are reported on a "residency" basis, associating securities with the location of their immediate issuer, so they record these positions as U.S. investments in the financial sector of the Cayman Islands. Merging our mapping with the Morningstar holdings data, we can instead classify these positions as U.S. investments in Brazil's energy sector, a treatment consistent with a "nationality" basis, which registers the country of the issuer's ultimate parent.

We record the country of the immediate issuer and ultimate parent for all positions in the Morningstar data and, for each asset class, build a set of "reallocation matrices" that characterize how to convert a dataset of bilateral investment positions from a residency to a nationality basis. For example, one entry in our reallocation matrix for U.S. corporate bond positions specifies that 20 percent of all U.S. holdings in the Cayman Islands on a residency basis should be considered U.S. holdings in Brazil on a nationality basis. The value of U.S. holdings of PIFCO bonds – the example discussed above – contributes to our calculation of this 20 percent.

We apply these reallocation matrices to two widely-used, publicly available, and residency-based datasets – the U.S. Treasury's International Capital (TIC) data and the IMF's Coordinated Portfolio Investment Survey (CPIS) data – to transform them into nationality-based bilateral positions.[2] For example, we multiply the value in TIC of overall U.S. holdings of Cayman Islands corporate bonds by 20 percent to calculate the value of those bonds that should under nationality be considered to be Brazilian. TIC and CPIS cover the universe of security positions held by each country's investors, a superset of those in the Morningstar data. Therefore, our key assumption is that our reallocation matrices, which are constructed entirely from investments made by funds in the Morningstar data, are representative of the overall set of securities investments, including those not made by funds or made by funds excluded from the Morningstar data.[3] We apply this procedure and report nationality-based bilateral investment positions for nine developed economies with high quality fund holding data: the United States, the European Monetary Union (EMU), the United Kingdom (U.K.), Canada, Switzerland, Australia, Sweden, Denmark, and Norway. The resulting nationality-

[2]TIC covers all foreign portfolio investments in securities made by U.S. residents and is used by the Bureau of Economic Analysis to calculate the U.S. external accounts. The CPIS dataset covers the foreign bilateral portfolio investments of a large number of other countries.

[3]This assumption is supported by the alignment of country portfolio shares in these datasets and in the Morningstar data when expressed under residency. Furthermore, in many countries, the mutual fund and ETF sector is the largest cross-border investor in securities.

based statistics paint a vastly different picture of global capital allocation than the original residency-based data.

In Section 2, we organize our discussion of this redrawn map around three broad patterns. First, we highlight that the nationality-based positions involve significantly larger portfolio investments from developed markets to large emerging markets, with the difference primarily reflecting issuance in tax havens. For example, whereas the national statistics for 2017 list the United States as holding $160 billion in Chinese equities, we find the position to be worth about $700 billion. These positions are largely associated with Variable Interest Entities (VIEs), structures designed to avoid China's capital controls that restrict foreign ownership in key industries.[4] We report that U.S. investments in Brazilian corporate bonds equal $50 billion, much larger than the $8 billion position listed in TIC. EMU holdings of Russian debt triples from $36 billion in CPIS to $107 billion in our restated tables. Similar patterns are found for U.K. investment in emerging market securities. The value of developed country positions in Bermuda, the Cayman Islands, Ireland, Luxembourg, the Netherlands, and Panama plunge. Our work provides a sizable upward revision in investments by developed countries in large emerging economies such as Brazil, China, India, Russia, and South Africa (the "BRICS" countries).

Second, in our restated data, foreign-currency corporate bonds account for a greater share of portfolio investment from large developed countries to large emerging markets. For some emerging markets, nearly all of the corporate sector's bond financing from developed market investors is intermediated through subsidiaries in tax havens. Emerging market sovereigns, by contrast, issue externally under their own name. As a result, the standard residency-based datasets overstate the importance of sovereign bonds relative to corporate bonds. For example, according to TIC, U.S. investors hold three times more Brazilian government bonds than Brazilian corporate bonds. Our nationality-based statistics imply the corporate bond positions are in fact worth more than twice the positions in government bonds. TIC implies that corporate bonds account for none of the overall U.S. position in Russian bonds, whereas our nationality-based statistics imply they account for half of it. The greater weight of corporate bonds on a nationality basis, together with the fact that foreign-held corporate bonds are overwhelmingly denominated in foreign currency (Du and Schreger, 2015), leads to a marked increase in the foreign currency share of external portfolio liabilities of emerging

[4]The Chinese internet giants Alibaba, Baidu, JD.com, and Tencent, for example, are all VIEs that raise capital through shell companies located in the Cayman Islands, the British Virgin Islands, or Hong Kong.

economies. For example, switching from residency to nationality reduces the local currency share of external portfolio debt from 70 to 34 percent for Brazil and from 71 to 41 percent for Russia.[5]

Third, the nationality-based data show that a portion of foreign investment positions in the residency-based data should, under nationality, not be considered foreign investment at all. For the United States, we find that 7 percent of all foreign common equity holdings and 11 percent of all foreign bond holdings in official statistics are actually domestic investments. These investments largely reflect the issuance in the Cayman Islands of collateralized loan obligations (CLOs) backed by U.S. assets as well as tax inversions into Ireland by U.S. firms. For the United Kingdom, the percentages are 1 and 3 for equity and debt, respectively. Analyses of financial globalization that use residency-based data, and policies aiming to influence the extent of cross-border investment, should account for these cases of spurious foreign investment.

Much of the analysis in our paper focuses on bilateral portfolio investment and does not draw conclusions for multilateral positions. The one exception is Section 3 in which we highlight how offshore issuance distorts measurement of China's net foreign asset (NFA) position. We show that due to Chinese companies' reliance on equity issuances via foreign affiliates, China's reported NFA is roughly twice as large as its true value. When foreign investors take small equity positions in a country's companies, these positions constitute a portfolio liability in the country's external statistics such as its NFA and its balance of payments (BoP). By contrast, if those foreign investors buy shares in offshore affiliates that themselves have a majority stake in a country's companies, then the affiliates' positions constitute an FDI liability in the country's NFA and BoP. Whereas the value of portfolio liabilities in these external accounts typically moves together with market prices, BoP accounting rules grant countries more options in how they estimate the value of FDI liabilities. Additionally, the complex series of corporate linkages embodied in the VIE structure used for China's offshore issuances further distances the entity listed on public markets from onshore operations in China. As a result, China's NFA does not reflect significant changes in the market value of its listed companies. For example, we show that when China's offshore listed companies increased in market value by nearly $1 trillion during 2016-2018, China's FDI liabilities barely moved. Our analysis suggests that, due to this issue, China's true NFA position is $1.1

[5]On measuring foreign currency exposures, see also Eichengreen and Hausmann (1999), Eichengreen and Hausmann (2005), Lane and Shambaugh (2010), and Bénétrix et al. (2015). This literature is largely based on statistics under the residency principle.

trillion smaller than the $2.1 trillion officially reported.[6]

This large reduction in China's net creditor position – one of the world's largest – is of first order importance for both policymakers and academics. A large literature has emphasized how capital flows between the United States and China only go in one direction, namely official Chinese purchases of U.S. Treasury bonds. Our work highlights the comparable scale and under-appreciated importance of flows in the other direction, namely private U.S. holdings of Chinese corporate securities. Our estimates strengthen the view of the United States as a world banker, first articulated by Despres et al. (1966).

Academic researchers cannot on their own simply adjust TIC or CPIS data from a residency to a nationality basis without our reallocation matrices because the security-level information underlying such datasets is rarely accessible to outside researchers. This is the case, for example, for TIC. Further, many datasets in international macroeconomics are not even collected at the security (or even issuer) level, but are instead based on aggregate reporting by financial institutions. This is the case, for example, for data on many countries in CPIS, which are based on surveys run by the IMF. Our algorithm allows users to entertain different assumptions when adjusting residency-based datasets. For example, researchers or policymakers might be focused on tax havens per se, and therefore would only wish to reallocate positions away from countries like the British Virgin Islands or Guernsey. Others might focus on the issue of corporate control and would therefore also wish to treat issuances from Toyota Motors North America as Japanese securities (since the parent company, Toyota, is Japanese). Our procedure allows the flexibility to consider both exercises, and we present results from both treatments below.[7]

Related Literature. Our paper contributes to a growing literature on the economic impact of tax havens, including Hines and Rice (1994), Desai et al. (2004), Gravelle (2009), Zucman (2013), Guvenen et al. (2018), and Tørsløv et al. (2018). Much of the literature has focused on the use of tax havens by wealthy households to shield assets from taxation and by developed market firms to minimize corporate tax exposures. Our results shed light

[6]This pattern of portfolio investment being masked as FDI due to offshore issuance likely holds around the world, not just in China, a possibility suggested in Blanchard and Acalin (2016). The potential misclassification of portfolio and FDI positions carries important policy implications as countries often differentially regulate these types of investments based on the presumption that they exhibit different dynamic behavior.

[7]The set of activities that one wishes to reallocate depends, of course, on the question at hand and on corporations' rationales for issuing offshore. Appendix Section A details the primary motivations for offshore issuance and offers examples for each corresponding case. See also Fuertes and Serena (2016), who investigate how firms choose in which international market to borrow.

on a different role of tax havens as conduits for emerging market firms to access developed market capital.

The shortcoming of residency-based statistics has long been recognized and initiatives have been recently introduced at the Bank for International Statistics (BIS), the U.S. Federal Reserve, and the IMF to restate various investment flows on a nationality basis. Lane and Milesi-Ferretti (2018) and Avdjiev et al. (2016), for example, highlight the growing importance of tax havens in intermediating global capital flows, which renders standard datasets increasingly inadequate. The BIS has spearheaded the production of statistics for international debt securities outstanding by country under both residency and nationality. Bertaut et al. (2019) offer a rich comparison of U.S. TIC data under residency and nationality and explore implications for home bias and the sustainability of the U.S. current account deficit. Damgaard et al. (2019) estimate FDI flows in the Coordinated Direct Investment Dataset (CDIS) after accounting for positions in tax havens. Our contribution is to offer a global analysis of portfolio investment for multiple countries and under different scenarios. Our approach stresses replicability for other researchers and open availability of code and data.[8] We aim to contribute a novel set of tools and analysis for others in the field to build on.

The implications of our restated bilateral investment positions touch a wide range of literatures and have clear relevance for any analyses using TIC or CPIS data. For example, a voluminous literature uses gravity models to study these data including Portes and Rey (2005), Coeurdacier and Martin (2009), and Okawa and Van Wincoop (2012). Forbes (2010) studies the determinants of global investment into U.S. securities. Most recently, Koijen and Yogo (2019) use CPIS data to estimate a demand system for financial assets.

Finally, our result that offshore issuance leads to a massive overstatement of China's NFA is important for work on global imbalances, such as Bernanke (2005), Gourinchas and Rey (2007), Caballero et al. (2008), Gourinchas et al. (2011), Maggiori (2017), and Farhi and Maggiori (2018). While much of the focus in the literature has been on the impact on U.S. interest rates of large Chinese holdings of U.S. Treasuries, we focus on the distribution of China's external corporate borrowing. This complements recent efforts to better document the global distribution of China's official foreign lending by Horn et al. (2019).

[8] All data sources we use are available for other researchers to purchase commercially from the data providers. Our code is available online and runs even if provided with only a subset of the commercial datasets we draw from. Additionally, we post aggregate statistics produced by our algorithm, subject to restrictions from data providers.

1 Building the Reallocation Matrices

To resolve the impact of offshore issuance on bilateral investment positions, we develop investor-specific "reallocation matrices" that list the share of investment in any given country on a residency basis that should instead be considered investment in any other country on a nationality basis. In this section, we discuss how we combine publicly and commercially available micro data to generate these matrices, and we list examples of the specific corporate reallocations that underlie them. We consider this parent-matching algorithm a valuable contribution of interest for many applications, but in the interest of brevity we only provide here a brief overview. We provide full details in Appendix Section B.

1.1 Corporate Ownership Chains

The units of observation in our analysis are security-issuing entities, such as governments and firms, and the securities that they issue. We uniquely identify issuers using CUSIP codes, which are issued and managed by CUSIP Global Services (CGS). CGS assigns a 9-digit identifier (the "CUSIP9") to the vast majority of securities issued globally, including equities and sovereign and corporate bonds, where the first 6-digits (the "CUSIP6") identify the issuer. We work with the full 26 million securities present in CGS's master file.

We combine information from seven commercially available data sources: (i) the CGS Associated Issuer (AI) database, (ii) the Refinitiv SDC Platinum New Issues database (SDC), (iii) the S&P Capital IQ platform (CIQ), (iv) the Dealogic Debt Capital Markets (DCM) feed, (v) Bureau van Dijk's Orbis database, (vi) the Factset Data Management Solutions database, and (vii) Morningstar data on the holdings of open-end mutual funds and ETFs. The sources cover overlapping but differentiated sets of issuers and contain information linking them to their ultimate parents or parents' geographies. CGS provides information on the residency, or the place of incorporation of the immediate issuer, of every CUSIP-bearing security globally, which we use to calculate statistics on a residency basis.

We start by constructing mappings of issuers to their ultimate parents or operational headquarters, i.e. links of one CUSIP6 to another, for each of our data sources. For those sources listing ownership stakes, we consider an entity to be a parent if it owns more than 50 percent of the equity of the subsidiary. Next, we merge these mappings across data sources to develop integrated ownership chains, adopting various priority and majority rules to resolve any conflicts across sources. Throughout, we avoid reassigning ownership away

from countries that are not tax havens and toward those countries that are tax havens, in order to avoid assigning ownership to shell holding companies. After all, little or no economic activity takes place in tax havens compared to the value of most security issuances.[9]

Table A.1 lists the countries that our analysis treats as tax havens. As detailed in Appendix Section B, our list is based on the European Council's grey and black lists of non-cooperative tax jurisdictions, as of May 2018 (European Council, 2019), and the main modifications we implement are that we remove Switzerland and add Luxembourg, the Netherlands, and Ireland to the list. There is no universal agreement on which countries are tax havens, and importantly the definition changes depending on the specific activity of interest. Our focus on securities issuance leads us to include Luxembourg, the Netherlands, and Ireland because issuance in these countries is dominated by local subsidiaries of multinational corporations that are set up for that sole purpose. This pattern is very similar to that occurring in other tax havens such as Bermuda or the Cayman Islands. Under the same rationale, we exclude Switzerland from the list of tax havens because issuance there is dominated by domestic firms.

Though most of the tax havens listed in Table A.1 are small countries that account for tiny shares of world GDP, issuance in tax-haven-resident affiliates accounts for a large and growing share of the overall financing of corporations around the world. The blue line in Figure 1a shows that, by 2017, bonds issued by affiliates resident in tax havens account for 10 percent of the total value of corporate bonds outstanding worldwide. The red dashed line demonstrates a similar scale for equities, with roughly 8 percent of all global equity outstanding resident in tax havens. Both lines exhibit mild upward trends over the past decade. Figure 1b expresses the value of tax-haven-based corporate stocks and bonds relative to total cross-border securities outstanding, where we now exclude domestic issuances such as when the U.S. automaker General Motors issues a bond resident in the United States. The levels of the lines are, by construction, higher, but the trends are also steeper, showing that tax havens account for a growing share of cross-border corporate financing.

[9]For example, suppose company A, headquartered in Italy, owns 51 percent of an issuing subsidiary B in Bermuda, and is in turn owned by a company C incorporated in the Cayman Islands. We would associate B and C with Italy on a nationality basis, not with the Cayman Islands or Bermuda.

1.2 Firm-level Reallocations

Our algorithm described above generates a database that maps each CUSIP6 into the CUSIP6 of its ultimate parent or operational headquarters.[10] Table 1 lists the issuer-parent mappings that constitute the largest reallocations away from key tax havens when we change from a residency to a nationality basis.[11] For example, the top row of Panel A shows that Vale SA, a Brazilian mining and logistics company, has a subsidiary called Vale Overseas Ltd. with a CUSIP6 of 91911T that is resident in the Cayman Islands. Using data from Factset and Bloomberg, we calculate that this latter entity issues $12.3 billion of bonds which, using our algorithm, we instead associate with the Brazilian ultimate parent company. We emphasize that Vale might have multiple issuing affiliates in the Cayman Islands corresponding to multiple CUSIP6 values, so this is a lower bound on the value of reallocated bond positions from the Cayman Islands to Brazil that our algorithm identifies with Vale's offshore issuance. In the second row, we see a $10.3 billion reallocation of bonds issued by one of the affiliates of Alibaba, the Chinese online retail giant.

