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

Antonio Coppola*   Matteo Maggiori†   Brent Neiman‡   Jesse Schreger§

January 2020

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 private capital flows from developed countries to firms in large emerging markets are 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, while China's official net creditor position to the rest of the world may be overstated by as much as 50 percent. We additionally show how taking account of offshore issuance is important for our understanding of the currency composition of external liabilities, the nature of foreign direct investment, and the growth of financial globalization.

Keywords: Tax Havens, Offshore, China, Variable Interest Entities, Lucas Paradox.

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

*Harvard University, Department of Economics; acoppola@g.harvard.edu.
†Stanford University Graduate School of Business, NBER, and CEPR; maggiori@stanford.edu.
‡University of Chicago Booth School of Business, NBER, and CEPR; brent.neiman@chicagobooth.edu.
§Columbia Business School and NBER; jesse.schreger@columbia.edu.

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 private capital flows 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 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, Neiman and Schreger (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

---

[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.

by Petrobras International 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 13 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 13 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 13 percent to calculate the value of those bonds that should under nationality be considered to be Brazilian. 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), United Kingdom (U.K.), Canada, Switzerland, Australia, Sweden, Denmark, and Norway.

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 and any funds not in the Morningstar data. 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, mutual funds

---

[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. Balance of Payments and International Investment Position. The CPIS dataset covers the foreign bilateral portfolio investments of a large number of other countries.

and ETFs are the largest cross-border investors in securities.

Our nationality-based statistics paint a vastly different picture of global investment patterns than the original residency-based data and we highlight four broad findings. First, we report significantly larger portfolio investments from developed markets to 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.[3] We report that U.S. investments in Brazilian corporate bonds equal $44 billion, much larger than the $8 billion position listed in TIC. EMU holdings of Russian debt triples from $35 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. Lucas (1990) famously noted the paradoxically small magnitude of North-to-South investments. Our work provides a sizable upward revision in such investments in large emerging economies such as Brazil, China, India, and Russia (the "BRIC" countries).

Second, in our restated data, foreign-currency corporate bonds account for a greater share of flows from large developed countries to large emerging markets. For some emerging markets, nearly all of the corporate sector's debt 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 relative 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 debt on a nationality basis, together with the fact that external corporate debt is 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 economies.

---

[3]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.

For example, switching from residency to nationality reduces the local currency share of external portfolio debt from 80 to 50 percent for Brazil and from about 70 to 40 percent for Russia.[4]

Third, we show that for some countries 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 equity holdings and 12 percent of all foreign bond holdings in official statistics are actually domestic investment. 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 2 and 4 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.

Fourth, we show that offshore issuances cause what would otherwise be portfolio flows to instead be classified as FDI and demonstrate how, as as result, China's reported net foreign asset (NFA) position is nearly 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 balance of payments (BoP) and international investment position (IIP). 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 BoP and IIP. Whereas portfolio liabilities are marked to market, FDI liabilities, far more often, are not. Consistent with this possibility, we demonstrate that during 2016-2018, when China's offshore listed companies increased in market value by nearly $1 trillion, China's FDI liabilities barely moved. As a result, our analysis suggests that China's true NFA position is $1 trillion smaller than the $2.1 trillion officially reported.[5]

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

---

[4]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 based on statistics under the residency principle.

[5]This pattern of portfolio flows being masked as FDI flows 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 flows carries important policy implications as countries often differentially regulate these flows based on the presumption they exhibit different dynamic behavior.

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.[6]

Our paper proceeds as follows. Section 1 presents our algorithm for matching parents and subsidiaries and details how we apply this subsidiary-parent mapping to security-level data on fund holdings. Section 2 then reports restated TIC and CPIS data under nationality, detailing the major differences and exploring key implications. Section 3 demonstrates how, due to offshore issuance, China's NFA is overstated in the official statistics. Finally, Section 4 concludes.

Related Literature. 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. (2018), for example, highlight

---

[6]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 B details the primary motivations and offers examples for each corresponding case. See also Fuertes and Serena (2016), who investigate how firms choose in which international markets to borrow.

the growing importance of tax havens in intermediating global capital flows, which renders standard datasets increasingly inadequate. Bertaut, Bressler and Curcuru (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, Elkjaer and Johannesen (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 flows for multiple countries and under different scenarios. Our approach stresses replicability for other researchers and open availability of code and data.[7] 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 obviously have 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). Lucas (1990), Gourinchas and Jeanne (2013), and Alfaro et al. (2008) focus on the puzzling behavior of North-to-South capital flows. 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.

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 foreign lending by Horn, Reinhart and Trebesch (2019).

Finally, 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, Wier and Zucman (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 exposure. Our results shed light a different role of tax havens as conduits for emerging market firms to access developed market capital.

---

[7]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 unwind 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 A.

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.[8] We work with the full $26,027,455$ 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) the Morningstar holdings sample 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

---

[8]For securities by issuers resident outside of the United States and Canada, the security codes assigned by CGS are formally known as CGS International Numbering System (CINS) codes, and follow the same structure as the CUSIP codes issued in the United States and Canada. For simplicity, we thus also refer to the CINS codes as CUSIP codes. There are securities that do not have a CUSIP, but might have an alternative identifier such as an ISIN or a FIGI. We hope in future work to include these cases.

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 we consider to be tax havens. As detailed in Appendix Section A, 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 the sole purpose of securities' issuance. 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 firms 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 bonds relative to total cross-border bonds outstanding, where we now exclude domestic corporate bonds such as when the U.S. automaker General Motors issues a bond resident in the United States. The level of the lines is, by construction, higher, but the trend is 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. 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.[10] 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 database, 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 subsidiaries 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 discussed above, 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 China, Brazil, 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 operational 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

---

[10]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 obtain 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 and provide additional details in the Appendix.

the fact that the firm's operations are based in London. We link to Switzerland the significant debt financing raised by UBS and Credit Suisse through special purpose vehicles (SPVs) in Jersey and Guernsey, jointly referred to as the Channel Islands, 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.[11] 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.[12] 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 proper 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 the case in which we only reallocate tax-haven issuances and for the broader case in which we restate all issuances on a nationality basis.

---

[11]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 firm receiving a new CUSIP, which obviates the issue.

[12]We reallocate more than 90 percent of corporate bonds and equities issued by firms resident in all 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 atually operating there.

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.[13] 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. We follow MNS in restricting our sample to funds domiciled in countries with high quality holding data: the United States, the EMU, Great Britain, Canada, Switzerland, Australia, Sweden, Denmark, and Norway.[14] 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.[15]

---

[13]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 these and related data.

[14]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. 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.

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

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 $x_{i,j}^{\mathcal{R}}$ denote the dollar value of holdings in the Morningstar data of investor country j in securities issued by country i on a residency basis.[16] Let $x_{i,k,j}^{\mathcal{R}\to\mathcal{N}}$ 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 $x_{i,j}^{\mathcal{R}} = \sum_k x_{i,k,j}^{\mathcal{R}\to\mathcal{N}}$. We can then define an entry $\omega_{i,k,j}$ in our reallocation matrix for country j as:

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

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

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

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.[17] 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 that column. For example, 12.6 percent of U.S. corporate bond investments in the Cayman

Islands are reallocated to Brazil, 20.7 percent to China, and 35.1 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.

As noted above, 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 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.[18] Figure 2b plots the same statistic for equities and

---

[18]The plot does not directly compare the entries of the Ω_j matrices because it reports an aggregation

13

shows an equally pervasive home-bias in tax havens. Issuance data alone, we conclude, are not sufficient to restate bilateral accounts by nationality.