Panel B of Table 1 focuses on equities. The largest reallocations from the Cayman Islands are all Chinese companies, including reallocations for Tencent and Alibaba valued at $493 billion and $442 billion, respectively. As mentioned in the introduction, these companies all issue offshore as part of the VIE structure designed to skirt China's restriction on foreign ownership in strategic industries. The largest reallocations from Ireland, at the bottom of Panel B, are predominantly U.S. firms such as Accenture or Medtronic that performed tax inversions to avoid paying U.S. corporate taxes on their worldwide profits. We explore VIEs and tax inversions, and their aggregated impact on global capital flows, in Sections 2 and 3.

Overall, we see an interesting mix of parent companies from Brazil, China, Japan, Russia, Switzerland, and the United Arab Emirates, among others, in these large-scale reallocations. Our procedure successfully reallocates to the United States bonds issued by Weatherford International, an oil and gas services company with legal registration in Bermuda but with oper-

[10] For some questions, one might wish to associate firms with the country in which they earn the most revenues or produce the most output or, relatedly, map a given firm to multiple countries. Appendix Section F discusses our (ongoing) analysis that reallocates firms based on the geographic distribution of their sales. In the main text, we focus on nationality as we view it as a clear improvement over existing residency-based datasets, which also map each firm to a single country, often a tax haven.

[11] We obtain notional amounts outstanding for debt securities from the Factset Debt Capital Structure (DCS) database. For certain bonds not covered by DCS, we used auxiliary data obtained separately from Factset or obtained the data from Bloomberg. We calculate the market value of all shares of equity outstanding using the Factset Fundamentals database for equities. We perform several robustness checks to make sure that we cover the universe of outstanding securities for each firm.

ational headquarters in Texas, and by Bermudian affiliates of Aircastle Ltd., a Connecticut-headquartered owner of commercial jets. IHS Markit is incorporated in Bermuda and is publicly listed in the United States on the Nasdaq, but our procedure successfully reflects the fact that the firm's operations are based in London. We link to Switzerland the debt financing raised by UBS and Credit Suisse through special purpose vehicles (SPVs) set up in Jersey and Guernsey, jointly referred to as the Channel Islands, allegedly to avoid Swiss withholding tax on interest payments (Reuters, 2016). We also associate with Switzerland the equity of Glencore, a multinational commodity trading and mining company that is headquartered in Baar, Switzerland, even though it is registered in Jersey. Similarly, we associate Shire plc, which is registered in Jersey, with Japan because it was acquired by Takeda, a Japanese pharmaceuticals company.[12] The largest reallocation of corporate bonds from the Netherlands comes from Petrobras Global Finance BV, a debt-issuing vehicle for the Brazilian parent that performs no industrial activity. Similarly, we associate the debt issuance of Luxembourg-based funding vehicle GAZ Capital International Funding Company with Russia, the country of its parent firm Gazprom.

Our algorithm reassigns the vast majority of securities away from small tax havens since almost none of the economic activity behind these capital allocations takes place in those countries.[13] We can also apply our algorithm to offshore affiliates located in non-tax haven countries, such as to restate the securities of Toyota Motor North America, which are U.S. securities under residency, as Japanese securities, which is the classification under nationality. Whether one wishes to include non-tax haven reallocations in the analysis depends of course on the question at hand. One benefit of our procedure is that it is flexible enough to accommodate either choice. In fact, our results below are presented both for a case in which we only reallocate tax-haven issuances and for a broader case in which we reallocate all issuances.[14]

[12]This highlights one limitation of our methodology: it discards any chronological information associated with the parent-subsidiary corporate links, effectively only retaining the latest information available from each data source. In this case, Shire plc was only acquired by Takeda Pharmaceutical in 2019, but our methodology imposes this link for earlier years. The influence of this limitation is muted by the fact that many corporate ownership changes and mergers result in the assignment of new CUSIPs, which obviates the issue.

[13]We reallocate more than 90 percent of corporate bonds and equities issued by firms resident in each of Bermuda, Curacao, the Cayman Islands, the Channel Islands, Luxembourg, Macau, Panama, and the British Virgin Islands. Hong Kong, Ireland, and the Netherlands have lower reallocation rates – ranging from 34 percent to 73 percent – since, as discussed, these countries are destinations for offshore issuance but also have significant domestic issuance by companies actually operating there.

[14]See also Appendix Section F, which develops a sales-based reallocation. Firms such as Toyota Motor North America or T-Mobile generate most of their revenues in the U.S. but are foreign owned. They are

1.3 Calculating Reallocation Matrices

Thus far we have demonstrated how we can restate the value of securities outstanding from a residency to a nationality basis. If all investor countries held the same portfolio of offshore securities, i.e. if Americans and Canadians held the same portfolios of Cayman Islands securities, then this is all we would need to restate bilateral investment positions on a nationality basis. As we demonstrate below, however, investor portfolios are very different. We therefore need to integrate information about each country's portfolio holdings. Toward that end, we now describe how we merge the above parent-matching algorithm with security-level data on the worldwide holdings of mutual funds and ETFs, obtained from Morningstar and introduced in MNS.

The Morningstar dataset provides good coverage of worldwide mutual fund and ETF assets under management (AUM). For example, in December 2017 it includes 61,000 funds reporting over 11 million individual positions amounting to $32 trillion in AUM. MNS offers further details on these data and below we provide evidence supporting their suitability for this paper's purposes.[15] Following the approach in MNS, we also treat the domicile of each fund as reflecting the nationality of its investors. Therefore, this paper does not study the accumulation of wealth in foreign offshore bank accounts, such as when wealthy foreigners avoid taxes by depositing in a Swiss bank account.[16] We follow MNS in restricting our sample to funds domiciled in countries with high quality holding data: the United States, the EMU, the United Kingdom, Canada, Switzerland, Australia, Sweden, Denmark, and Norway.[17] For countries in the European Monetary Union, we follow MNS and make an exception to the assumption that only domestic residents invest in domestic mutual funds. We only consider the EMU as a block since, as detailed in MNS, mutual funds are concentrated in Luxembourg and Ireland, but collect investments from the rest of the countries in the European Union.[18]

examples of firms for which the country of residency is closer to the geographic center of their sales than the country of nationality.

[15] MNS confirmed the accuracy of these holdings data by cross-checking against funds' regulatory filings, funds' own websites, and other commercial data sources. Chen, Cohen and Gurun (2019) also confirm the accuracy of Morningstar's security-level holdings data, though they criticize the accuracy of the summary descriptions of fund portfolios reported to Morningstar. These latter summary descriptions are not used in MNS nor in this paper. See Maggiori, Neiman and Schreger (2019b) and Lilley, Maggiori, Neiman and Schreger (2019) for additional applications using these and related data.

[16] Given our focus on mutual funds and ETFs, our analysis does not study outward investment by hedge funds with master-feeder structures registered in tax havens.

[17] Relative to MNS, we exclude New Zealand because the value of its key bilateral holdings, particularly its holdings of U.S. and German bonds, are redacted in CPIS.

[18] MNS use the CPIS data to document that 72 percent of investment in Luxembourg mutual funds comes from other EMU countries. The central bank of Luxembourg estimates that the percentage might be lower

The fund holdings data include all equity and bond positions at the CUSIP9 level, which we can use together with our CUSIP6-to-CUSIP6 issuer-to-parent matching to assess any fund's holdings both under residency and under nationality. We aggregate across all funds' positions and construct, for each investor country and asset class, reallocation matrices that determine the share of investment in each country on a residency basis that would be reallocated to all other countries on a nationality basis.

For a given asset class, let $x^{\mathcal{R}}_{i,j}$ denote the dollar value of holdings in the Morningstar data of investor country j in securities issued by country i on a residency basis.[19] Let $x^{\mathcal{R}\to\mathcal{N}}_{i,k,j}$ denote the dollar value of these same holdings that, on nationality rather than residency, would be associated with issuer country k rather than i, such that $x^{\mathcal{R}}_{i,j} = \sum_k x^{\mathcal{R}\to\mathcal{N}}_{i,k,j}$. We can then define an entry $\omega_{i,k,j}$ in our reallocation matrix for country j as:

$$\omega_{i,k,j} = \frac{x^{\mathcal{R}\to\mathcal{N}}_{i,k,j}}{x^{\mathcal{R}}_{i,j}}. \tag{1}$$

Collecting $\omega_{i,k,j}$ over all rows i and columns k, we have country j's reallocation matrix Ω_j:

$$\Omega_j = \begin{bmatrix} \omega_{1,1,j} & \omega_{1,2,j} & \omega_{1,3,j} & \dots \\ \omega_{2,1,j} & \omega_{2,2,j} & \omega_{2,3,j} & \dots \\ \omega_{3,1,j} & \omega_{3,2,j} & \omega_{3,3,j} & \dots \\ \vdots & \vdots & \vdots & \ddots \end{bmatrix}, \tag{2}$$

where each row of Ω_j sums to one.

As an illustration, Table 2 shows selected entries from the reallocation matrix for U.S. investments in corporate bonds.[20] The fifth row corresponds to the Cayman Islands (CYM) and each column shows the share of U.S. corporate bond holdings that under residency are in the Cayman Islands that would be allocated under nationality to the country listed atop

at around 54 percent. Similarly, Irish mutual funds may also invest on behalf of non-EMU countries. In order to be consistent with CPIS and EMU national statistics, we count all investment by mutual funds in Ireland and Luxembourg as originating from EMU residents. Future research should attempt to better unwind non-EMU investments in funds domiciled in these countries.

[19] To save on notation, we do not index these values by asset class and time. Our analyses of TIC separately study common equities, corporate bonds, government bonds, and structured finance securities. CPIS reporting of separate investment positions in sovereign and corporate bonds is limited, so for CPIS we pool all debt securities and compute the reallocation matrices accordingly.

[20] We make these matrices for each investor, asset class, and year available to other researchers for download at globalcapitalallocation.com. The data in CPIS do not generally distinguish corporate and government bonds, so our restatement of CPIS tables pool the two. We nonetheless post online reallocation matrices that are computed separately for corporate bonds, as they are of independent interest.

that column. For example, 20.1 percent of U.S. corporate bond investments in the Cayman Islands are reallocated to Brazil, 33 percent to China, and 13.3 percent to the United States itself. The diagonal elements show the fraction of investments in each destination that are not reallocated elsewhere. Each row's values sum to 100 percent (for ease of reading, we only list non-zero entries).

Equipped with these reallocation matrices, we can transform bilateral positions in any dataset from a residency to a nationality basis. Let $q_j^{\mathcal{R}} = \left[q_{1,j}^{\mathcal{R}}, q_{2,j}^{\mathcal{R}}, \ldots\right]'$ denote the vector of positions of country j in issuer country i, observed in a residency-based dataset, and let superscript $'$ denote the transpose operator. We can then transform these data to a nationality basis by pre-multiplying the residency-based vector by the transpose of the reallocation matrix:

$$q_j^{\mathcal{N}} = \Omega_j' q_j^{\mathcal{R}}, \tag{3}$$

where $q_j^{\mathcal{N}} = \left[q_{1,j}^{\mathcal{N}}, q_{2,j}^{\mathcal{N}}, \ldots\right]'$ is the resulting estimate of nationality-based positions for that dataset.

If all investment portfolios were the same, one would not need the Morningstar holdings data for this transformation to nationality-based positions. In that case, data on issuance, together with our subsidiary-parent mapping, would be sufficient to do the restatement. For example, 83 percent of all equity issuances in the Cayman Islands are from offshore affiliates of Chinese firms. If countries all held the identical portfolio of Cayman Islands stocks, then one could simply reallocate 83 percent of each country's investment in Cayman Islands equities to China. In other words, holdings data are not required for the exercise if reallocation matrices are the same across countries because, by market clearing, a common reallocation matrix constructed from the value of total outstanding securities would suffice.

In fact, we find that the reallocation matrices are not very similar across countries. One reason these reallocation matrices are so different relates to an interesting phenomenon: investors tend to disproportionately hold securities issued by the tax-haven affiliates of their own domestic firms, what we refer to as "home-bias in tax havens." The blue bars in Figure 2a report for each investor country the share of its corporate bond investment in tax havens that is, under nationality, reallocated to its domestic firms. The red bars report the share of investment from the rest of the world (RoW) into tax havens that gets reallocated to that country. The fact that the blue bars are uniformly larger than the red bars shows how investors disproportionately hold tax-haven-resident corporate bonds that are issued by

parents based in their own countries.[21] Figure 2b plots the same statistic for equities and shows an equally pervasive home-bias in tax havens. Issuance data alone, we conclude, are not sufficient to restate bilateral accounts by nationality.[22]

2 A New Map of Global Capital Allocations

In this section, we apply our reallocation matrices to residency-based data on bilateral investment positions and restate them on a nationality basis. We emphasize three broad changes in the resulting map of capital flows on a nationality basis. First, we find that the scale of lending by advanced economies to large emerging markets increases significantly. Second, corporate bond flows to emerging markets play a far more prominent role relative to government debt. Third, for the United States and United Kingdom, there is a large share of foreign investment that is instead reclassified as a domestic investment, what we refer to as "spurious foreign investment."

2.1 Restatement of TIC and CPIS

Before analyzing the restated bilateral investment positions in TIC and CPIS, we note the implication from equation (3) that the quality of the restatement depends on the representativeness for those datasets of each entry $\omega_{i,k,j}$ in the Morningstar data. Intuitively, our exercise assumes that the share of country j's investment in country i under residency that switches to k under nationality in the mutual fund and ETF holding data is representative of country j's overall holdings, which also include other large investors such as insurance companies and hedge funds.

While we generally cannot directly test this assumption, we make progress in two particular cases. For the U.S., we collected data on the universe of insurance company holdings of bonds and equities. Insurance companies are the second largest U.S. holder of foreign assets after mutual funds and ETFs. For Norway, we collected data on all security holdings by the Norwegian sovereign wealth fund, which accounts for the bulk Norway's foreign asset hold-

[21] The plot does not directly compare the entries of the Ω_j matrices because it reports an aggregation across all tax havens. The point nonetheless holds for individual tax havens like the Cayman Islands or Bermuda.

[22] Appendix Section E expands upon how our approach requires holdings data and introduces bilateral issuance distribution matrices that we make available for download. Additionally, Appendix Section G explains why one cannot perform our analysis using multilateral datasets such as the International Debt Securities (IDS) data published by the BIS.

ings. Appendix Section E demonstrates the close similarity in the nationality-based restated positions that we obtain with mutual funds and ETFs alone and those obtained for the U.S. using insurance companies' holding and for Norway using its sovereign wealth fund. This evidence further suggests that mutual fund and ETF holdings are sufficiently representative of the broader set of investments for our purposes.

Additionally, we demonstrate that a condition related to this representativeness assumption holds, namely that bilateral country shares in outward investment under residency are similar when comparing the Morningstar data to TIC and CPIS. Figures 3a and 3b compare the outward bilateral U.S. portfolio shares in the TIC dataset in 2017 to those in the Morningstar data on a residency basis, separately for corporate bonds and equities. TIC and Morningstar offer a similar picture of U.S. bilateral outward portfolio investments, with most data points close to the 45-degree line.[23] The close alignment between Morningstar and TIC bilateral investment shares is perhaps not surprising since mutual funds account for nearly half of all cross-border holdings observed in TIC. Figures 3c and 3d show that the Morningstar and CPIS data on EMU investments are also aligned for the total of all bonds (since CPIS does not allow us to separate corporates from government bonds) and equities.

Tables 3 to 4 report key entries in our nationality-based restatements of TIC for U.S. positions in corporate bonds and equities and Tables 5 to 6 do so for CPIS data on EMU positions in total bonds and equities.[24] The first three columns in those tables list the investment destination country, its ISO code, and the value of the corresponding position when stated under residency in TIC and CPIS. Columns four and five, labeled "Tax Haven Only," report nationality-based positions, and the change relative to the residency-based positions, when we only reallocate investments made in tax havens. In calculating these values, we only use the rows of the reallocation matrices corresponding to tax havens. This treatment is of interest since almost all applications would benefit from the reallocation of capital investments away from these tax havens and toward the country of the tax-haven affiliate's ultimate parent or operational headquarters. Columns six and seven, labeled "Full Nationality," report positions when we reallocate all investments from residency to nationality, regardless of where they are made. In this case we use all rows of the reallocation

[23] We obtain corporate bond positions in TIC starting from private debt and then removing asset-backed securities. Equities in TIC include both common shares, fund shares, and holdings in other types of equity assets such as investment trusts. Our calculations focus only on common shares, which account for the vast majority of holdings.