2   A New Map of Global Capital Flows

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 flow, what we refer to as "spurious foreign investment." Our restated investment tables have important implications for the Lucas Paradox, for measurement of the currency composition of external liabilities, and for financial globalization.

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 i's overall holdings, which also include other large investors such as insurance companies and hedge funds. While we cannot directly test this assumption, we demonstrate that a related condition holds, namely that bilateral country shares in outward investment under residency are similar when comparing the Morningstar data to TIC/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.[19] The close alignment between

across all tax havens. The point nonetheless holds for individual tax havens like the Cayman Islands or Bermuda.

[19]We obtain corporate bond positions in TIC starting from private debt and then removing asset-backed

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 similarly 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.[20] 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/CPIS. Columns four and five, labeled "Tax Haven Only," report nationality-based positions, and the change relative to the residency-based positions they imply, 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 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/CPIS based on the ratio of domestic to foreign investment in the Morningstar data. Specifically, we calculate:

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

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 since for most destinations they account for the vast majority of holdings.

[20]The tables in their entirety for all nine investor countries and all available asset classes are available for download.

Intuitively, we assume that mutual funds and ETFs in the Morningstar data have a similar share of domestic over total investments as do the universe of all investors covered in TIC and CPIS.[21]

2.2 North-to-South Flows are Much Larger

It has long been puzzling to economists that an advanced economy like the United States invests so little in rapidly growing emerging economies such as Brazil, China, India, and Russia. 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 nearly zero in Russia. These positions are tiny compared to the $390 billion invested in Canada, the $548 billion in the EMU, the $326 billion in the United Kingdom, and even the $144 billion allocated to Australia. Overall, BRIC economies account for only 1.1 percent of all foreign corporate debt investments made by the United States in 2017 on a residency basis. Famously, Lucas (1990) called this type of pattern a paradox since simple neoclassical theory predicts that much more capital should flow to these fast-growing economies given their assumed high marginal product of capital.

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 BRIC economies in corporate bonds from $17 to $99 billion, a 480 percent increase. The increase is broad-based with Brazil increasing from $8 to $44 billion, China from $3 to $37 billion, and Russia from $0.4 to $12 billion. Other large emerging markets also receive capital in the reallocation: U.S. corporate bond investment in South Africa jumps from $1 to $5 billion and 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

---

[21]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 and offers more detail on our treatment of this issue for the EMU, which is more nuanced given that Luxembourg, Ireland, and the Netherlands are both tax havens and domiciles of mutual funds in our data.

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 focuses on 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 flows 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 seen in Tables 5 and 6, we additionally find large increases in investments in BRIC countries coming from the EMU. EMU investments in Russian bonds increase from $35 billion to $107 billion, largely reflecting reallocation from Ireland and Luxembourg.[22] 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 BRIC countries is a widespread phenomenon found in all our investor countries.

Our finding that nationality-based data feature large flows from North to South alleviates the Lucas Paradox (Lucas, 1990). Appendix Table A.9 shows that, on a residency basis, cross-border capital flows from the nine developed countries in our data to emerg-

---

[22]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.

ing markets are 75 percent smaller than equivalent flows among developed markets when measured relative to recipients' GDPs, and 44 percent smaller when measured as a share of the recipients' amount of securities outstanding. Instead, on a nationality basis, flows to emerging economies are only 66 and 27 percent smaller, respectively. While capital flows to emerging markets remain comparatively small, our nationality-based statistics imply a less severe Lucas Paradox in securities investments than is found in residency-based data.[23]

2.3   Increasing Importance of Corporate Bond Flows

The shift to the nationality view of bilateral investment increases the importance of bond inflows to private emerging market firms relative to governments. While the previous subsection reported massive increases in the inflow of corporate bond investment to emerging markets, Appendix Table A.6 shows that reallocations are minimal for government bonds. After all, 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.[24]

TIC reports that only 24 percent of all bond positions of the United States in Brazil are corporate bonds. Under the "Full Nationality" view, this percentage is actually 63 percent. Similarly, whereas under residency U.S. bond investment in Russia is entirely dominated by government bonds, corporate bonds become equally important under nationality.

One important repercussion of this change in the importance of corporate bond flows under the nationality view is that it implies that emerging market debt held by foreigners has a higher foreign currency share. After all, most bonds issued by offshore affiliates and reallocated by our procedure to emerging markets are denominated in dollars or other foreign currencies.

Figure 6 quantifies the impact of the corporate reallocations on the currency composition of external debt for two large emerging markets: Brazil and Russia. Sovereign debt in

---

[23]Relatedly, in Appendix C, we follow the large literature on gravity in international portfolio investment, including Portes and Rey (2005), Coeurdacier and Martin (2009), and Okawa and Van Wincoop (2012), and explore the sensitivity of the estimated elasticities of gravity variables to our restatement of the bilateral investment accounts. Further, conditional on these variables, we show the negative effect of an emerging-market dummy on investment flows goes away when changing to a nationality basis in a gravity regression weighted by market size.

[24]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.

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 debt issued by Brazil and Russia and show rapid increases during 2007-2017. The solid lines correspond to corporate debt and are flat or declining from low values.[25] 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 debt. The top panels of Figure 6 show how the switch to a nationality view also substantially decreases the share of local currency debt in these countries' external portfolios. While the foreign-held debt of Brazil and Russia under residency have local currency shares in 2017 equal to 80 and 70 percent, under nationality, these shares drop to 50 and 40 percent.

These adjustments play an important role in our understanding of the wealth effects of currency movements.[26] For example, our results suggest that the influential estimates of financial exchange rates by Lane and Shambaugh (2010) understate the negative wealth effects from an emerging market currency depreciation because they do not take offshore issuance into account and so likely overstate the local currency share of foreign liabilities. Similarly, our new estimates call for a more prominent role for foreign-held corporate debt in models of emerging markets and sovereign default.

2.4   Spurious Foreign Investment

As shown in the previous subsections, our nationality-based tables reallocate significant flows from one overseas investment destination to another. Some of these flows, 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 extent of these flows and demonstrates that they are enormous for the United States, moderate in the United Kingdom, and quite muted in our other investor countries.

---

[25]Appendix Table A.12 reports results for other countries in our sample.

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

Figure 7a reports for each investor country the share of its foreign bond positions under residency that, under nationality, are in fact domestic investment. The U.S. bar is clearly the largest and indicates that nearly 12 percent of all foreign bond holdings in TIC, an amount totalling nearly $350 billion, should not by nationality be even included in the U.S. external accounts. 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.[27] 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 four 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 reflect Irish tax inversions, where a U.S. company acquires an Irish target to relocate its headquarters there and lower its tax rate.[28] 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.

---

[27]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.

[28]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 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.

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 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 flows into FDI flows. As a result, large foreign equity positions in Chinese companies have not been marked to market in China's external accounts. Finally, we show that China's NFA position, one of the world's largest, is approximately half as large as is officially reported.

3.1   The VIE Structure

The VIE structure offers a way for firms to avoid the Chinese government's restriction on foreign investment in firms 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." A VIE can then state to foreign investors that they own the company and, at the same time, can state to Chinese regulators that it is wholly owned by Chinese citizens.

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 set of bilateral contracts such that, for the purposes of international accounting and reporting, the Listed Company can represent to global investors that it owns the Operating Company.[29]

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 flows to the WFOE are where capital actually enters into mainland China for the purposes of national accounting.

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 while satisfying the requirement that regulators consider the Operating Company to be Chinese owned. 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 firm at a pre-specified price and may sign over a proxy agreement or its 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.[30]

---

[29]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 revenues 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).

[30]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."

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.[31] Indeed, many of the risks faced by investors arise from the possibility that 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.[32] Additionally, the Chinese authorities could prevent or change the tax treatment on the profit transfers from the Operating Company to the WFOE.[33]

These risks are well documented. Our work demonstrates, however, that 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 $300 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.[34] Our results suggest that this risk may be under-appreciated by regulators due to the understatement of its scale in official statistics.

---

[31] 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."

[32] 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.

[33] 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).

[34] 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.15 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 VIEs and China's International Investment Position

When investors in developed countries, such as those in our sample, buy securities issued by VIEs, it affects the distribution of reported positions in the Cayman Islands and in China, but it does not affect their total gross asset position across all foreign countries. By contrast, in this subsection we demonstrate that the VIE structure effectively transforms those Chinese external liabilities from portfolio investments that are marked to market to FDI flows that are not. As a result, we demonstrate that, due to offshore issuance, China's official NFA position is roughly $1 trillion larger than its true value.

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 flows, we return to Figure 8. The only flows in the figure that affect China's external liabilities are the investments in the WFOE. These inflows either come via an SPV, as in arrow C, or come directly from the Listed Company, as in arrow D. In either case, since the investments are made by entities that wholly own the WFOE, they would be 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 be classified as portfolio positions.

In theory, it should not matter whether foreign investments are booked as portfolio or FDI flows. According to the IMF Balance of Payments and International Investment Position Manual Sixth Edition (BPM6), all assets and liabilities should be recorded at their current market value. In practice, however, FDI is often recorded at cost and is not updated to reflect current market values.[35] We genuinely do not know how China's statisticians book these inflows, but we present evidence that, however it is done, the inflows do not reflect current market values.[36]

The solid blue line in Figure 9a plots the evolution of the market value of all VIEs.

---

[35]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." In the BPM6 Manual, the IMF suggests six alternative methods to approximate the market value of FDI: "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."

[36]We are reaching out to China's statistical agencies to try to obtain further information on the accounting treatment of the VIEs.

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 inward FDI 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. Flows captured in the green dashed line should be a superset of those captured in the solid blue line as the green line should include all VIE-related inflows 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 market value in China's external FDI liabilities.[37]

Figure 9b shows that it is very unlikely that the VIE-associated inflows are marked to market but 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 any of the VIE equity investments. The surge of value of the VIEs is simply not reflected anywhere on the liabilities side of China's external accounts.

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 were 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.

To measure the implications of the failure to mark VIE-related inflows to market, we must make an assumption about how China's statisticians book the VIE-related FDI positions.[38]

---

[37]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.

[38]Why do Chinese statisticians not record FDI at market value using the listed share price in New York as a reference? While straightforward in theory, Appendix Figure A.14 displays the full VIE corporate

We assume that China books the FDI associated with each VIE at its value at the time of its latest public equity offering.[39] We refer to this series as "VIE Cost" and plot it with the long-dashed red line in Figure 9a. The gap between the solid blue and long-dashed red lines captures the extent to which, under this assumption, China's external liabilities are understated. The amount understated has grown rapidly starting from only a few billion in 2009 to more than $1 trillion in recent years.

3.3.2 VIEs and China's External Assets

Having documented how China's external liabilities are understated because of the VIE structure, we next turn to examining whether China's foreign assets might be affected by the same issue. After all, if the equity holdings of Chinese residents in a VIE's Listed Company are also not marked to market, that 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 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 Companies by non-Chinese foreign investors (arrow A) and by Chinese residents (via offshore investment vehicles, arrows H and L). The Bloomberg data have the advantage of including both institutional holdings, such as Blackrock holdings in Alibaba, and insiders' holdings,

---

structure of Alibaba and demonstrates how hard this would be in practice. Multiple ownership chains pass through various geographies and 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. It is also possible that Chinese statisticians reject the notion that the market value of the VIEs in fact should be reflected in China's external accounts. After all, as discussed above, Chinese law does not recognize the listed shares as equity claims on a Chinese company.

[39]We cumulate the equity capital raised by the VIEs in their equity offerings, and only mark a firm's equity to market when it performs a secondary equity offering following its IPO. We reiterate that we do not know what is actually done. Many alternatives exist. For example, China might use the cumulated capital raised via IPOs over time but with no revaluation of existing shares or might use the book value of the WFOE. Alternatively, the Chinese statistics might capture the FDI inflow when the SPV or the Listed Company first establishes the WFOE. This may occur years before the actual IPO, and in this case, it would be unclear how to value the transaction. We think that our approach is conservative in that it accounts for the full value of the firm at the time of equity offerings, rather than just the capital raised.

such as Jack Ma's stake in Alibaba.[40] 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 17 percent of the market capitalization of VIEs via offshore investment vehicles. We assume that these holdings have been booked in China's foreign assets positions using the same "VIE Cost" notion used for the liabilities.

The Bloomberg data do not include direct Chinese holdings of Listed Company shares (arrow I). These are unlikely to meaningfully affect our estimates, however, as they are most likely small and booked at market value in China's foreign assets.[41]

An alternate methodology uses the nationality-based restatements of TIC and CPIS that we introduced in Section 2 and yields 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 VIEs.[42] This calculation implies that the share of VIEs owned by Chinese investors is about 14 percent, in the same range as our baseline estimate of 17 percent, which is the value we use to calculate the mismeasurement of China's external assets.

3.3.3 VIEs and China's Net Foreign Asset Position

The solid blue line in Figure 11 plots the official NFA of China, a net credit position equaling $2.1 trillion in 2018 (15 percent of its GDP), making it one of the world's largest, alongside Japan's $3.1 trillion position. The dashed red line is our estimate of the true NFA, obtained by adding to the blue line the difference between the understatement of external assets and liabilities discussed in the previous subsections. The overstatement of China's NFA starts at zero in 2008 and grows rapidly over time, reaching nearly $1 trillion by the end of 2018. Currently, China is only 50 percent as big of a creditor to the rest of the world as official

---

[40]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 Tables A.10 and A.11.

[41]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.

[42]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.

statistics say it is.

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. 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 from China to the safe assets of the developed world (U.S. Treasuries), we show that in the last decade there has been an important flow from developed market investors into China, and this flow is 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 a capital gain of nearly $1 trillion 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 methodology to resolve corporate ownership chains and offshore issuance in tax havens globally. Our methodology is transparent and can be used directly or easily modified by other researchers. We show that correctly resolving global ownership chains is key in forming a consolidated view of global cross-border portfolios. Commonly used datasets significantly understate the magnitude of the corporate financing flowing from developed-market investors to emerging-market firms and incorrectly attribute these flows to tax-haven countries. 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 and current accounts 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 characterization of capital flows in international macroeconomics.

References

Alfaro, Laura, Sebnem Kalemli-Ozcan, and Vadym Volosovych, "Why doesn't capital flow from rich to poor countries? An empirical investigation," *The Review of Economics and Statistics*, 2008, *90* (2), 347–368.

Avdjiev, Stefan, Mary Everett, Philip R Lane, and Hyun Song Shin, "Tracking the international footprints of global firms," *BIS Quarterly Review*, 2018.

Bénétrix, Agustín S, Philip R Lane, and Jay C Shambaugh, "International currency exposures, valuation effects and the global financial crisis," *Journal of International Economics*, 2015, *96*, S98–S109.