[24] We report equivalent tables for Canada and the United Kingdom in the appendix. The tables in their entirety for all nine investor countries and all asset classes are available for download.

matrices. This treatment is of interest, for example, if one wishes to consider the geography of the entity that has ultimate control of the investment, as would be captured, for example, when we reallocate bonds issued by Toyota Motor North America from the United States under residency to Japan under "Full Nationality."

In the "Full Nationality" case, not only do we reallocate foreign positions but also reallocate domestic positions, something we are able to do using the Morningstar data because it, unlike TIC and CPIS, includes both domestic and foreign positions. We impute domestic investment by asset class in TIC and CPIS based on the ratio of domestic to foreign investment in the Morningstar data. Specifically, we calculate:

$$q^{\mathcal{R}}_{j,j} = \frac{x^{\mathcal{R}}_{j,j}}{\sum_{i \neq j} x^{\mathcal{R}}_{i,j}} \left(\sum_{i \neq j} q^{\mathcal{R}}_{i,j} \right). \tag{4}$$

Intuitively, we assume that mutual funds and ETFs in the Morningstar data have a similar share of domestic investments as does the universe of all investors covered in TIC and CPIS.[25]

2.2 Investment in Large Emerging Markets is Much Bigger

It has long been puzzling to economists that advanced economies like the United States invest so little in rapidly growing emerging economies such as Brazil, China, India, Russia, and South Africa. For example, the corresponding rows in Table 3 show that U.S. investments in corporate bonds under residency total a mere $8 billion in Brazil, $3 billion in China, $6 billion in India, and essentially zero in Russia. These positions are tiny compared to the $390 billion invested in Canada, the $549 billion in the EMU, the $308 billion in the United Kingdom, and even the $144 billion allocated to Australia. Overall, the BRICS account for only 1 percent of all foreign corporate debt investments made by the United States in 2017 on a residency basis.

Table 3 shows that our reallocation has a notable impact on these low allocations to emerging economies. Our "Tax Haven Only" estimates raise investment from the United States to the BRICS in corporate bonds from $19 to $122 billion, a 540 percent increase.

[25] This assumption is clearly imperfect but for most countries it is also likely to be conservative since mutual funds and ETFs are perhaps more likely to invest abroad, thus leading to lower reallocations in our procedure. The appendix provides a sensitivity analysis for this imputation of domestic positions: Appendix Table A.8 shows our "full nationality" estimates for U.S. external portfolios without performing this imputation and instead setting unobserved domestic positions to zero. In the case of Norway, we exclude the Norwegian sovereign wealth fund holdings when performing the domestic position imputation since the fund does not invest in domestic securities by mandate.

The increase is broad-based with Brazil increasing from $8 to $50 billion, China from $3 to $47 billion, Russia from $0.4 to $12 billion, and South Africa from $1 to $6 billion. Other large emerging markets also receive capital in the reallocation. For example, U.S. corporate bond investment in Indonesia moves from $5 to $7 billion. The positions in tax havens correspondingly drop by hundreds of billions of dollars.

This large increase in corporate bond holdings in emerging markets is even stronger in our "Full Nationality" treatment. This occurs because emerging market companies also own subsidiaries in the United States that issue bonds to U.S. investors. This dynamic is important for India and South Korea, which become much more prominent destinations for U.S. corporate bond investment under the "Full Nationality" treatment. Figure 4a summarizes these reallocations with a scatterplot that compares the residency-based positions with restated positions using our "Full Nationality" treatment. Countries below the 45-degree line see their positions reduced and include Bermuda, the Cayman Islands, and Luxembourg, among others. Countries above the 45-degree lines are the major recipients of these reallocated positions and include a number of large developing countries such as Brazil, China, India, and Russia, among others.

Table 4 reports equity reallocations in TIC. The United States holds $547 billion of common equities in the Cayman Islands, an amount similar to U.S. holdings of equities in Canada and bigger than those in Germany and France. U.S. investment in equities of Bermudian-resident companies equals $195 billion, larger than the positions in Indian companies. Our procedure completely reallocates these enormous investment positions away from tax havens. A large share are reallocated to the United States but, as is seen in Figure 4c, the bulk of these investments are reallocated to China.

In fact, the reallocation of holdings of Cayman Islands equities to China constitutes the single largest adjustment seen in North-to-South positions in our restated data. Figure 5a shows the share of external equity portfolios invested in China for all nine investor countries in our data. The blue bars, which show China's share under nationality, pervasively and significantly exceed the red bars, which capture the same share under residency. Section 3 details the reason why so many Chinese firms issue equity in the Cayman Islands and elaborates the implications for global imbalances.

As shown in Tables 5 and 6, we additionally find large increases in investments in BRICS countries coming from the EMU. EMU investments in Russian bonds increase from $36

billion to $107 billion, largely reflecting reallocation from Ireland and Luxembourg.[26] Table A.2 shows a related increase of U.K. investment in Russian bonds, going from $2 billion to $5 billion. The adjustment reflects the fact that the United Kingdom only buys Russian corporate debt issued by offshore subsidiaries. Comparing the blue and red bars in Figure 5b shows for corporate bonds that the reallocation to the BRICS countries is a widespread phenomenon found in all our investor countries. Overall we find a sizable increase in portfolio investment from the nine developed countries in our sample to large emerging markets. The BRICS countries attract the vast majorities of these investments that are intermediated through tax havens.

2.3 Corporate Bond Investments are More Important

The shift to the nationality view of bilateral investment increases the importance of foreign investment in corporate relative to sovereign bonds issued by large emerging markets. While the previous subsection reported massive increases in corporate bond investment to large emerging markets, Appendix Table A.6 shows that reallocations are minimal for government bonds. Governments almost always issue under their own name and not via affiliates. Even when sovereigns issue international bonds in foreign markets, such as when the Brazilian government issues a bond on international capital markets, the immediate issuer is in fact that sovereign and the residency and nationality approaches coincide.[27]

TIC reports that only 25 percent of all bond positions of the United States in Brazil are corporate bonds. Under the "Tax Haven Only" and "Full Nationality" views, this percentage rises to 66 and 72 percent, respectively. Similarly, whereas under residency U.S. bond investment in Russia is entirely dominated by government bonds, corporate bonds become equally important under nationality.

One repercussion of this change in the importance of corporate bond positions under the nationality view is that it implies that for many large emerging markets, their bonds held by foreigners have a higher foreign currency share. Most bonds issued by offshore affiliates and reallocated by our procedure to emerging markets are denominated in dollars or other foreign currencies.

[26] Figure 4b shows the equivalent of Figure 4a, but for EMU investment in all bonds, instead of U.S. investment in corporate bonds. The inclusion of government bonds, which are typically unchanged by our mapping, accounts for the more muted visual pattern.

[27] The same of course applies to corporates issuing bonds in international markets, like the Eurobond market, under their own name, rather than via a subsidiary.

Figure 6 quantifies the impact of the corporate reallocations on the currency composition of foreign-held bonds for two large emerging markets: Brazil and Russia. Sovereign debt in emerging markets has transitioned away from "Original Sin" (Eichengreen and Hausmann, 1999, 2005), with a greater share denominated in local currency, even among the securities held by foreign investors. Du and Schreger (2015) document that a similar increase in the local currency share has not occurred for emerging markets' corporate debt held by foreigners. Indeed, the dashed lines in the middle panels of Figure 6 correspond to the local currency shares of foreign-held sovereign bonds issued by Brazil and Russia and show rapid increases during 2007-2017. The solid lines correspond to corporate bonds and are flat or declining from low values.[28] As discussed above, and as shown in the bottom panels of Figure 6, switching to a nationality view substantially increases the importance of corporate relative to sovereign bonds. The top panels of Figure 6 show that the switch to a nationality view also substantially decreases the share of local currency bonds in these countries' external portfolios.[29] While the foreign-held bonds of Brazil and Russia under residency have local currency shares in 2017 equal to 70 and 71 percent, under nationality, these shares drop to 34 and 41 percent. In fact, for the case of Brazil, our adjustment to a nationality basis eliminates the upward trend in the local currency share of foreign-held bonds that is found in the residency-based data.

Offshore issuance need not change the currency composition of a country's overall external liabilities.[30] Many countries, however, have historically not reported underlying details on the currency composition of their total external liabilities. In part for this reason, analyses of currency exposures commonly focus on bank loans and bonds and so are subject to the adjustments from residency to nationality that are the focus of this paper. Further, bonds and equity securities are of particular interest because policymakers view portfolio investments as the most volatile type of foreign investment. Our work, therefore, also has relevance for efforts to measure financial exchange rates following the influential work by Lane and Shambaugh (2010).

[28]The details underlying these calculations appear in Appendix Section C. Appendix Table A.9 reports equivalent results for other countries in our sample.

[29]We note the important caveat that the literature, this paper included, has not systematically studied currency hedging.

[30]Imagine an offshore affiliate raises financing and then transfers those exact funds (equal in the amount and currency of denomination) to its parent company. If everything were to be measured perfectly in the international investment statistics of the parent's country, these funds would not constitute portfolio investment but they would be booked as intercompany loans, FDI, or some other component of the country's external liabilities.

2.4 Spurious Foreign Investment

As shown in the previous subsections, our nationality-based tables reallocate significant investment positions from one overseas destination to another. Some of these positions, however, are in fact reallocated back to the investor's country, and therefore we refer to them as "spurious foreign investment." The key drivers of spurious foreign investment have been recognized for some time, including U.S. corporate tax inversions to Ireland and the use of the Cayman Islands as a hub for U.S.-based structured finance products. Our work quantifies the scale of these positions and demonstrates that they are large for the United States, moderate in the United Kingdom, and quite muted in our other investor countries.

Figure 7a reports for each investor country the share of its foreign bond positions under residency that, under nationality (using the "Tax Haven Only" treatment), are in fact domestic investment. The U.S. bar is clearly the largest and indicates that more than 11 percent of all foreign bond holdings in TIC, an amount totaling nearly $370 billion, should not even be considered foreign investment on a nationality basis. The bulk of these holdings are CLOs, a type of structured finance product that securitizes corporate loans, issued by SPVs registered in the Cayman Islands.[31] Our algorithm reallocates these Cayman Islands securities to the United States because, as first documented in Liu and Schmidt-Eisenlohr (2019), these bonds are almost always backed by U.S. leveraged loans and mortgages and are sponsored and serviced by U.S. banks.

Spurious foreign bond investment is not nearly as important in other countries. We calculate that about three percent of U.K. foreign bond investment is spurious, owing to large British holdings of bonds issued by the Cayman Islands subsidiaries of U.K. regional water suppliers Thames Water, Southern Water, and Yorkshire Water. No other bars exceed two percent in the upper panel.

Figure 7b shows the share of foreign equity investment that is spurious. Again, the United States stands out, with nearly 7 percent of all foreign investment – more than half a trillion dollars – considered under nationality to be domestic investment. More than half of the United States' spurious foreign equity positions reflects Irish tax inversions, in which a U.S. company acquires an Irish target to relocate its headquarters there and lower its tax rate.[32]

[31] The Cayman Islands is a popular residency for this arrangement as it does not impose taxes on the SPV's income, has zero withholding tax on the securities' payouts, and has passed recent legislation upholding "bankruptcy remoteness", a protection that insulates the creditworthiness of a structured finance product from its issuer, manager, and underwriter.

[32] For example, consider Medtronic, one of the world's largest medical technology firms, which in 2015 purchased the Irish firm Covidien. Despite having 57 percent of its net sales in the United States and

Our holdings data demonstrate that U.S. ownership of the largest six tax inverted companies remains stable and above 80 percent through the inversion process, corroborating that they should continue to be classified under nationality as U.S. firms. As discussed in Desai et al. (2006) and Zucman (2013), U.S. multinationals have historically been particularly prone to tax invert because the United States has had a high corporate tax rate and a worldwide tax system, where even profits earned outside of the United States are taxed by the U.S. government. The recent U.S. tax reform likely reduced the scale of both of these incentives.

In changing the scale of foreign investment and its growth, and in doing so to heterogeneous degrees across countries, this finding is relevant for work studying financial globalization and the growth and co-movement in gross external assets and liabilities of developed countries. Such large offshore transactions also have important consequences for financial stability. In a possible crisis, any intervention would have to contend with foreign jurisdictions over what are essentially domestic transactions.

3 Implications of Chinese Offshore Issuance

As noted in Section 2, the investments in China's VIEs – companies such as Alibaba, Baidu, JD.com, and Tencent – underlie the single largest reallocation from residency to nationality in our data. In this section, we detail how the VIE structure uses offshore shell companies to evade China's restrictions on foreign investment and why these investments carry unique risks. Next, we demonstrate how the VIE structure transforms what would otherwise be accounted for as portfolio investment into FDI and distances the offshore entities that are listed on public markets from the underlying operations in China. As a result, large gains in the market values of foreign equity positions in Chinese companies are not reflected in China's external accounts. The disconnect between the market price of these offshore companies and the valuation of foreign holdings in China's external accounts implies that China's NFA position, one of the world's largest, is approximately half as large as is officially reported.

retaining its main operational offices and the bulk of its employment in the United States, Medtronic shifted its headquarters to Ireland, which accounts for less than half of one percent of its net sales. As a result of this tax inversion all U.S. equity investments in Medtronic, which were considered domestic investment up to January 2015, were subsequently moved in the official statistics of both the United States and Ireland to be U.S. foreign investments in Ireland. Our algorithm restores those positions as domestic investments.

3.1 The VIE Structure

The VIE structure offers a way for firms to avoid the Chinese government's restriction on foreign investment in strategically important industries such as internet platforms, financial services, telecommunications, energy, agriculture, transportation, and education. As detailed in Whitehill (2017), VIEs are designed to allow for control of a company "by means other than a majority of voting rights."

Figure 8 illustrates the relationships involved in a typical VIE structure. The Operating Company is the firm based in China and is, for all intents and purposes, what investors (and economists) would think of as the "real" company. Since this firm operates in an industry in which foreign ownership is restricted, its equity is fully owned by Chinese citizens, as indicated by the arrow labeled G in the figure. The Listed Company, by contrast, is the entity listed on a global stock exchange. It is generally resident in the Cayman Islands. The VIE structure then involves a chain of subsidiaries and a set of bilateral contracts such that, for the purposes of international accounting and reporting, the Listed Company can represent to foreign investors that it owns the Operating Company, while at the same time the Operating Company can represent to Chinese regulators that it is wholly owned by Chinese citizens.[33]

The first step in this chain is the Listed Company's ownership of a Wholly Foreign Owned Enterprise (WFOE) in mainland China. This foreign ownership is allowed because the WFOE is not itself registered and licensed to operate in a protected industry. Sometimes the Listed Company's ownership of the WFOE is intermediated through a SPV, itself often based in Hong Kong, as shown with arrows B and C. Sometimes, as shown with arrow D, this ownership is direct. These foreign equity stakes in the WFOEs are the cross-border positions in mainland China for the purposes of national statistics.

The most tenuous links in the corporate structure are represented by arrows E and F. In these links, the WFOE, the Operating Company, and the Chinese owners of the Operating Company enter into a series of contractual relationships designed to mimic equity ownership

[33]For example, investors that purchase shares of Alibaba (BABA ticker on the NYSE) are actually purchasing shares of Alibaba Group Holding Limited, a holding company based in the Cayman Islands. The group needs to be able to report its operations on a consolidated basis under which the Operating Company is consolidated on the balance sheet of the Listed Company. Financial Accounting Standards Board (FASB) Interpretation No. 46R provides that: "An enterprise that consolidates a VIE is the primary beneficiary of the VIE. The primary beneficiary of a VIE is the party that absorbs a majority of the entity's expected losses, receives a majority of its expected residual returns, or both, as a result of holding variable interests, which are the ownership, contractual, or other pecuniary interests" (Whitehill, 2017).

while satisfying the requirement that regulators consider the Operating Company to be Chinese owned. For example, the WFOE provides the Chinese owners of the firm a zero-interest loan with their equity in the firm pledged as collateral (arrow F). In addition, the Chinese owners grant the WFOE an exclusive option to buy the Operating Company at a pre-specified price and may sign over a proxy agreement or power of attorney. Taken together, these contracts offer the WFOE "equity-like" control over the Operating Company. Further, in order to transfer the Operating Company's profits to the WFOE, they enter into an exclusive agreement (arrow E) in which the Operating Company hires the WFOE to provide technical services such as "website maintenance, programming, sales support, fulfillment services, curriculum development, etc." (Gillis, 2019). The WFOE charges a fee for providing these services that is approximately equal to the entire profits of the Operating Company.[34]

3.2 Risk to Investors in VIEs

Companies using VIE structures generally include a disclaimer about their risks in the "Risks Related to Our Corporate Structure" section of their U.S. SEC filings.[35] Indeed, many of the risks faced by investors arise from the possibility that the Chinese authorities may recognize such structures as illegal, leaving foreign investors without the ability to claim the Operating Company's assets and cash flows and holding worthless shares in an empty shell company in the Cayman Islands. The Chinese owners could take control of the assets of the firm in a perceived contravention of the bilateral contracts with the WFOE.[36] Additionally, the Chinese authorities could prevent or change the tax treatment on the profit transfers from the Operating Company to the WFOE.[37]

[34] In one of its SEC filings (Form F-1, May 2014), Alibaba reports that "the variable interest entity pays a service fee to the wholly foreign owned enterprise which typically amount to what would be substantially all of the variable interest entity's pretax profit (absent the service fee), resulting in a transfer of substantially all of the profits from the variable interest entity to the wholly foreign owned enterprise."