Bernanke, Ben, "The global saving glut and the U.S. current account deficit," *Sandridge Lecture*, 2005.

Bertaut, Carol, Beau Bressler, and Stephanie Curcuru, "Globalization and the geography of capital flows," *Working Paper*, 2019.

Blanchard, Olivier and Julien Acalin, "What does measured FDI actually measure?," *Policy Report, Peterson Institute for International Economics*, 2016.

Caballero, Ricardo J, Emmanuel Farhi, and Pierre-Olivier Gourinchas, "An equilibrium model of "global imbalances" and low interest rates," *American Economic Review*, 2008, *98* (1), 358–393.

Chen, Huaizhi, Lauren Cohen, and Umit Gurun, "Don't take their word for it: The mis-classification of bond mutual funds," *Working Paper*, 2019.

Coeurdacier, Nicolas and Philippe Martin, "The geography of asset trade and the euro: Insiders and outsiders," *Journal of the Japanese and International Economies*, 2009, *23* (2), 90–113.

Damgaard, Jannick, Thomas Elkjaer, and Niels Johannesen, "What is real and what is not in the global FDI network?," *IMF Working Paper*, 2019.

Desai, Mihir A, C Fritz Foley, and James R Hines Jr, "A multinational perspective on capital structure choice and internal capital markets," *The Journal of Finance*, 2004, *59* (6), 2451–2487.

Desai, Mihir A, C Fritz Foley, and James R Hines Jr, "The demand for tax haven opera-tions," *Journal of Public Economics*, 2006, *90* (3), 513–531.

Despres, E., C.P. Kindleberger, and W.S. Salant, *The Dollar and World Liquidity: A Minority View.*, Brookings Institution, 1966.

Du, Wenxin and Jesse Schreger, "Sovereign risk, currency risk, and corporate balance sheets," *Working Paper*, 2015.

Eichengreen, Barry J and Ricardo Hausmann, "Exchange rates and financial fragility," *Proceedings of the Jackson Hole Economic Policy Symposium*, 1999.

Eichengreen, Barry J and Ricardo Hausmann, *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economics*, University of Chicago Press, 2005.

European Council, "EU list of non-cooperative jurisdictions for tax purposes," *Technical Report*, 2019.

Farhi, Emmanuel and Matteo Maggiori, "A Model of the International Monetary System," *The Quarterly Journal of Economics*, 2018, *133* (1), 295–355.

Fernández, Andrés, Michael W Klein, Alessandro Rebucci, Martin Schindler, and Martin Uribe, "Capital control measures: A new dataset," *IMF Economic Review*, 2016, *64* (3), 548–574.

Forbes, Kristin J, "Why do foreigners invest in the United States?," *Journal of International Economics*, 2010, *80* (1), 3–21.

Fuertes, Alberto and José María Serena, "How firms borrow in international bond markets: securities regulation and market segmentation," *Bank of Spain Working Paper*, 2016.

Gillis, Paul, "Variable interest entities in China," *Policy Report, GMT Research*, 2019.

Gourinchas, Pierre-Olivier and Helene Rey, "From world banker to world venture capitalist: US external adjustment and the exorbitant privilege," in "G7 Current Account Imbalances: Sustainability and Adjustment" 2007.

Gourinchas, Pierre-Olivier and Olivier Jeanne, "Capital flows to developing countries: The allocation puzzle," *Review of Economic Studies*, 2013, *80* (4), 1484–1515.

Gourinchas, Pierre-Olivier, Nicolas Govillot, and Hélène Rey, "Exorbitant Privilege and Exorbitant Duty," *Unpublished manuscript, UC Berkeley and LBS*, 2011.

Gravelle, Jane G, "Tax havens: International tax avoidance and evasion," *National Tax Journal*, 2009, pp. 727–753.

Guvenen, Fatih, Raymond J Mataloni Jr, Dylan G Rassier, and Kim J Ruhl, "Offshore profit shifting and domestic productivity measurement," *Working Paper*, 2018.

Hines, James R and Eric M Rice, "Fiscal paradise: Foreign tax havens and American business," *The Quarterly Journal of Economics*, 1994, *109* (1), 149–182.

Hopkins, Justin, Mark Lang, and Donny Zhao, "When Enron met Alibaba: The rise of VIEs in China," *Working Paper*, 2017.

Horn, Sebastian, Carmen M Reinhart, and Christoph Trebesch, "China's overseas lending," *Working Paper*, 2019.

Jiang, Wei and Guochao Yang, "The Alibaba Partnership: Illustrating the Costs of Separating Ownership and Control," *Columbia CaseWorks*, 2017.

Koijen, Ralph SJ and Motohiro Yogo, "Exchange rates and asset prices in a global demand system," *Working Paper*, 2019.

Lane, Philip R and Gian Maria Milesi-Ferretti, "International financial integration in the aftermath of the global financial crisis," *IMF Economic Review*, 2018, *66* (1), 189–222.

Lane, Philip R and Jay C Shambaugh, "Financial exchange rates and international currency exposures," *American Economic Review*, 2010, *100* (1), 518–540.

Lilley, Andrew, Matteo Maggiori, Brent Neiman, and Jesse Schreger, "Exchange rate reconnect," *Working Paper*, 2019.

Liu, Emily and Tim Schmidt-Eisenlohr, "Who Owns US CLO Securities?," *FEDS Notes Series*, 2019.

Lucas, Robert E, "Why doesn't capital flow from rich to poor countries?," *American Economic Review*, 1990, *80* (2), 92–96.

Maggiori, Matteo, "Financial Intermediation, International Risk Sharing, and Reserve Currencies," *American Economic Review*, 2017, *107* (10), 3038–3071.

Maggiori, Matteo, Brent Neiman, and Jesse Schreger, "International currencies and capital allocation," *Forthcoming at the Journal of Political Economy*, 2019.

Maggiori, Matteo, Brent Neiman, and Jesse Schreger, "The rise of the dollar and fall of the Euro as international currencies," *AEA Papers and Proceedings*, 2019, *109*, 521–26.

Okawa, Yohei and Eric Van Wincoop, "Gravity in international finance," *Journal of International Economics*, 2012, *87* (2), 205–215.

Portes, Richard and Helene Rey, "The determinants of cross-border equity flows," *Journal of International Economics*, 2005, *65* (2), 269–296.

Reuters, "Fitch rates UBS's holdco senior debt A," *News Report*, 2016.

Tørsløv, Thomas R, Ludvig S Wier, and Gabriel Zucman, "The missing profits of nations," *NBER Working Paper No. 24701*, 2018.

Whitehill, Brandon, "Buyer beware: Chinese companies and the VIE structure," *Council of Institutional Investors*, 2017.

Ziegler, Samuel Farrell, "China's variable interest entity problem: How Americans have illegally invested billions in China and How to fix it," *Geo. Wash. L. Rev.*, 2016, *84*, 539.

Zucman, Gabriel, "The missing wealth of nations: Are Europe and the US net debtors or net creditors?," *The Quarterly Journal of Economics*, 2013, *128* (3), 1321–1364.