[35] Alibaba's prospectus for its IPO on the NYSE (SEC Form F-1) states: "If the [Chinese] government deems that the contractual arrangements in relation to our variable interest entities do not comply with [Chinese] governmental restrictions on foreign investment, or if these regulations or the interpretation of existing regulations changes in the future, we could be subject to penalties or be forced to relinquish our interests in those operations."

[36] The most famous example of this, detailed in Jiang and Yang (2017), was when Jack Ma seized control of Alipay in contravention of Yahoo's belief that it was a partial owner through its stake in Alibaba. Ziegler (2016) discusses related cases including Gigamedia and FAB Universal.

[37] If Chinese authorities treated payments from the Operating Companies to the WFOEs as dividend payments, they would incur an effective tax rate in excess of 50 percent, dramatically reducing the value of VIEs to their offshore investors (Whitehill, 2017).

These risks are well documented. Our work demonstrates, however, that investors in countries such as the United States face exposures to these risks that vastly outstrip what would be ascertained from official residency-based data. As shown in Section 2, we find that U.S. and EMU positions in Chinese securities increase under nationality by nearly $600 billion and $350 billion, respectively.

Further, these positions are not only held by specialists but, rather, are routinely owned by retail investors, often through mutual funds held in retirement accounts. It is hard to believe that when retail investors buy Alibaba shares on the NYSE they understand that they are buying a claim on a Cayman Islands based holding company with a complex and tenuous legal relationship with the Chinese firm.[38] Our results suggest that this risk may be under-appreciated by regulators due to the understatement of its scale in official statistics.

3.3 VIEs and China's Net Foreign Asset Position

When investors in developed countries, such as those in our sample, buy securities issued by the Listed Companies in VIE structures, these positions enter the foreign assets of the respective countries. The fact that the Listed Companies are in the Cayman Islands masks the true geographic composition of any given investor's reported positions as we have shown in Section 2, but it does not affect their total gross foreign asset position across all destinations. By contrast, in this subsection we demonstrate that the VIE structure effectively transforms those Chinese external liabilities from portfolio to FDI positions with values that are not linked to listed security prices on public markets. A country's NFA equals the value of its foreign assets minus its foreign liabilities, or equivalently, the accumulation of its past current account balances plus valuation changes. Since China's external positions associated with the VIEs have not tracked their market value, we demonstrate that even given correct measurement of its current accounts, China's overall external position is incorrectly measured from an economic perspective. We find that, due to offshore issuance, China's official NFA position is roughly $1.1 trillion larger than its true value.

[38] Companies choose the names of the Listed Company and the Operating Company to be almost identical and the financial press rarely draws the distinction. For example, Appendix Figure A.3 shows screenshots of the Financial Times pages for Tencent and Baidu. In both cases, the reported details refer to the Operating Company in China and no mention is made of the VIE structure or the Cayman Islands in the company's profile.

3.3.1 VIEs and China's External Liabilities

To illustrate the implications of the VIE structure for the classification of investments in Chinese companies as portfolio or FDI liabilities, we return to Figure 8. The only positions in the figure that directly affect China's external liabilities are the investments in the WFOE. These positions are either held by an SPV, as in arrow C, or are held directly by the Listed Company, as in arrow D. In either case, since the investments are made by entities that wholly own the WFOE, they are classified as FDI positions in China's external liabilities. By contrast, if the VIE structure were not in place, foreigners might directly hold shares issued by the Operating Company, and those holdings would instead be classified as portfolio equity investments.[39]

In theory, it should not matter whether foreign investments are booked as portfolio or FDI positions. In practice, however, while the value of portfolio investments almost always tracks market prices, the IMF Balance of Payments and International Investment Position Manual Sixth Edition (BPM6) offers six alternative methods to record the value of FDI.[40] Further, since the VIE structure dissociates the onshore Operating Company from the rest of the corporate chain, it raises reasonable questions as to the relationship between the market price of the publicly Listed Company and the value of the WFOE, the Chinese entity that is foreign owned. Chinese law does not recognize the listed shares as equity claims on the Chinese Operating Company, therefore China's statisticians may reject the notion that the value of owning the WFOE equals the market value of the Listed Company.[41] We have corresponded with China's statisticians and have no reason to believe their treatment is inconsistent with BPM6 guidelines. However, given that the underlying BoP transactions are confidential, we still do not know exactly how foreign ownership positions in the VIEs are valued. Nonetheless, we present evidence that, however it is done, the value of these

[39] For example, retail holdings of the shares or holdings by mutual funds and ETFs would be classified as portfolio investment. Large holdings by a single investor would still be classified as FDI.

[40] In the BPM6 Manual, the IMF suggests six alternative methods to approximate the market value of FDI and then notes: "In cases in which none of the above methods are feasible, less suitable data may need to be used as data inputs. For example, cumulated flows or a previous balance sheet adjusted by subsequent flows may be the only sources available." The OECD Benchmark Definition of Foreign Direct Investment Fourth Edition notes the challenges of recording FDI at market value: "Although market value is the recommended basis for valuation it is recognized that, in practice, values based on the books of direct investment enterprises (or investors) are often used to determine the values of direct investment positions (stocks) or transactions."

[41] We note that even if national statistical offices wished to link the value of FDI positions with the listed share prices in New York or Hong Kong, this would be difficult to do in practice. Appendix Figure A.2 displays the full VIE corporate structure of Alibaba and demonstrates how multiple ownership chains pass through various geographies. It is not clear how statisticians would update the value of individual FDI positions in WFOEs in response to changes in the Listed Companies' share prices.

foreign positions in China's external liabilities is not connected to the market value of the corresponding publicly listed firms.

The long-dashed red line in Figure 9a plots the evolution of the market value of all VIEs.[42] Worth only a few billion dollars in 2005, they are currently worth almost $2 trillion. Most strikingly, the VIEs gained more than $1 trillion in market value during the six quarters from 2016Q4 to 2018Q1. The short-dashed green line in Figure 9a uses the IMF Coordinated Direct Investment Survey (CDIS) to plot China's reported stock of inward FDI positions from Hong Kong, the British Virgin Islands, and the Cayman Islands, the three tax havens where the Listed Companies and SPVs of VIEs are most plausibly located. The positions captured in the green line should be a superset of those captured in the red line as the green line should include all VIE-related investment plus additional FDI unrelated to VIEs. The green line's evolution, however, displays none of the recent surge in the VIEs' market value. In fact, toward the end of our sample, the total reported value of inward FDI from those three tax havens lies below the market value of VIEs. It is clear that the VIEs are not captured at their foreign stock market value in China's external FDI liabilities.[43]

Figure 9b casts doubt on the possibility that the VIE-associated positions track equity market prices but are included in a category of China's external liabilities other than FDI. While the VIEs increased in market value by $1.1 trillion between 2016Q4 and 2018Q1, total recorded external liabilities of China (excluding official reserves and trade credits) only increased by $390 billion over the same period. Most of the increase in total liabilities came from a $180 billion increase in portfolio debt liabilities. This component is highly unlikely to include the VIE equity investments.

By contrast, the evolution in VIE market value is easy to see in the external accounts of other countries. For example, we showed in Section 2 that U.S. common equity positions in the Cayman Islands are largely holdings of VIEs. It is not surprising, therefore, that the value in TIC of U.S. common equity investment in the Cayman Islands co-moves almost perfectly with the VIEs' market capitalization, as shown in Figure 10a. Similarly, Naspers, a South African company, has owned 31 percent of Tencent since 2009. As shown in Figure 10b, the value in CDIS of South Africa's FDI investment in China co-moves perfectly with Tencent's market capitalization.

[42]Our analysis defines Chinese companies resident in the Cayman Islands as VIEs. These companies account for more than 99 percent of the market value of the list of VIEs found in Whitehill (2017).

[43]CDIS also includes an unspecified source "country" which contributes another $230 billion to China's inward FDI in 2018. Even including this amount, the FDI series would fail to track the recent time-series behavior and would barely match the level of VIE market capitalization.

To quantify the implications of the VIE structures for China's external liabilities, we must make an assumption about how China's statisticians book the value of VIE-related inward FDI positions. We argue above that changes in the foreign stock market value of the VIEs are not captured in China's external accounts, but the accounts should reflect the cumulative value of any financial transfers or actual flows that cross China's border. We assume that at the time of each Listed Company's initial public offering and follow-on equity offerings, the capital raised is transferred from outside to inside of China; therefore, the value associated with each foreign-held VIE position equals the cumulative value of all equity offerings made by that VIE. This would be the case, for example, if after each equity offering, each Listed Company in the Cayman Islands immediately transfers the proceeds as an intercompany loan to a China-resident entity that is part of the VIE structure, such as the WFOE. As seen in Figure 9a, we estimate that under this assumption, China's reported external liabilities are understated by an amount that has grown rapidly from a few billions in 2009 to nearly $1.4 trillion in 2018. We reach this estimate by calculating the market value of the Listed Companies as $1.55 trillion at the end of 2018 but measuring the total capital raised from public offerings at only $167 billion.[44]

3.3.2 VIEs and China's External Assets

Having documented that China's external liabilities are understated because of the VIE structures, we next turn to examining whether China's foreign assets are affected by the same issue. If the value of equity holdings of Chinese residents in a VIE's Listed Company also did not track the market price of those securities, this disconnect would lead to an understatement of China's external assets. Any understatement in China's external assets would cancel out the understatement in its liabilities when calculating China's NFA. As pictured in Figure 8, Chinese residents can directly own shares of the Listed Company of a VIE issued in global markets (arrow I) or they could hold shares in foreign-based investment vehicles that in turn hold shares in the Listed Company (arrows H and L). We estimate the scale of these Chinese investments in VIEs' Listed Companies and find that understatement of China's external assets is modest relative to the understatement of China's liabilities.

We use the Bloomberg Ownership Database to determine the holdings in the Listed

[44]Our assumption that the value of VIEs are reflected in China's external liabilities as the accumulation of their equity offerings may in fact be conservative. If the Chinese statisticians only estimated the value of the WFOEs as consulting firms and the holding companies never transfer the funds raised offshore back onshore, their value in China's external liabilities may be even lower.

Companies by non-Chinese foreign investors (arrow A) and by Chinese residents via offshore investment vehicles (arrows H and L) or directly (arrow I) if held by company insiders. The Bloomberg data have the advantage of including both institutional holdings, such as Blackrock holdings in Alibaba, and insiders' holdings, such as Jack Ma's stake in Alibaba.[45] We perform this analysis for the largest 40 publicly traded VIEs, which account for 90 percent of the total VIE market capitalization. We estimate that Chinese residents own about 18.4 percent of the market capitalization of VIEs via offshore investment vehicles or via shares held directly by company insiders.[46] In our baseline treatment, we assume that these holdings have been booked in China's foreign assets positions using the same notion of value as was used for the liabilities, specifically the cumulative value of equity offerings by the firm. We estimate that China's reported external assets are understated by $256 billion by 2018.

The Bloomberg data do not include direct holdings of Listed Company shares by Chinese residents (arrow I) that are not company insiders. These are unlikely to meaningfully affect our estimates, however, as they are most likely small and booked at the value of the listed stock in China's foreign assets.[47]

If we consider an alternate methodology that uses the nationality-based restatements of TIC and CPIS that we introduced in Section 2, we obtain similar results. We sum the estimated holdings of Chinese equities based in the Cayman Islands from our nine developed countries and augment this total with Naspers' investment in Tencent and with Softbank's investment in Alibaba. We then assume that Chinese investors own the remaining market value of all Listed Companies.[48] This calculation implies that the share of VIEs owned by

[45] We further refine Bloomberg's classification by inspecting the holdings assigned to entities in tax havens using SEC filings and various financial databases to determine whether the ultimate owners are Chinese. See Appendix Section D for a detailed discussion.

[46] This finding is consistent with the evidence in Edison and Warnock (2004) and Ammer et al. (2012) that investors from large developed countries hold significant stakes in foreign companies that are cross-listed on U.S. exchanges.

[47] Chinese citizens are generally restricted from directly owning foreign securities. Conditions are more relaxed for purchases of equities listed in Hong Kong due to a recent policy initiative (Stock Connect). However, the Hong Kong Stock Exchange reports that a mere 2.0 percent of the outstanding amount of the Hong Kong listed VIEs are owned by Mainland Chinese investors. This implies that only 1.1 percent of all worldwide shares of listed VIEs are directly owned by Chinese citizens via their Hong Kong listed shares, implying overall Chinese ownership of the Listed Companies at 19.5 percent. Because the 1.1 percent is unambiguously portfolio equity investment of Chinese residents from the perspective of balance of payments accounting, we assume throughout it is recorded at market value.

[48] The estimates for some investor countries are potentially overstated because CPIS reports equities and fund shares jointly. If many investments in the Cayman Islands are in fund shares rather than in common equity then our estimates of equity investments reallocated to China are biased upwards. This problem does not affect our U.S. estimates since TIC separates fund investments from common equity.

Chinese investors is about 14 percent, in the same range as our baseline estimate.

3.3.3 Estimates of China's Net Foreign Asset Position

The dashed black line in Figure 11 plots the official NFA of China. Its net credit position equals $2.1 trillion in 2018 (15 percent of its GDP), making it one of the world's largest, alongside Germany's similarly sized position and Japan's $3.1 trillion position. The solid red line is our estimate of the true NFA, obtained by adding to the dashed black line the difference between the understatement of external assets and liabilities, estimated in the previous subsections. The overstatement of China's NFA starts close to zero in 2008 and grows rapidly over time, reaching $1.1 trillion by the end of 2018. Currently, China is only half as large a creditor to the rest of the world as official statistics say it is.

We test the sensitivity of this estimate to other methodological choices. As reported in Appendix Section D, we cannot identify the ownership of 15.3 percent of the VIEs. In addition, we assign 0.7 percent of the remaining positions to funds based in the Cayman Islands and British Virgin Islands. If we treat all the positions with unidentified owners, as well as those based in the Cayman Islands and British Virgin Islands, as if they were owned by Chinese residents and not recorded at market value – a treatment we label as "Upper Bound on Chinese Holdings" and plot with a short-dashed gray line in Figure 11 – we reduce the overestimation of China's NFA in 2018 from $1.1 trillion to $0.9 trillion. If instead we assume that the value of all of China's holdings of the VIEs is linked to their listed market prices – a treatment we label as "Assets Reflect Listed Value" and plot with a long-dashed gray line – we increase the scale of the NFA mismeasurement to $1.4 trillion.

Although China has run large current account surpluses since the early 2000s, China is a much smaller net creditor today than statisticians, economists, and policymakers believe because its NFA does not reflect massive valuation changes. In fact, China's net credit position is closer to that of Norway or Switzerland than it is to Japan's. While the common narrative is that of a one-way flow of investments from China to the safe assets of the developed world (U.S. Treasuries), we show that in the last decade there has been important investments made by developed markets into China, and these positions are masked by official statistics. While much attention has been paid to the $1.1 trillion of U.S. Treasuries held by China, almost no attention has been paid to the $700 billion of U.S. holdings in Chinese equities.