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, 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	1.6	0.5	1.0	1.1		0.4	9.3	1.2		1.6	1.1				65.7	16.6
BRA		100.0														
CAN		0.1	95.1	0.2		0.1	0.3				0.2				2.9	1.1
CHN				82.8			0.8									16.4
CYM		12.6	0.9	20.7	6.6	0.1	3.3	3.4		3.1	1.4				35.1	12.9
DEU						93.4	6.2								0.3	0.2
GBR		0.2	0.1				86.3		1.4		0.2				4.1	7.7
HKG				54.9		3.7	5.8	28.2	0.2							7.1
IND									100.0							
IRL				0.1		0.5	1.8			29.9	21.7			4.6	39.1	2.3
JPN											100.0					
LUX		4.7	1.2	0.1		2.8	1.5			0.4		4.5		10.9	44.7	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*) under 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. The rows of the matrix therefore sum to 100 percent. All data are as of December 2017.

| Destination	ISO Code	TIC	Tax Haven Only		Full Nationality	
			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	44	36	61	52
Canada	CAN	390	392	2	410	20
China	CHN	3	37	34	44	42
France	FRA	118	120	2	109	-9
Germany	DEU	60	80	20	117	57
India	IND	6	6	1	21	15
Indonesia	IDN	5	7	1	9	4
Italy	ITA	16	29	13	34	18
Japan	JPN	80	95	15	184	104
Mexico	MEX	58	58	0	60	2
Russia	RUS	0	12	12	12	12
Saudi Arabia	SAU	0	0	0	0	0
Spain	ESP	16	19	2	52	36
South Africa	ZAF	1	5	4	6	5
South Korea	KOR	11	11	0	17	6
Turkey	TUR	4	4	0	4	0
United Kingdom	GBR	326	343	16	373	47
B. Selected Tax Havens						
Bermuda	BMU	30	0	-30	0	-30
Cayman Islands	CYM	80	5	-75	5	-75
Curaçao	CUW	0	0	-0	0	-0
Guernsey	GGY	13	0	-13	0	-13
Hong Kong	HKG	8	6	-3	7	-1
Ireland	IRL	63	24	-39	39	-24
Jersey	JEY	14	0	-14	0	-14
Luxembourg	LUX	72	3	-69	3	-69
Netherlands	NLD	179	94	-86	115	-65
Panama	PAN	3	0	-3	0	-3
C. Domestic Reallocation						
United States	USA	5,009*	5,132	122	4,775	-234

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 nationality basis, which we compare to the U.S. Treasury's TIC data. We present our
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 estimated. Corporate debt is defined in TIC as private debt holdings minus holdings
of asset-backed securities. All data are as of December 2017.

| Destination	ISO Code	TIC	Tax Haven Only Position	Δ	Full Nationality Position	Δ
A. Selected Non-Tax Haven Countries						
Argentina	ARG	9	11	1	17	8
Australia	AUS	181	182	1	184	3
Brazil	BRA	119	120	1	107	-13
Canada	CAN	493	500	8	527	34
China	CHN	154	694	540	694	540
France	FRA	434	447	14	458	24
Germany	DEU	375	385	10	402	27
India	IND	179	181	2	172	-7
Indonesia	IDN	40	40	0	31	-8
Italy	ITA	96	105	9	114	18
Japan	JPN	895	911	17	906	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	1,140	121	1,000	-20
B. Selected Tax Havens						
Bermuda	BMU	195	1	-194	1	-194
Cayman Islands	CYM	547	0	-547	0	-547
Curaçao	CUW	36	0	-36	0	-36
Guernsey	GGY	14	0	-14	0	-14
Hong Kong	HKG	147	135	-12	135	-11
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
C. Domestic Reallocation						
United States	USA	19,284*	19,810	526	19,977	693

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 the U.S. Treasury's TIC data. We present our 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 estimated. 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	175	180	4	193	18
Brazil	BRA	49	119	70	133	84
Canada	CAN	190	196	6	203	13
China	CHN	19	68	49	82	63
India	IND	19	26	7	47	28
Indonesia	IDN	44	49	5	54	10
Japan	JPN	209	220	11	251	42
Mexico	MEX	97	99	2	110	13
Russia	RUS	35	107	71	107	72
Saudi Arabia	SAU	2	5	2	5	2
South Africa	ZAF	28	33	4	45	16
South Korea	KOR	23	24	1	25	2
Turkey	TUR	39	39	0	38	-1
United Kingdom	GBR	1,291	1,406	115	1,211	-80
United States	USA	1,912	2,111	199	2,092	181
B. Selected Tax Havens						
Bermuda	BMU	26	2	-24	2	-24
Cayman Islands	CYM	96	7	-89	7	-89
Curaçao	CUW	1	0	-1	0	-1
Guernsey	GGY	3	0	-3	0	-3
Hong Kong	HKG	20	11	-9	14	-6
Ireland	IRL	294*	133	-161	139	-155
Jersey	JEY	10	0	-10	0	-10
Luxembourg	LUX	536*	27	-509	27	-509
Netherlands	NLD	979*	517	-462	561	-418
Panama	PAN	8	5	-4	5	-4
C. Domestic Reallocation						
France	FRA	1,732*	1,757	26	1,643	-89
Germany	DEU	1,357*	1,622	265	1,635	278
Italy	ITA	1,474*	1,597	123	1,616	142
Spain	ESP	879*	957	77	1,011	132
European Monetary Union	EMU	8,555*	7,944	-611	7,996	-559

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 our 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 estimated. 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	4	4	0	5	1
Australia	AUS	62	63	1	67	4
Brazil	BRA	53	54	0	46	-7
Canada	CAN	87	87	1	95	8
China	CHN	96	331	235	329	233
India	IND	85	85	0	85	-1
Indonesia	IDN	18	18	0	18	-1
Japan	JPN	316	316	0	317	2
Mexico	MEX	19	19	0	20	1
Russia	RUS	47	48	1	47	0
Saudi Arabia	SAU	2	2	0	2	0
South Africa	ZAF	33	33	0	34	1
South Korea	KOR	96	96	0	95	-1
Turkey	TUR	11	11	0	11	0
United Kingdom	GBR	593	675	82	612	18
United States	USA	1,708	2,035	326	2,064	356
B. Selected Tax Havens						
Bermuda	BMU	38	1	-37	1	-37
Cayman Islands	CYM	223	0	-223	0	-223
Curaçao	CUW	3	0	-3	0	-3
Guernsey	GGY	1	0	-1	0	-1
Hong Kong	HKG	64	48	-16	49	-16
Ireland	IRL	695*	346	-349	346	-349
Jersey	JEY	17	0	-17	0	-17
Netherlands	NLD	329*	278	-50	329	0
Panama	PAN	3	0	-3	0	-3
C. Domestic Reallocations						
France	FRA	1,315*	1,319	4	1,329	14
Germany	DEU	1,305*	1,306	0	1,303	-3
Italy	ITA	483*	488	5	489	6
Spain	ESP	262*	262	0	257	-5
European Monetary Union	EMU	4,761*	4,357	-404	4,405	-356

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 our 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 estimated. 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.
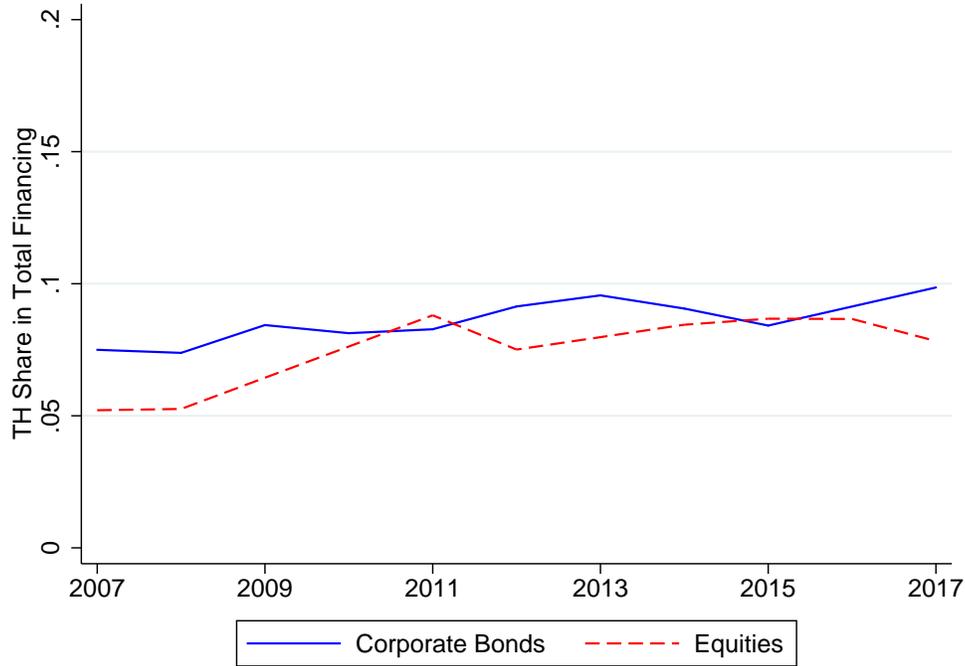
(a) Total Financing
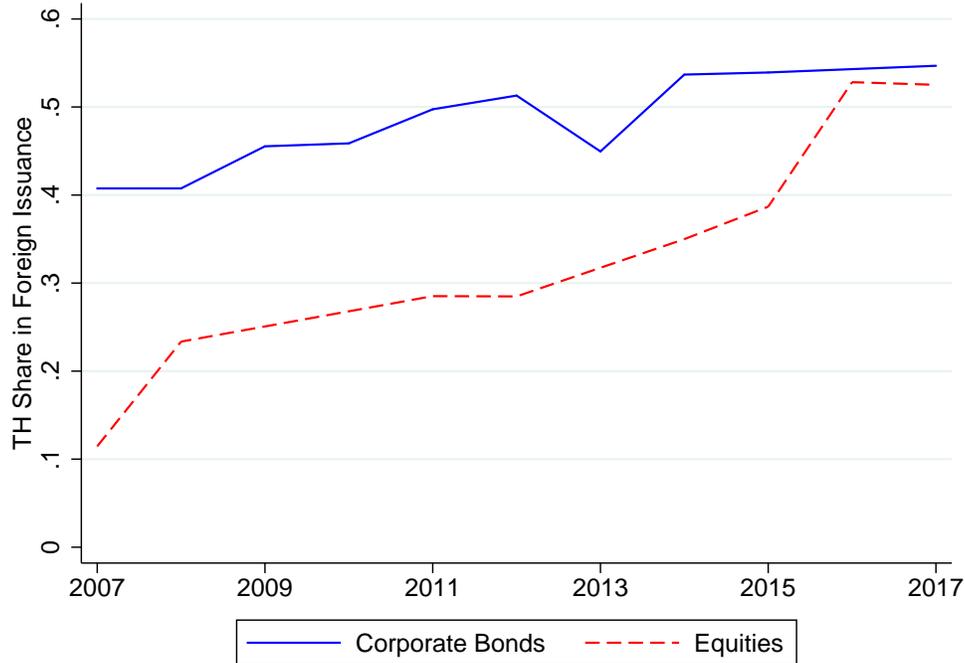
(b) Cross-Border Financing

Figure 1: **The rise of tax haven issuance.** Panel A shows the time series for the share of all equity and corporate debt securities worldwide that are issued using tax haven subsidiaries. Panel B shows the time series for the share of cross-border securities that are issued using tax haven subsidiaries. Cross-border securities include all securities issued by subsidiaries located outside the country of operations of their ultimate parent firm.
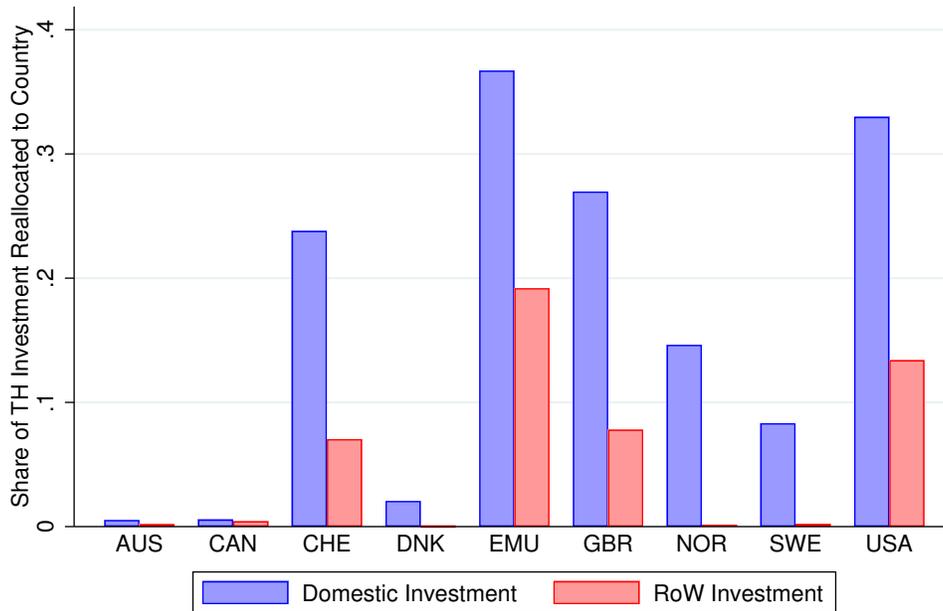
(a) Corporate Bonds
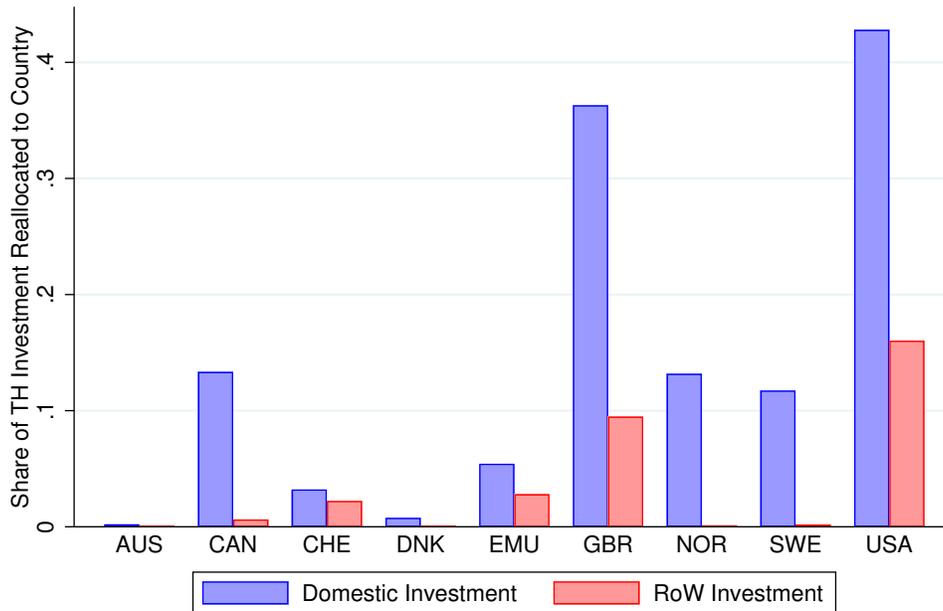
(b) Equity