Our restatement of China's NFA has far-reaching consequences. For policymakers, China's

large creditor position has long given rise to major concerns about a disruptive resolution of global imbalances. Our estimates suggest that much of this external adjustment has already happened during 2008-2018 but went unnoticed as it was obscured in the statistics due to offshore issuance. Since foreigners realized very large capital gains on Chinese equities during this period, they retain substantial claims on China. Therefore, significantly less external adjustment will be required in the future than was previously thought. For economic theory, these investments by developed countries in Chinese VIEs, coupled with China's investment in U.S. Treasuries, reinforces the world banker view of global imbalances.

4 Conclusion

We have provided a transparent and flexible methodology to resolve corporate ownership chains and offshore issuance in tax havens globally. Doing so redraws the map of global capital flows. Official statistics significantly understate the magnitude of the corporate financing flowing from developed market investors to emerging market firms and incorrectly attribute these flows to tax havens. The offshore structures that we uncover often mask portfolios flows under the cover of foreign direct investment. We show that this can impact, via valuation effects, the net foreign asset positions of countries. We estimate that China's net creditor position to the rest of the world is roughly half of what the official statistics report. We hope our procedure and estimates provide a foundation for a common measurement framework and improved characterization of capital flows in international macroeconomics.

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Issuer CUSIP6	Issuer Name	Issuer Residency	Parent CUSIP6	Parent Nationality	Parent Name	Value Outstanding (USD Billions)
A. Corporate bonds reallocated away from selected tax havens						
91911T	VALE OVERSEAS LTD	CYM	P96620	BRA	VALE SA	12.3
01609W	ALIBABA GROUP HLDG LTD	CYM	01609W	CHN	ALIBABA GROUP HLDG LTD	10.3
71645W	PETROBRAS INTL FIN CO	CYM	P78331	BRA	PETROLEO BRASILEIRO SA	9.2
G2119W	CHINA EVERGRANDE GROUP	CYM	16891Y	CHN	CHINA EVERGRANDE GROUP	8.6
947075	WEATHERFORD INTL LTD	BMU	G48833	USA	WEATHERFORD INTL PLC	5.3
G7303Z	QTEL INTERNATIONAL FIN LTD	BMU	74866E	QAT	QATAR TELECOM QSC	3.6
G27631	DIGICEL GROUP LIMITED	BMU	G27631	JAM	DIGICEL GROUP LIMITED	3.5
00928Q	AIRCASTLE LTD	BMU	G0129K	USA	AIRCASTLE LTD	3.1
G91703	UBS GROUP FDG JERSEY LTD	JEY	H42097	CHE	UBS GROUP AG	7.2
225433	CREDIT SUISSE GROUP FDG GUERNSEY LTD	GGY	H3698D	CHE	CREDIT SUISSE GROUP AG	7.2
90351D	UBS GROUP FDG JERSEY LTD	JEY	H42097	CHE	UBS GROUP AG	7.0
G25296	CREDIT SUISSE AG	GGY	H3698D	CHE	CREDIT SUISSE GROUP AG	5.4
71647N	PETROBRAS GLOBAL FIN BV	NLD	P78331	BRA	PETROLEO BRASILEIRO SA	32.5
N1420M	BMW FINANCE NV	NLD	D0785N	DEU	BAYERISCHE MOTORENWERKE AG	22.3
L4191B	GAZ CAPITAL SA LUXEMBOURG	LUX	368287	RUS	GAZPROM PJSC	22.2
36164Q	GE CAP INTL FDG CO	IRL	369604	USA	GENERAL ELEC CO	17.5
B. Equities reallocated away from selected tax havens						
G87572	TENCENT HLDGS LTD	CYM	G87572	CHN	TENCENT HLDGS LTD	493.3
01609W	ALIBABA GROUP HLDG LTD	CYM	01609W	CHN	ALIBABA GROUP HLDG LTD	441.6
056752	BAIDU INC	CYM	056752	CHN	BAIDU INC	64.2
47215P	JD COM INC	CYM	47215P	CHN	JD COM INC	49.4
471115	JARDINE MATHESON HLDGS LTD	BMU	471115	HKG	JARDINE MATHESON HLDGS LTD	44.1
G47567	IHS MARKIT LTD	BMU	44962L	GBR	IHS MARKIT LTD	18.0
G2519Y	CREDICORP LTD	BMU	G2519Y	PER	CREDICORP LTD	16.5
G45584	HAL TRUST	BMU	G45584	NLD	HAL TRUST	14.5
G39420	GLENCORE PLC	JEY	G39420	CHE	GLENCORE PLC	75.3
82481R	SHIRE PLC	JEY	J8129E	JPN	TAKEDA PHARMACEUTICAL CO LTD	47.0
G9227K	UNITED COMPANY RUSAL PLC	JEY	G9227K	RUS	UNITED COMPANY RUSAL PLC	11.8
G4474Y	JANUS HENDERSON GROUP PLC	JEY	G4474Y	GBR	JANUS HENDERSON GROUP PLC	11.5
G1151C	ACCENTURE PLC	IRL	G1151C	USA	ACCENTURE PLC	129.1
G5960L	MEDTRONIC PLC	IRL	G5960L	USA	MEDTRONIC PLC	85.7
G29183	EATON CORP PLC	IRL	G29183	USA	EATON CORP PLC	17.4
N59465	MYLAN NV	NLD	N59465	USA	MYLAN NV	11.3

Table 1: **Largest issuer-level reallocations away from selected tax havens.** All amounts outstanding are as of December 2017. Panel A shows corporate bond reallocations, while panel B shows equity reallocations. Within each panel, we show the largest four reallocations away from the following tax havens: (i) the Cayman Islands, (ii) Bermuda, (iii) the Channel Islands (Guernsey, Jersey, and the Isle of Man), and (iv) Ireland, Luxembourg, and the Netherlands. Amounts shown correspond to face value outstanding for bonds and market values outstanding for equities.

	Share Reallocated To:															
Destination	**BMU**	**BRA**	**CAN**	**CHN**	**CYM**	**DEU**	**GBR**	**HKG**	**IND**	**IRL**	**JPN**	**LUX**	**PAN**	**RUS**	**USA**	**RoW**
BMU	1.2	0.5	1.0	1.1		0.4	9.9	1.3		1.7	1.2				64.0	17.7
BRA		100.0														
CAN		0.1	95.2	0.3		0.1	0.3				0.2				2.9	1.0
CHN				99.2			0.8									
CYM		20.1	0.1	33.0	1.4	0.1	3.5	5.5		4.2	0.9				13.3	17.8
DEU						93.4	6.2								0.3	0.2
GBR		0.2	0.1				86.5		1.4		0.2				4.0	7.7
HKG				55.0		3.7	5.8	28.1	0.2							7.2
IND									100.0							
IRL				0.1		0.4	1.8			29.4	21.9			4.7	39.4	2.3
JPN											100.0					
LUX		4.7	1.2	0.1		2.8	1.5			0.4		4.4		10.9	44.8	29.1
PAN		2.3											5.4		77.2	15.2
RUS														100.0		
USA		0.3	0.7	0.1		0.8	1.3		0.1	0.3	1.7				92.3	2.3

Table 2: **Reallocation matrix, U.S. corporate debt investments.** This table shows the share of U.S. investment into selected destination countries (*rows*) that are distributed to each other country (*columns*) on a nationality basis. Values are expressed in percentage points. The last column, Rest of World (RoW), shows the sum of the shares allocated to all remaining countries. All data are as of December 2017.

			Tax Haven Only		Full Nationality	
Destination	**ISO Code**	**TIC**	**Position**	**Δ**	**Position**	**Δ**
A. Selected Non-Tax Haven Countries						
Argentina	ARG	5	5	0	5	0
Australia	AUS	144	144	0	149	5
Brazil	BRA	8	50	42	68	59
Canada	CAN	390	391	1	411	21
China	CHN	3	47	44	55	52
France	FRA	118	120	2	109	-9
Germany	DEU	60	80	20	119	59
India	IND	6	6	1	21	15
Indonesia	IDN	5	7	1	9	4
Italy	ITA	16	29	13	35	18
Japan	JPN	80	95	15	188	108
Mexico	MEX	58	58	0	60	2
Russia	RUS	0	12	12	12	12
Saudi Arabia	SAU	1	1	0	2	1
Spain	ESP	16	19	2	52	36
South Africa	ZAF	1	6	4	7	5
South Korea	KOR	11	11	0	17	6
Turkey	TUR	4	4	0	4	0
United Kingdom	GBR	308	325	17	362	54
B. Selected Tax Havens						
Bermuda	BMU	30	0	-30	0	-30
Cayman Islands	CYM	80	1	-79	1	-79
Curaçao	CUW	3	0	-3	0	-3
Guernsey	GGY	13	0	-13	0	-13
Hong Kong	HKG	8	7	-1	9	0
Ireland	IRL	63	24	-39	40	-23
Jersey	JEY	14	0	-14	0	-14
Luxembourg	LUX	72	3	-69	3	-69
Netherlands	NLD	179	93	-86	114	-65
Panama	PAN	3	0	-3	0	-3
British Virgin Islands	VGB	14	0	-14	0	-14
C. Domestic Reallocation						
United States	USA	5,247*	5,352	104	4,976	-271

Table 3: **Estimated nationality-based outward U.S. corporate debt portfolios.** This table presents estimates of restated outward U.S. corporate debt portfolio positions on a nationality basis, which we compare to TIC data. We present estimates which only reallocate holdings away from tax havens (*Tax Haven Only*), as well as estimates obtained under an alternative treatment that also reallocates holdings in countries that are not tax havens (*Full Nationality*). Positions in the *TIC* column with an asterisk (*) are our estimates. Corporate debt is defined in TIC as private debt holdings minus holdings of asset-backed securities. All data are as of December 2017.

			Tax Haven Only		Full Nationality	
Destination	**ISO Code**	**TIC**	**Position**	**Δ**	**Position**	**Δ**
A. Selected Non-Tax Haven Countries						
Argentina	ARG	9	11	1	18	8
Australia	AUS	181	182	1	184	3
Brazil	BRA	119	120	1	107	-13
Canada	CAN	493	500	8	527	35
China	CHN	154	695	541	695	541
France	FRA	434	447	14	459	25
Germany	DEU	375	385	10	403	27
India	IND	179	181	2	173	-6
Indonesia	IDN	40	40	0	31	-8
Italy	ITA	96	105	10	115	19
Japan	JPN	895	911	17	907	12
Mexico	MEX	64	64	0	61	-3
Russia	RUS	55	62	7	61	7
Saudi Arabia	SAU	0	0	0	0	0
Spain	ESP	123	123	0	130	7
South Africa	ZAF	100	100	0	101	1
South Korea	KOR	226	226	0	225	-1
Turkey	TUR	22	22	0	22	0
United Kingdom	GBR	1,019	1,146	126	1,005	-15
B. Selected Tax Havens						
Bermuda	BMU	195	1	-194	1	-194
Cayman Islands	CYM	547	0	-547	0	-547
Curaçao	CUW	68	0	-68	0	-68
Guernsey	GGY	14	0	-14	0	-14
Hong Kong	HKG	147	134	-13	134	-12
Ireland	IRL	385	71	-315	71	-314
Jersey	JEY	94	0	-94	0	-94
Luxembourg	LUX	33	4	-29	4	-29
Netherlands	NLD	339	272	-67	372	34
Panama	PAN	26	0	-26	0	-26
British Virgin Islands	VGB	15	0	-15	0	-15
C. Domestic Reallocation						
United States	USA	19,530*	20,125	596	20,292	762

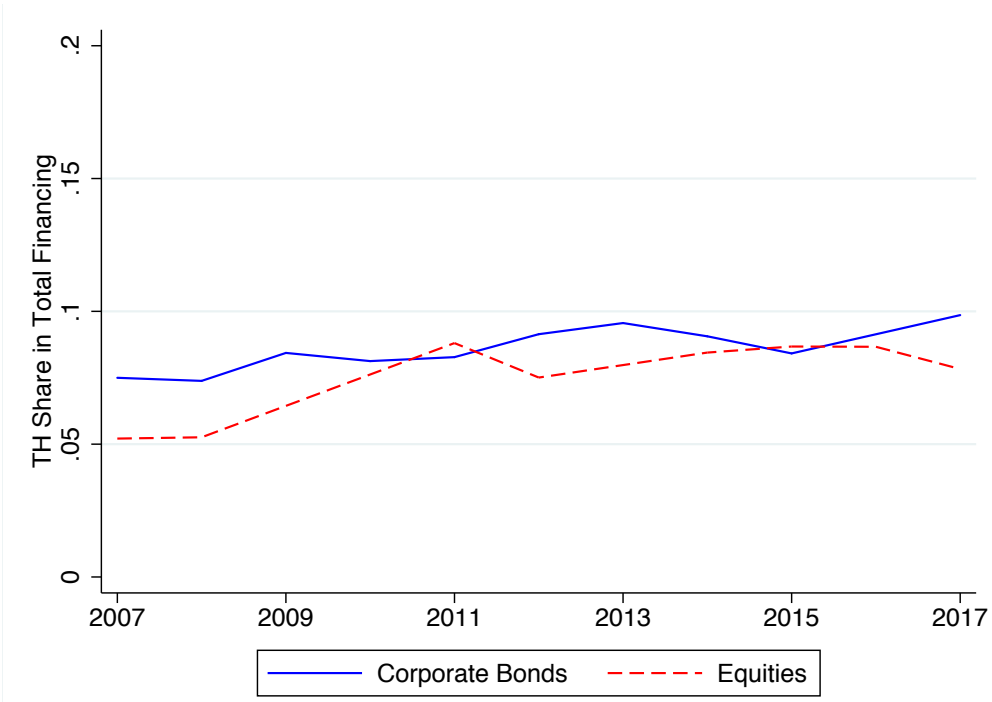
Table 4: **Estimated nationality-based outward U.S. equity portfolios.** This table presents estimates of restated outward U.S. equity portfolio positions on a nationality basis, which we compare to TIC data. We present estimates which only reallocate holdings away from tax havens (*Tax Haven Only*), as well as estimates obtained under an alternative estimation treatment that also reallocates holdings in countries that are not tax havens (*Full Nationality*). Positions in the *TIC* column with an asterisk (*) are our estimates. All data are as of December 2017.

Destination	ISO Code	CPIS	Tax Haven Only		Full Nationality	
			Position	Δ	Position	Δ
A. Selected Non-Tax Haven Countries						
Argentina	ARG	37	37	0	36	0
Australia	AUS	173	177	4	190	18
Brazil	BRA	50	120	71	134	85
Canada	CAN	191	197	6	204	13
China	CHN	19	92	73	107	88
India	IND	19	26	7	47	28
Indonesia	IDN	44	50	5	55	10
Japan	JPN	209	219	11	250	42
Mexico	MEX	98	99	2	110	13
Russia	RUS	36	107	72	107	72
Saudi Arabia	SAU	3	5	2	5	2
South Africa	ZAF	28	35	7	47	19
South Korea	KOR	25	26	1	27	2
Turkey	TUR	39	39	0	38	-1
United Kingdom	GBR	1,279	1,415	136	1,224	-56
United States	USA	1,904	2,109	206	2,092	188
B. Selected Tax Havens						
Bermuda	BMU	23	2	-21	2	-21
Cayman Islands	CYM	95	6	-89	6	-89
Curaçao	CUW	5	0	-5	0	-5
Guernsey	GGY	17	0	-17	0	-17
Hong Kong	HKG	21	12	-8	16	-5
Ireland	IRL	293*	135	-158	142	-151
Jersey	JEY	47	0	-47	0	-47
Luxembourg	LUX	535*	23	-512	23	-512
Netherlands	NLD	984*	520	-464	565	-420
Panama	PAN	8	5	-4	5	-4
British Virgin Islands	VGB	32	0	-31	0	-31
C. Domestic Reallocations						
France	FRA	1,765*	1,794	29	1,677	-88
Germany	DEU	1,397*	1,668	271	1,680	283
Italy	ITA	1,520*	1,643	123	1,662	142
Spain	ESP	881*	962	80	1,016	135
European Monetary Union	EMU	8,855*	8,255	-601	8,301	-554

Table 5: **Estimated nationality-based outward EMU total debt portfolios.** This table presents estimates of restated outward EMU total debt portfolio positions on a nationality basis, which we compare to CPIS data. We present estimates which only reallocate holdings away from tax havens (*Tax Haven Only*), as well as estimates obtained under an alternative estimation treatment that also reallocates holdings in countries that are not tax havens (*Full Nationality*). Positions in the *CPIS* column with an asterisk (*) are our estimates. All data are as of December 2017.