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.
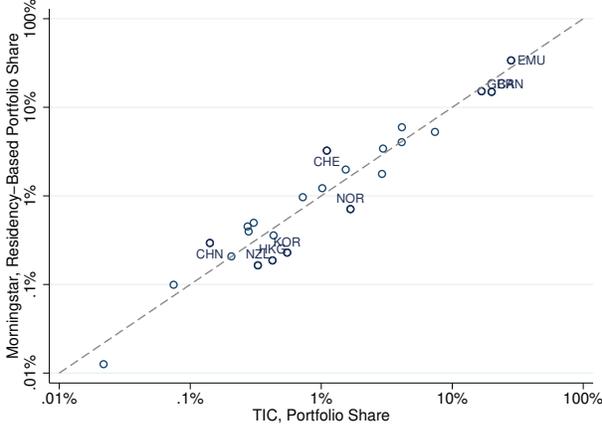
(a) USA: Corporate Bonds
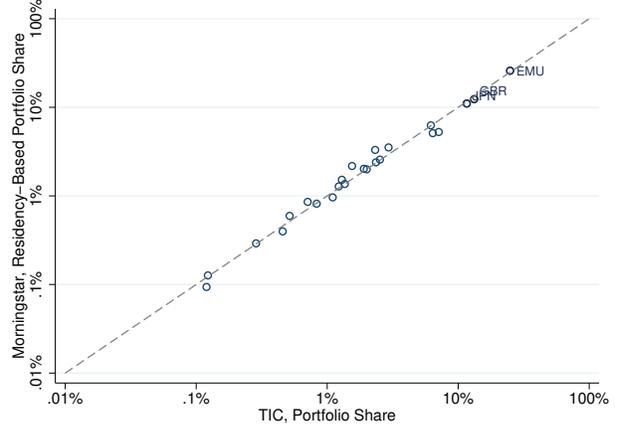
(b) USA: Equities
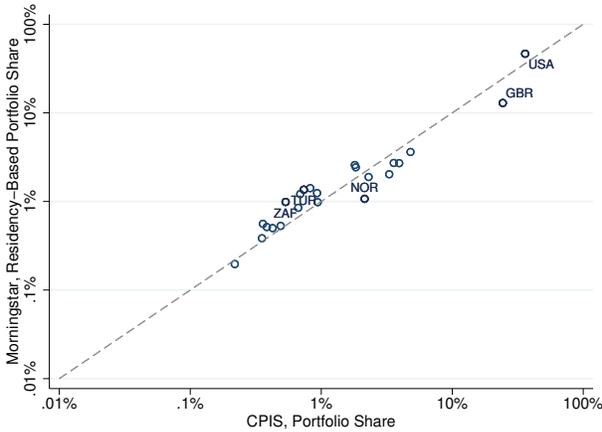
(c) EMU: All Bonds
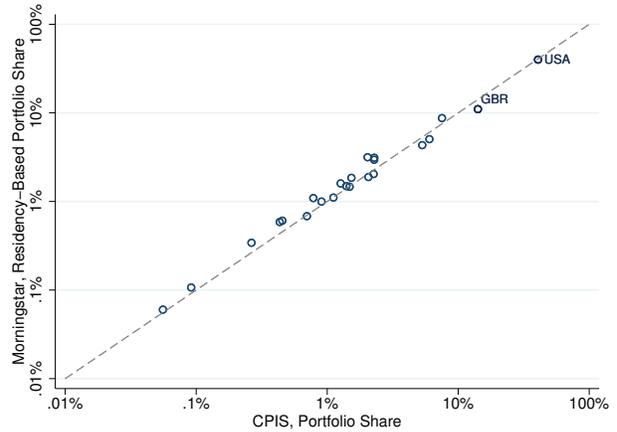
(d) EMU: Equities

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 published by the U.S. Treasury (*vertical axis*). 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. Corporate debt positions are defined in TIC as holding of private debt minus holdings of asset-backed securities; TIC equity positions exclude holdings of fund shares.
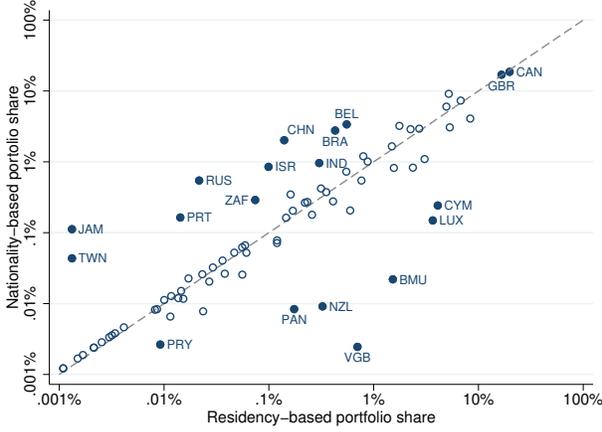
(a) USA, Corporate Bonds
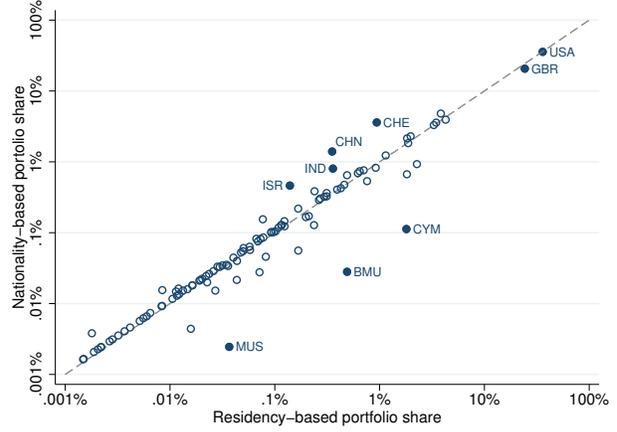
(b) EMU, All Bonds
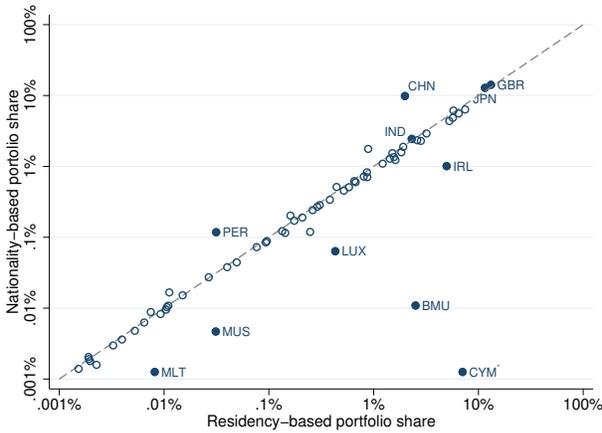
(c) USA, Equities
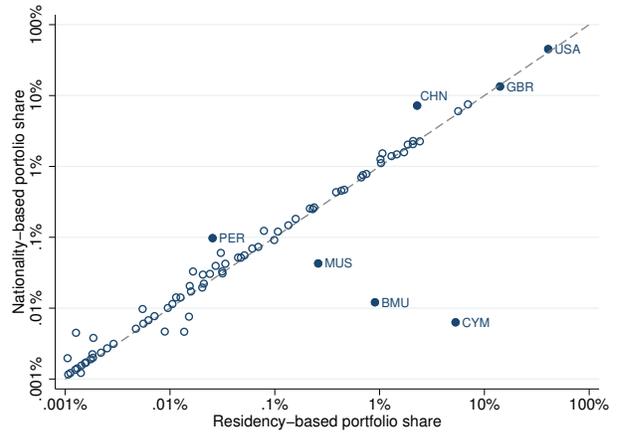
(d) EMU, Equities

Figure 4: **Bilateral shares of outward portfolios from USA and EMU: official vs. restated nationality-based TIC and CPIS positions.** This plot 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.