			Tax Haven Only		Full Nationality	
Destination	**ISO Code**	**CPIS**	**Position**	**Δ**	**Position**	**Δ**
A. Selected Non-Tax Haven Countries						
Argentina	ARG	4	4	0	5	1
Australia	AUS	61	62	1	65	4
Brazil	BRA	53	54	0	46	-7
Canada	CAN	92	96	5	103	12
China	CHN	96	333	237	330	234
India	IND	86	86	0	85	0
Indonesia	IDN	18	18	0	18	-1
Japan	JPN	314	328	14	330	16
Mexico	MEX	19	19	0	20	1
Russia	RUS	46	53	7	52	6
Saudi Arabia	SAU	2	2	0	2	0
South Africa	ZAF	33	33	0	34	1
South Korea	KOR	95	95	0	95	-1
Turkey	TUR	11	11	0	11	0
United Kingdom	GBR	582	694	112	632	50
United States	USA	1,666	2,026	360	2,056	389
B. Selected Tax Havens						
Bermuda	BMU	38	1	-37	1	-37
Cayman Islands	CYM	223	0	-223	0	-223
Curaçao	CUW	7	0	-7	0	-7
Guernsey	GGY	20	0	-20	0	-20
Hong Kong	HKG	64	48	-17	48	-16
Ireland	IRL	707*	352	-355	352	-355
Jersey	JEY	50	0	-50	0	-50
Netherlands	NLD	333*	282	-51	332	-1
Panama	PAN	3	0	-3	0	-3
British Virgin Islands	VGB	10	0	-10	0	-10
C. Domestic Reallocations						
France	FRA	1,339*	1,343	5	1,353	14
Germany	DEU	1,307*	1,307	0	1,304	-3
Italy	ITA	479*	485	5	486	7
Spain	ESP	262*	262	0	257	-5
European Monetary Union	EMU	4,791*	4,381	-410	4,427	-364

Table 6: **Estimated nationality-based outward EMU equity portfolios.** This table presents estimates of restated outward EMU equity portfolio positions on a nationality basis, which we compare to CPIS data. We present estimates which only reallocate holdings away from tax havens (*Tax Haven Only*), as well as estimates obtained under an alternative estimation treatment that also reallocates holdings in countries that are not tax havens (*Full Nationality*). Positions in the *CPIS* column with an asterisk (*) are our estimates. All data are as of December 2017. We drop holdings of the EMU in Luxembourg since the ultimate investments are accounted for by the foreign investments of Luxembourg.

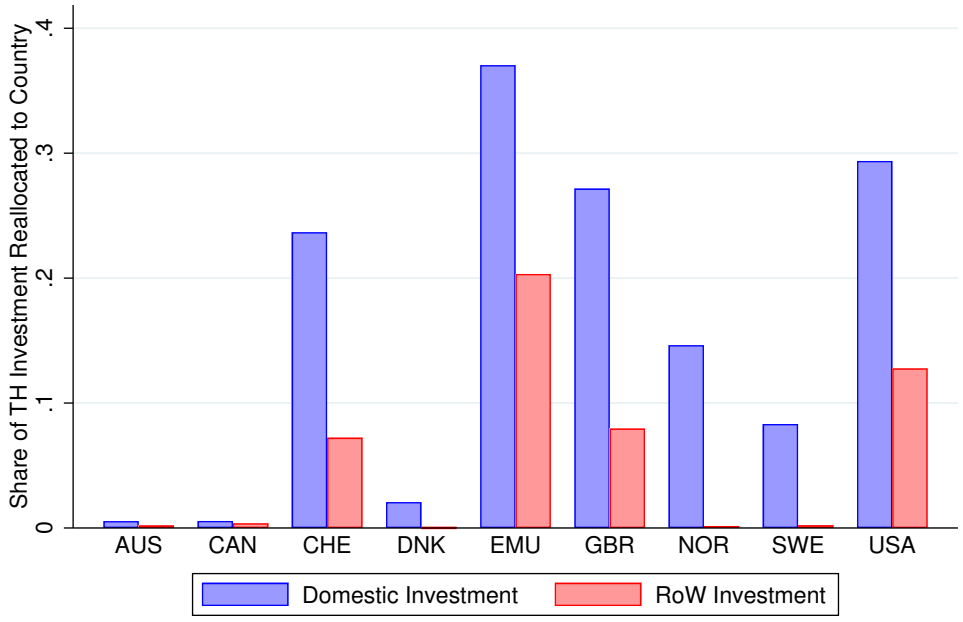


(a) Total Financing

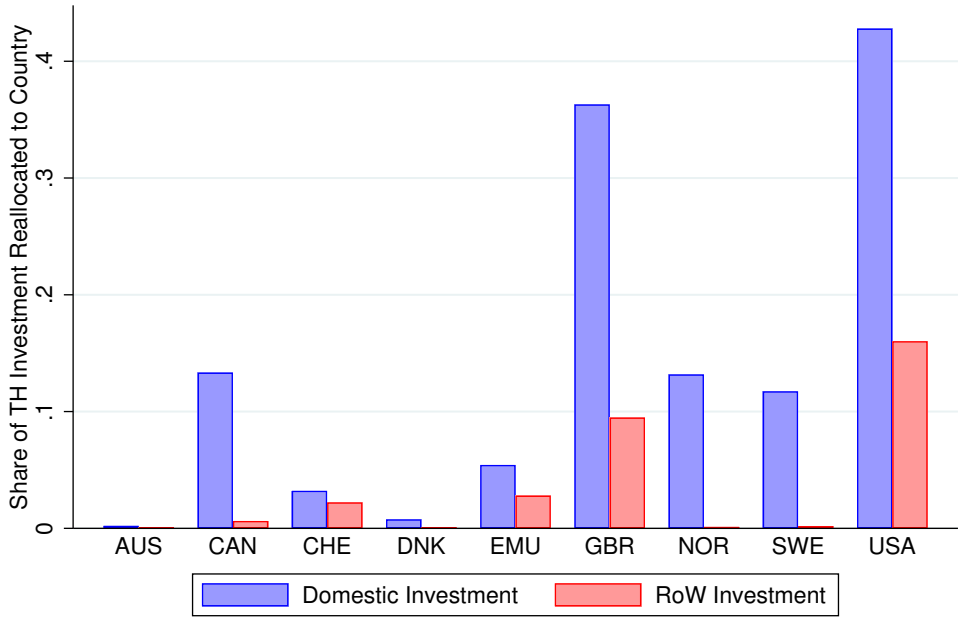


(b) Cross-Border Financing

Figure 1: **The rise of tax haven issuance.** Panel A plots the share of all equity and corporate debt securities worldwide that are issued using tax haven affiliates. Panel B plots the share of cross-border securities that are issued using tax haven affiliates. Cross-border securities include all securities issued by affiliates located outside the country of operations of their ultimate parent firm.

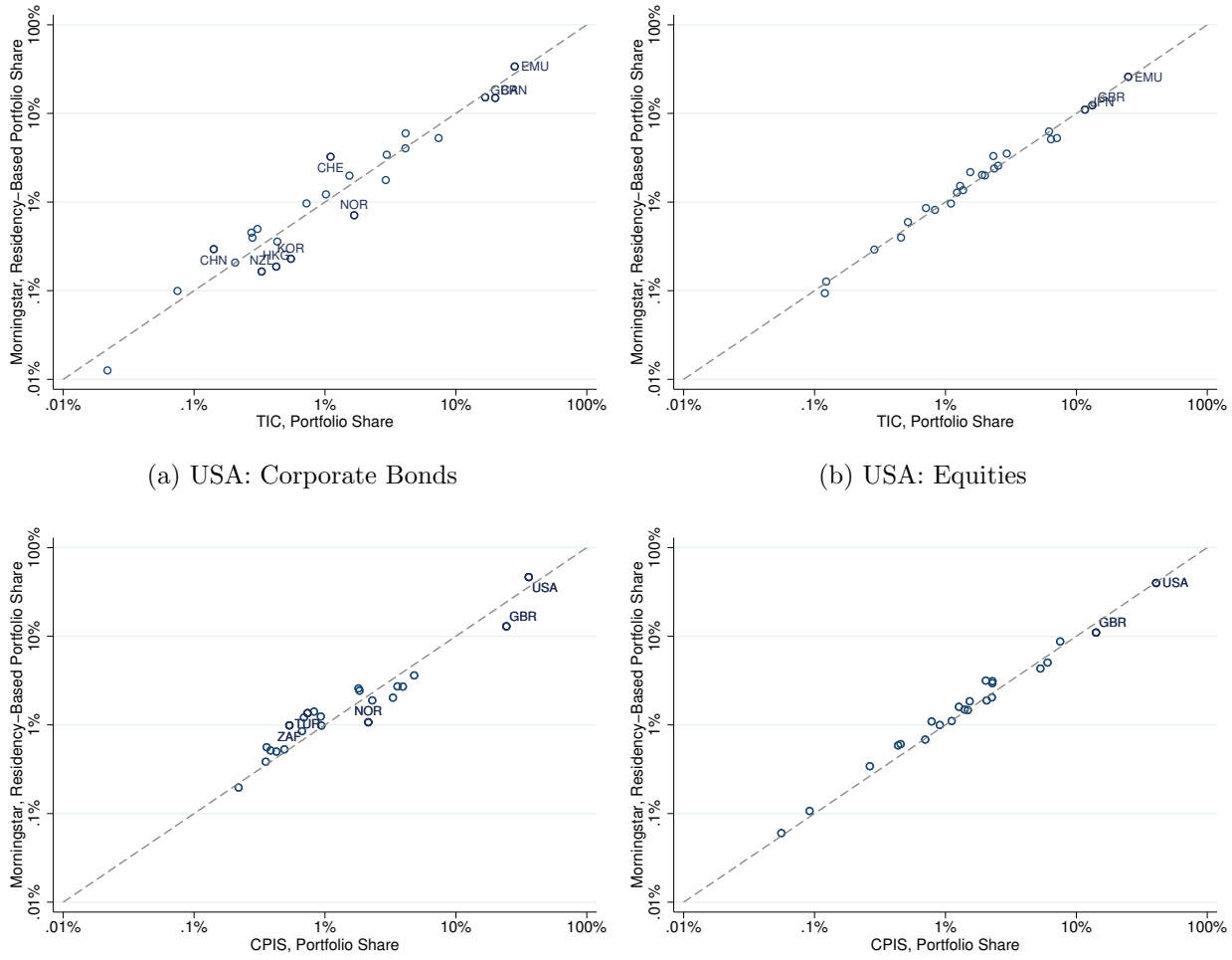


(a) Corporate Bonds



(b) Equity

Figure 2: **Home bias in tax havens.** For each investing country, we show the share of that country's tax haven investments that are reallocated domestically on a nationality basis (*blue bars*), and the share of all other countries' tax haven investments that are reallocated to that country on a nationality basis (*red bars*). Panel A plots these statistics for corporate bond portfolios; panel B does the same for equity portfolios. All data are for the year 2017.



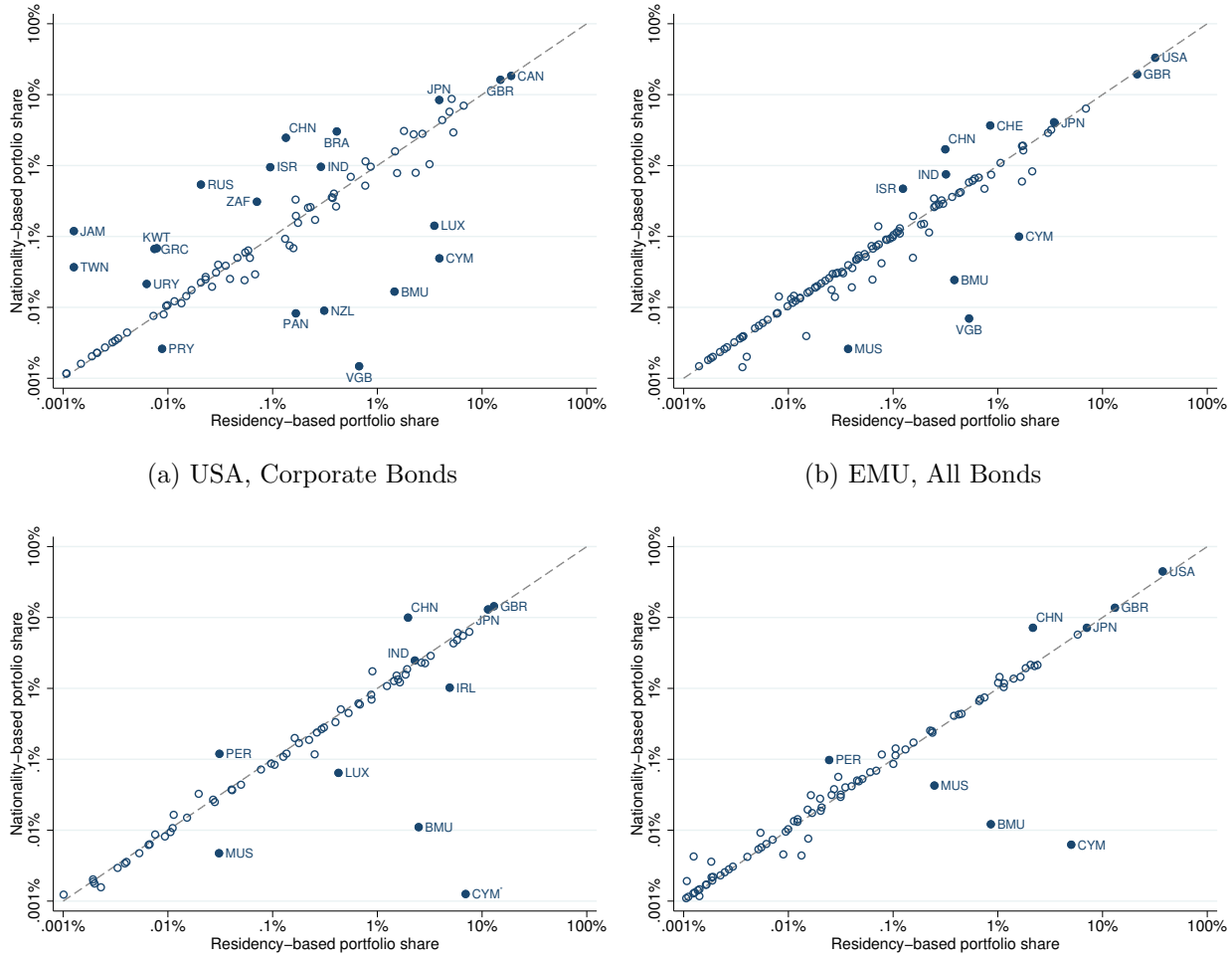
(a) USA: Corporate Bonds

(b) USA: Equities

(c) EMU: All Bonds

(d) EMU: Equities

Figure 3: **Alignment between official bilateral external portfolio composition and residency-based Morningstar data: USA and the EMU.** Panels A and B show the shares that each foreign destination country represents in USA outward portfolio holdings, both as computed in the Morningstar 2017 end-of-year sample using a residency criterion (*horizontal axis*), and as reported in the 2017 TIC data (*vertical axis*). Corporate debt positions are defined in TIC as holdings of private debt minus holdings of asset-backed securities; TIC equity positions exclude holdings of fund shares and other non-common equity. Panel A includes corporate debt securities; panel B includes all equity securities. Panels C and D repeat the same exercise for the positions reported by EMU member countries in CPIS. Panel C includes all debt securities; panel D includes all equity securities.



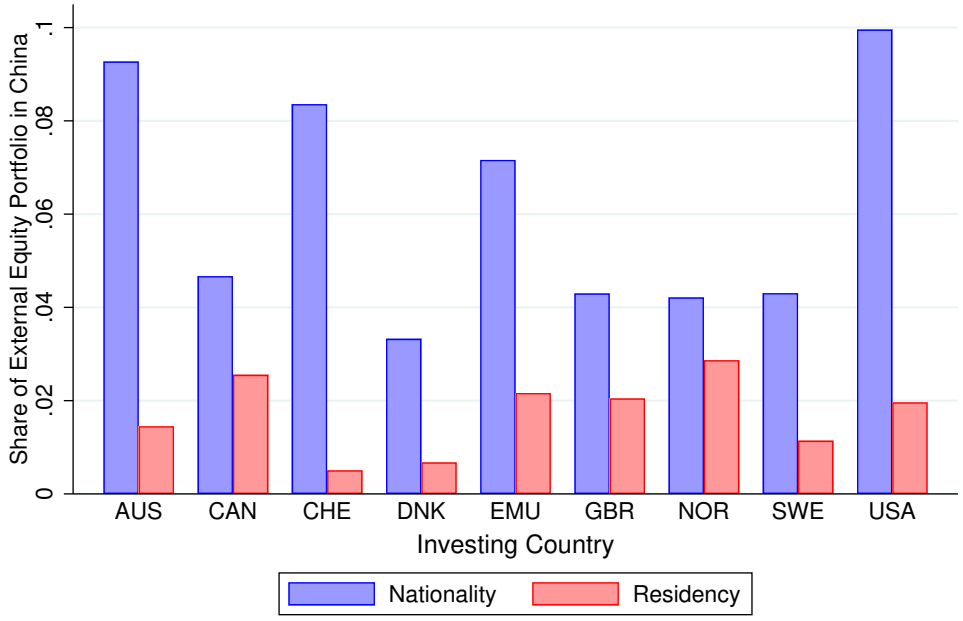
(a) USA, Corporate Bonds

(b) EMU, All Bonds

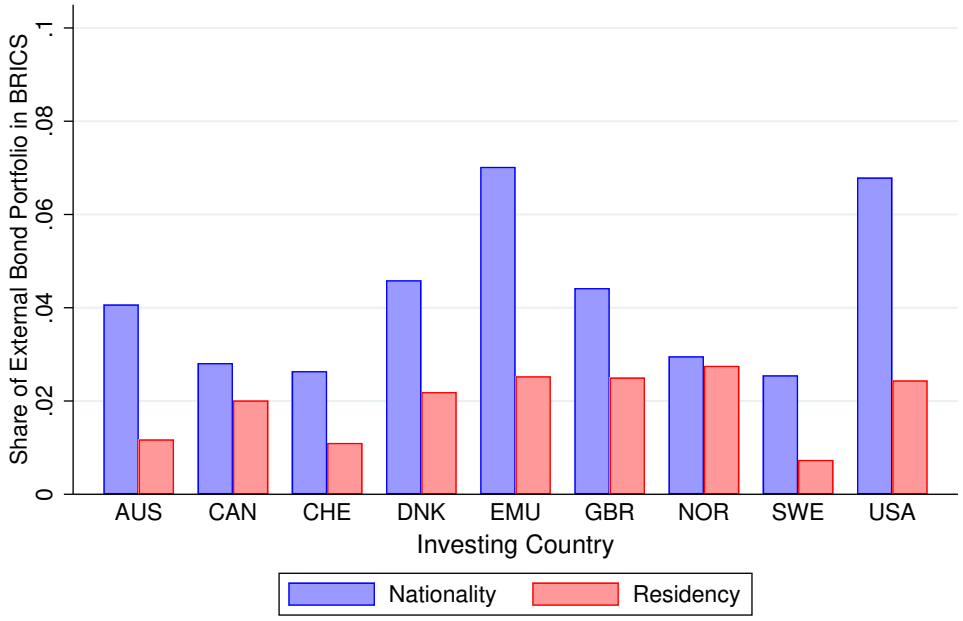
(c) USA, Equities

(d) EMU, Equities

Figure 4: **Bilateral shares of outward portfolios from USA and EMU: official vs. restated nationality-based TIC and CPIS positions.** This figure shows the shares that each foreign destination country represents in the outward portfolio holdings of the USA and EMU on a residency basis (*horizontal axis)* and on a nationality basis (*vertical axis).* The residency-based data come from the official TIC and CPIS releases, while the nationality-based data correspond to our restated versions of TIC and CPIS. Top panels shows corporate bond portfolios for the USA and bond portfolios for the EMU; bottom panels show equity portfolios. All data are for the year 2017. We use the "Full Nationality" estimates shown in Tables 3-6 in order to provide a full visualization of our reallocations. The Cayman Islands dot in Panel C is marked with an asterisk to indicate that the Caymans share under nationality is in fact lower than .001 percent.

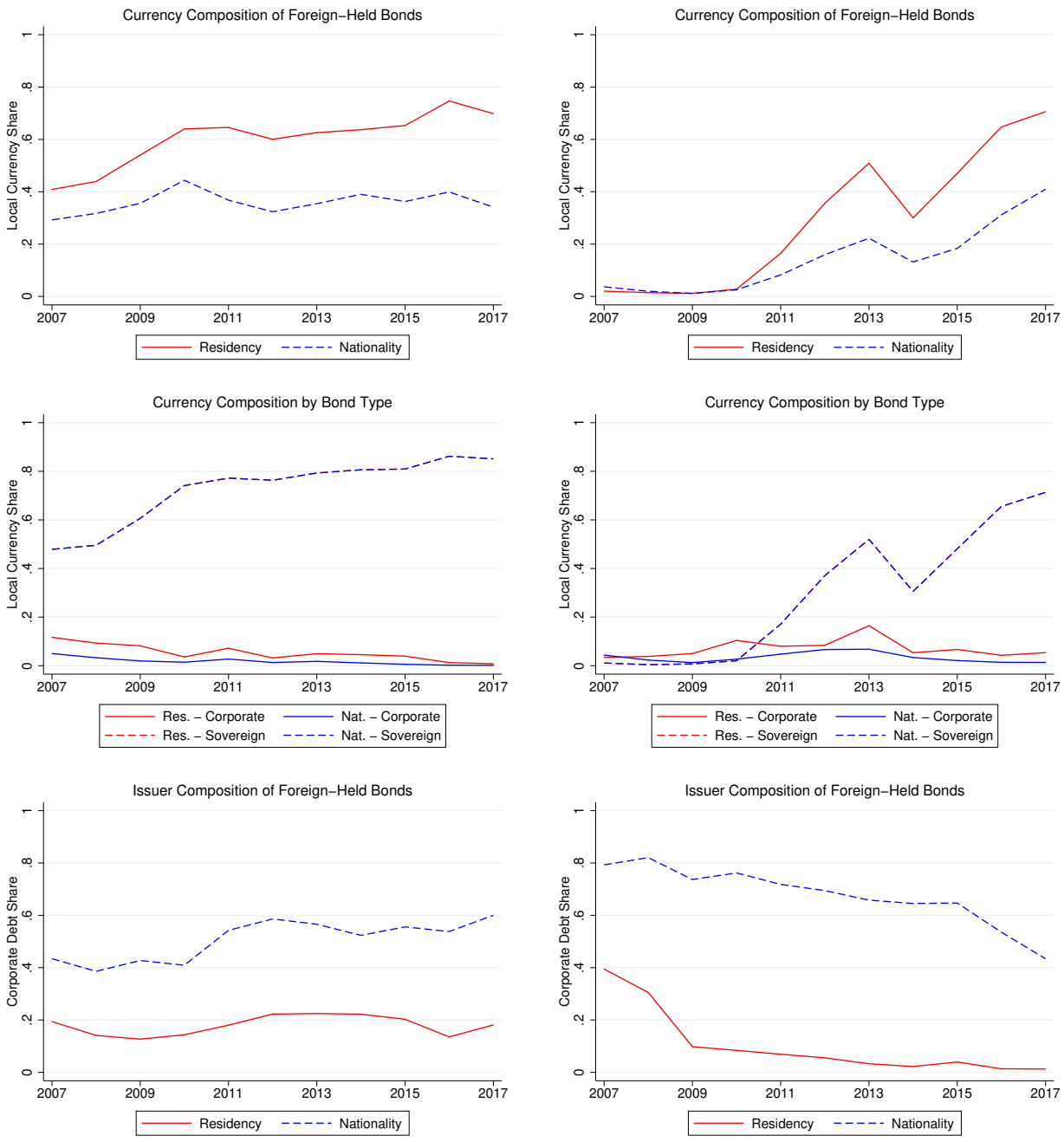


(a) External Equity Portfolio Investment in China



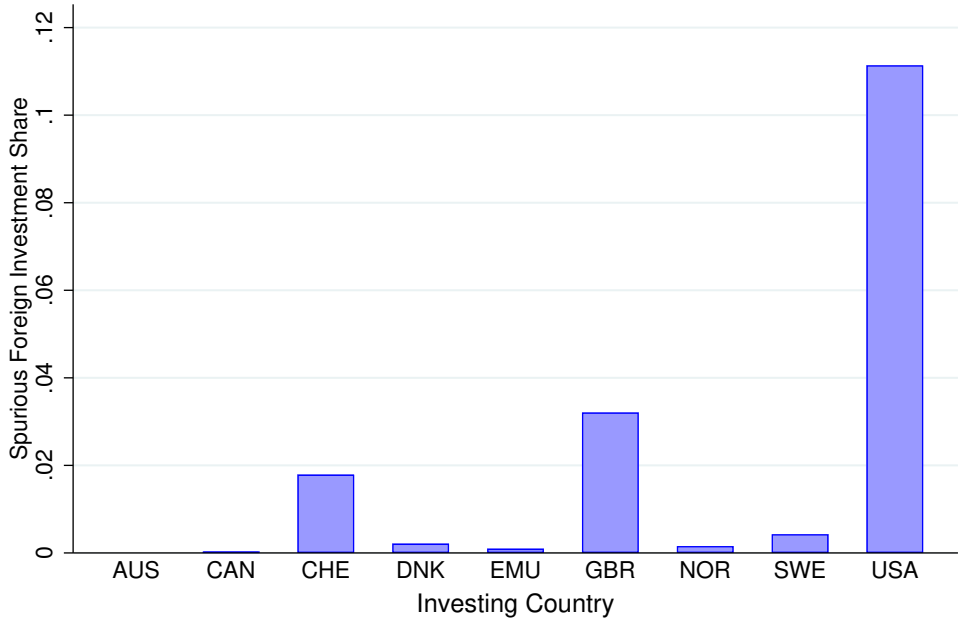
(b) External Bond Portfolio Investment in BRICS

Figure 5: **Portfolio shares in Chinese equities and BRICS debt, across countries: residency vs. nationality.** Using our restated TIC and CPIS data for each investing country, we show the share of all external equity investments that are attributed to China (*panel A*), as well as the share of all external bond investments that are attributed to BRICS countries (Brazil, China, India, Russia, and South Africa; *panel B*). We show this on both a nationality basis and on a residency basis. Nationality bars use our "Tax Haven Only" estimates. All data are for the year 2017.

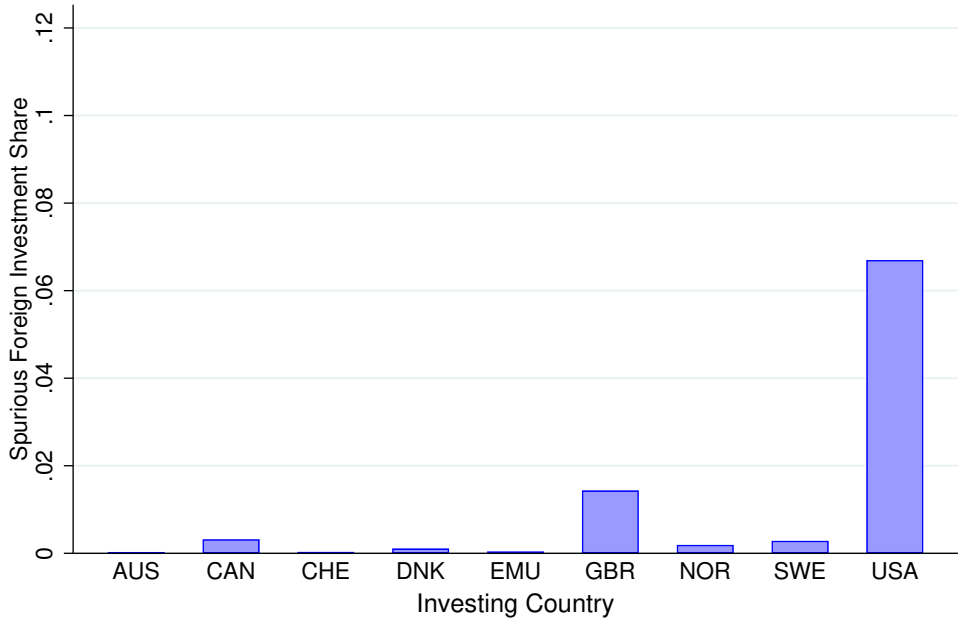


(a) Brazil (b) Russia

Figure 6: **Currency exposures in external portfolio debt liabilities.** The top plots show the local currency shares in the external portfolio debts of Brazil (*panel A*) and Russia (*panel B*), under residency and nationality. The middle plots show the local currency shares under residency and nationality, separately for corporate and sovereign bonds. The bottom plots show the shares of corporate bonds in total external portfolio debt under residency and nationality. All plots use our "Full Nationality" treatment. See Appendix Section C for details on the construction of these figures.



(a) Bond Investments



(b) Equity Investments

Figure 7: **Spurious foreign investment due to tax havens.** This figure plots the share of all cross-border investment in bonds (*panel A*) and equities (*panel B*) of each of the nine investing countries in our sample that is reallocated away from tax havens and reclassified as domestic investment on a nationality basis. For the USA, we exclude equity investments in fund shares and other non-common equity.

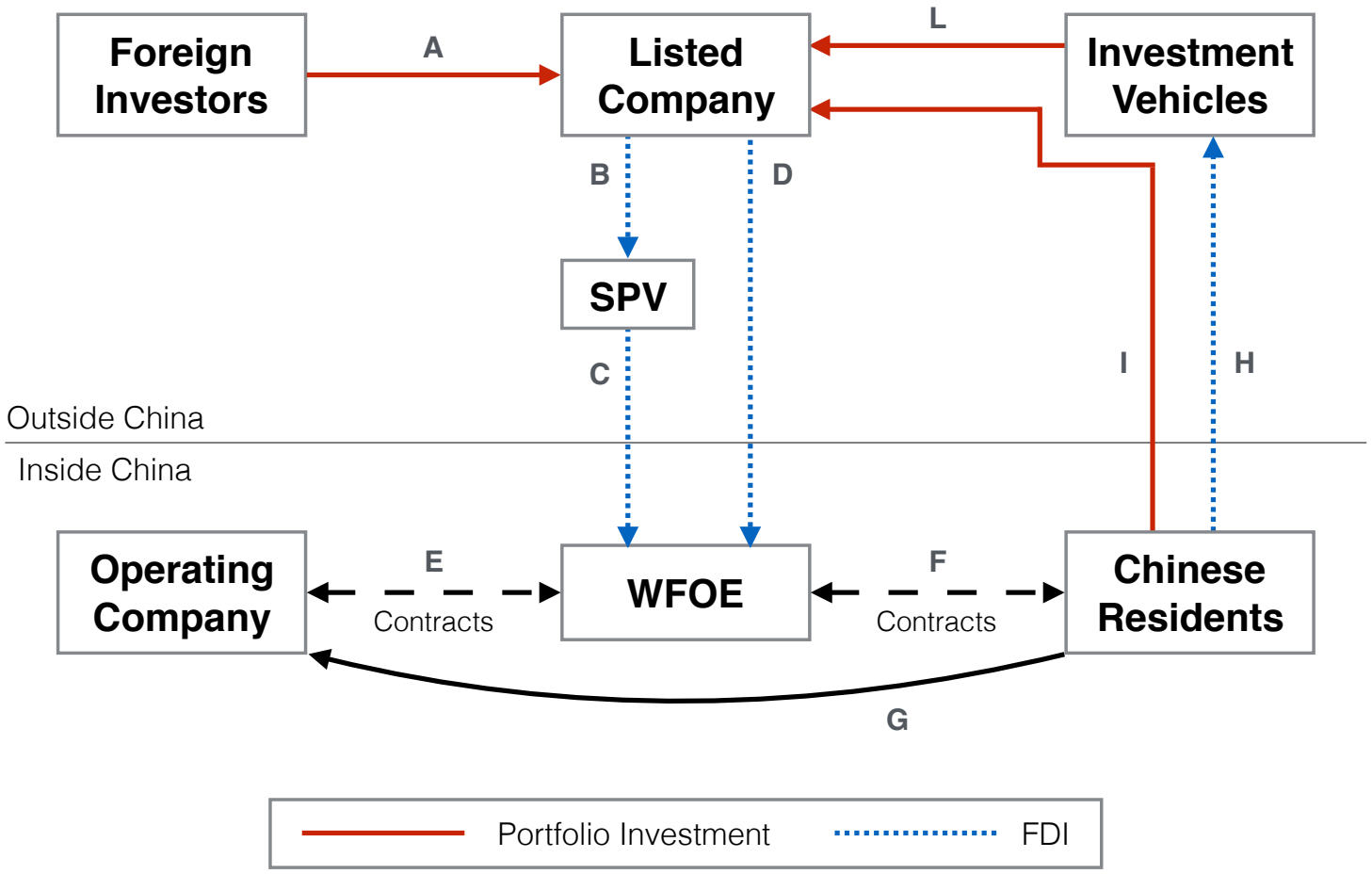
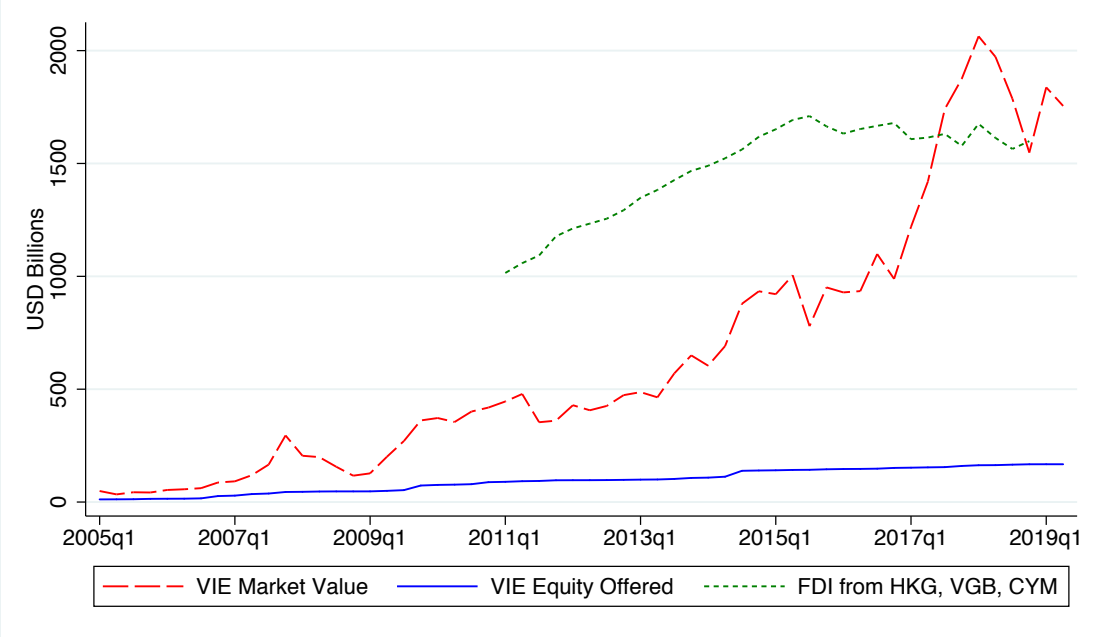
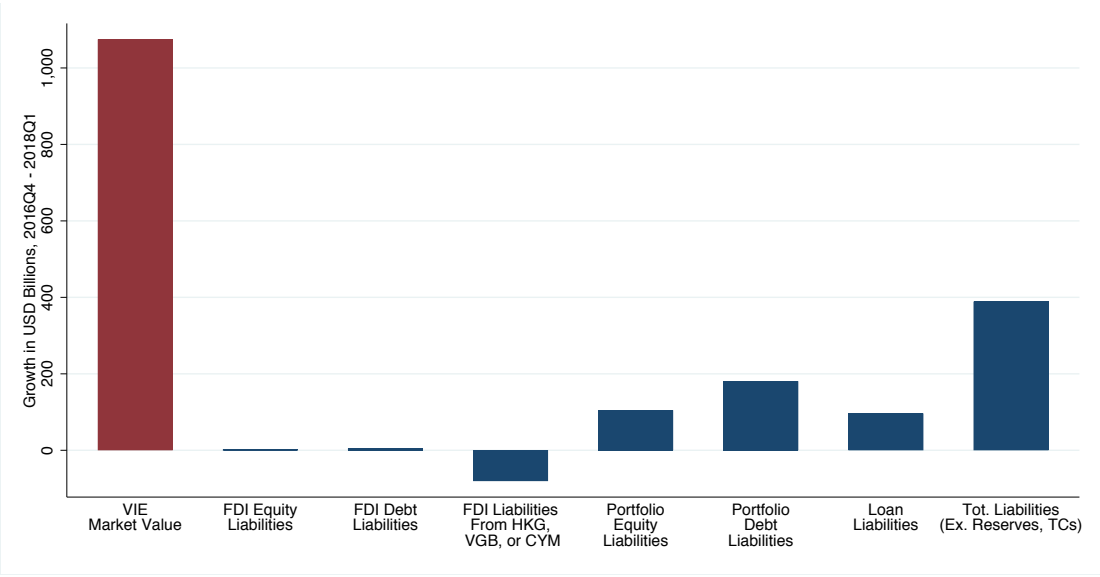


Figure 8: **VIE structure.** This figure displays a simplified characterization of the Variable Interest Entity (VIE) structure used by Chinese firms in order to access foreign capital. The Operating Company in China is fully owned by Chinese residents (*arrow G*). The public Listed Company is located offshore, generally in the Cayman Islands: foreign investors (*arrow A*) and some Chinese residents (*arrow I*) can hold shares in it. Chinese residents may also own stakes in offshore investment vehicles (*arrow H*) that own shares in the Listed Company on their behalf (*arrow L*). The Listed Company owns a Wholly Foreign Owned Enterprise (WFOE) inside China (*arrow D*), oftentimes through a special purpose vehicle (SPV) located in Hong Kong, the Cayman Islands, or the British Virgin Islands (*arrows B and C*). The WFOE engages in contracts with the Operating Company and its Chinese owners (*arrows E and F*) designed to transfer the profits of the Operating Company to the Listed Company. We highlight separately portfolio investment (*solid red arrows*) and FDI (*dashed blue arrows*) in the diagram.

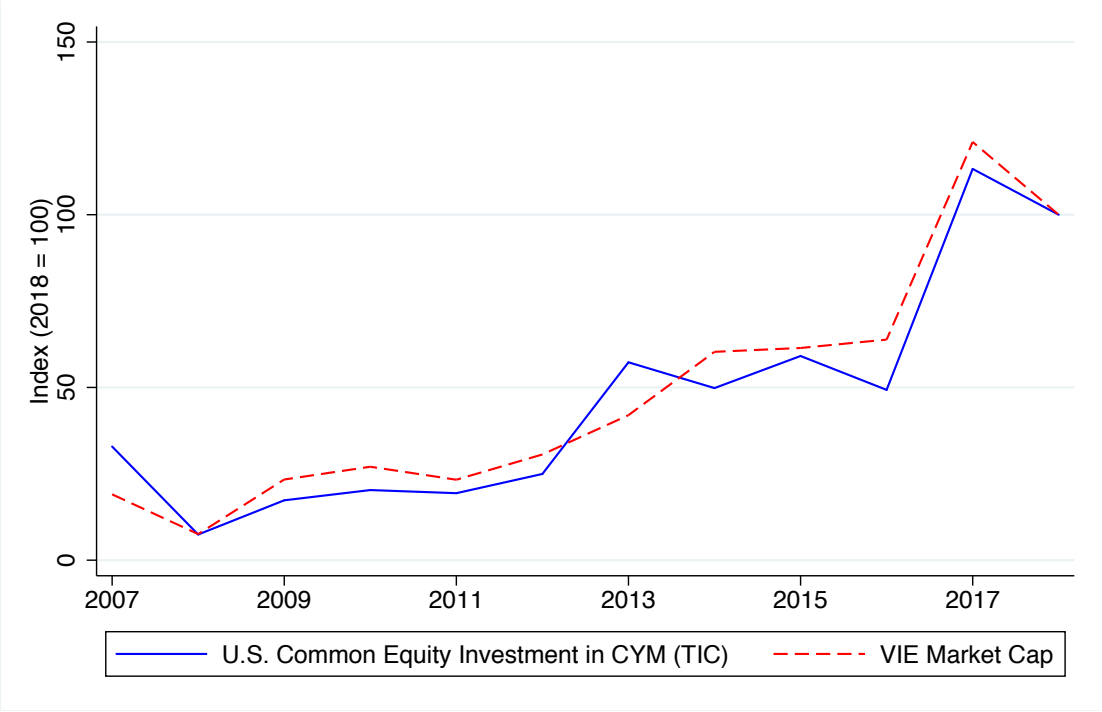


(a) VIE Market Value, Equity Offered, and Inward FDI

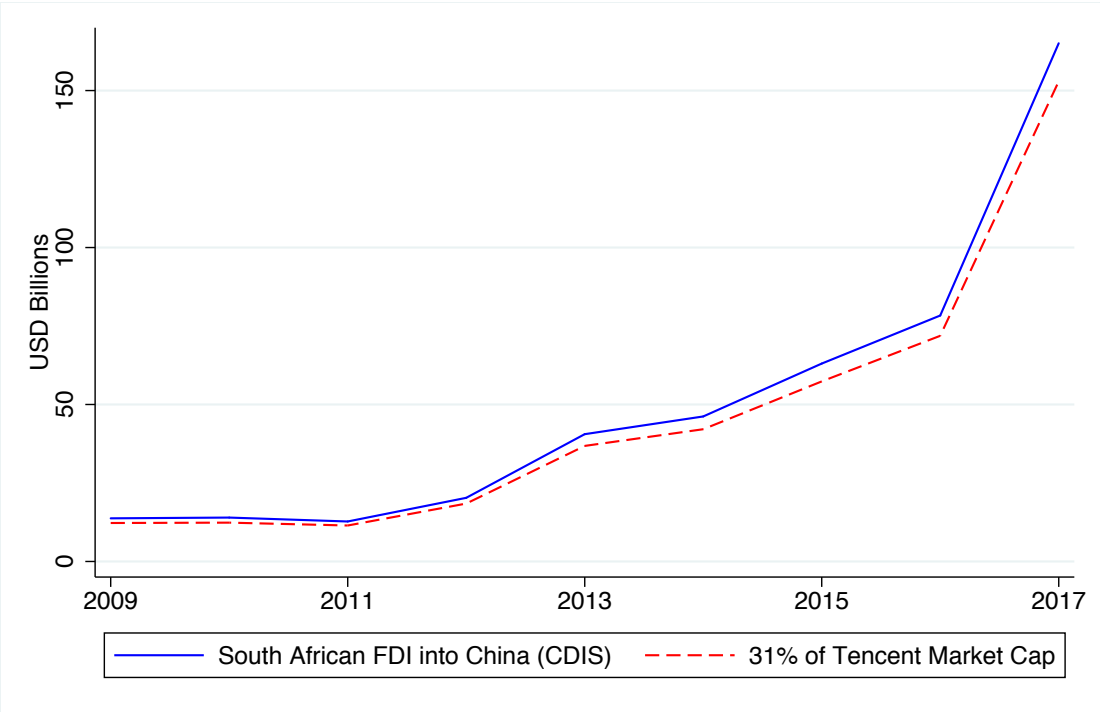


(b) VIE Market Value and External Liabilities

Figure 9: **China's external liabilities do not track VIEs' listed stock prices.** Panel A plots the total market value of all Chinese companies listed offshore via VIE structures (*long-dashed red line*), together with a measure of the cumulative value of VIE equity offerings (*solid blue line*). The graph also shows the total value of all inward FDI positions in China from Hong Kong, the Cayman Islands, and the British Virgin Islands (*short-dashed green line*). Panel B shows the change in market value for all VIEs between 2016Q4 and 2018Q1, alongside the contemporaneous changes in various categories of China's external liabilities, as reported by China's State Administration of Foreign Exchange.



(a) U.S. Common Equity Investments in CYM



(b) South African FDI into China

Figure 10: **Counterexamples: recorded external positions track VIE market prices elsewhere.** Panel A shows close co-movement of the U.S. position in Cayman Islands common equity investments (from TIC) and the market capitalization of the VIEs. Panel B shows close co-movement between South Africa's FDI position into China (from CDIS) and the market capitalization of Tencent: the South African FDI position is nearly entirely accounted for by the 31 percent share of Tencent owned by the South African firm Naspers.

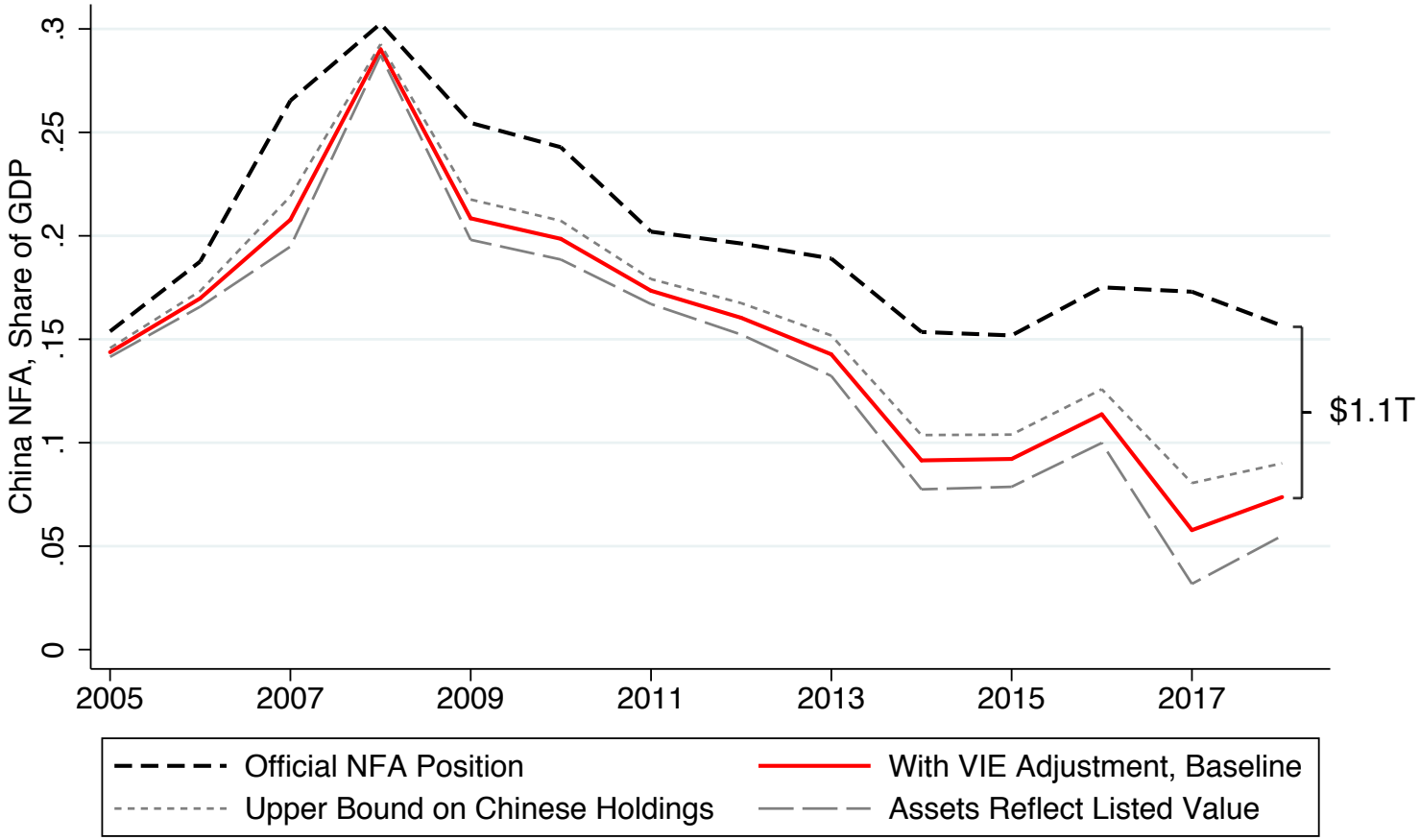


Figure 11: **Mismeasurement of China's Net Foreign Asset (NFA) position.** This graph shows China's official NFA position as a share of GDP (*dashed black line*), alongside our estimated NFA position, which accounts for the valuation effects due to the increases in the market values of the VIEs (*solid red line*). The estimate labeled "Upper Bound on Chinese Holdings" (*short-dashed gray line*) assigns to China any unattributed positions in the VIEs and any positions held by funds resident in the Cayman Islands or British Virgin Islands. The estimate labeled "Assets Reflect Listed Value" assumes that all recorded Chinese external assets track listed share prices (*long-dashed gray line*). See Section 3.3.3 and Appendix Section D for details on the construction of these estimates.