41

(a) Share of External Equity Portfolios in China
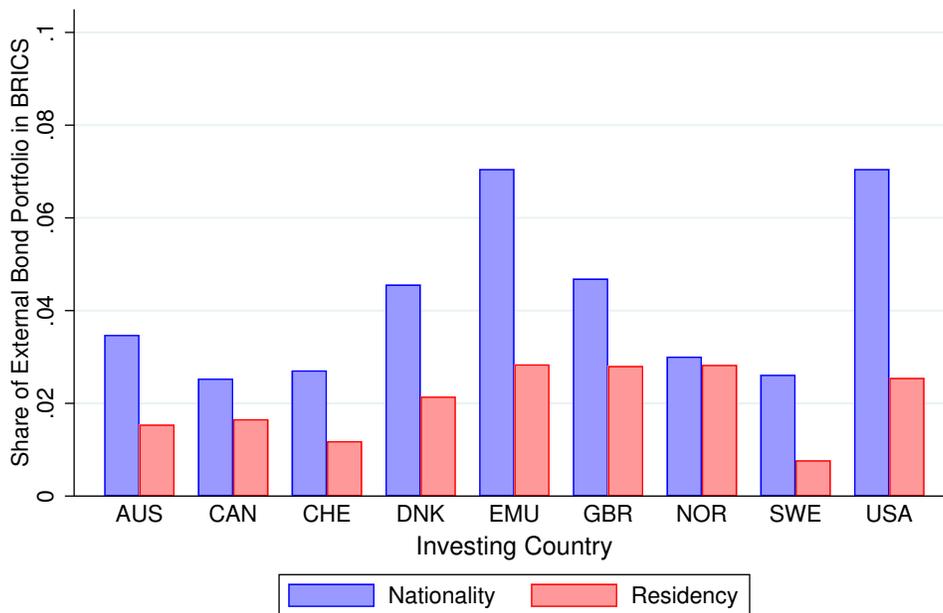
(b) Share of External Bond Portfolios in BRICS

Figure 5: **Portfolio shares in Chinese equities and BRICS debt, across countries: residency vs. nationality.** Using our restated TIC/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.
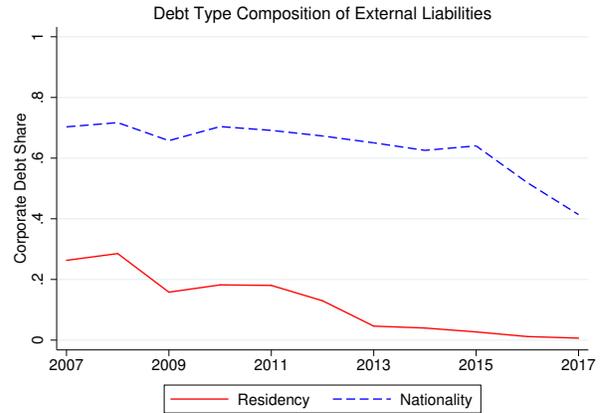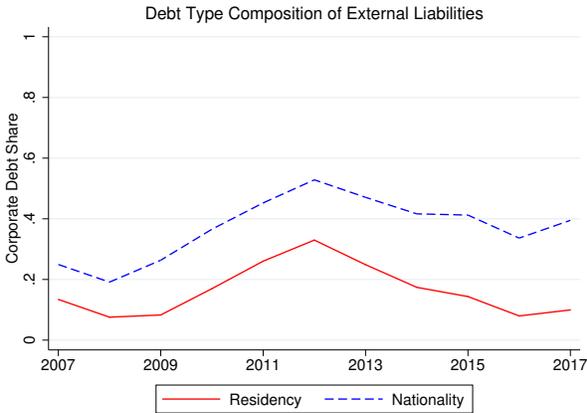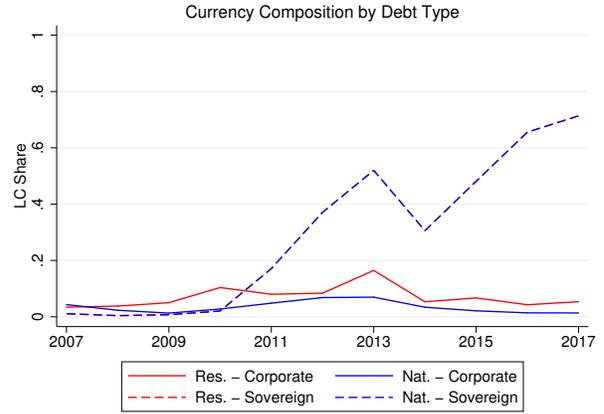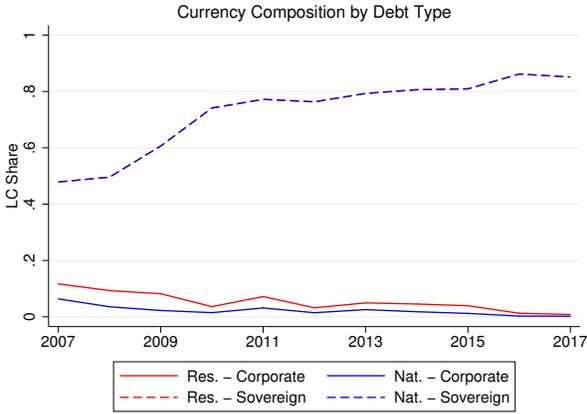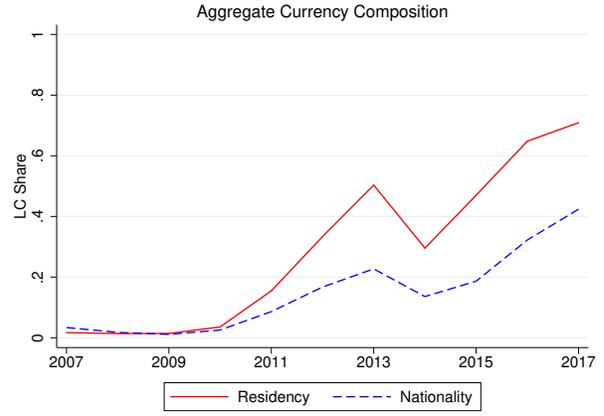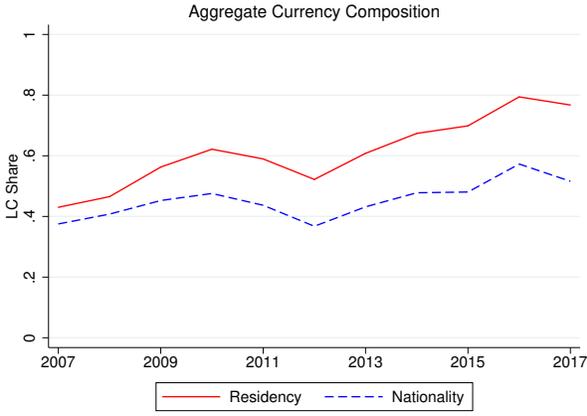
Figure 6: Understanding aggregate currency exposures in portfolio debt flows.
This graph shows the impact of our nationality-based restatement on the currency composition of portfolio debt flows to Brazil (*panel A, left side of figure*) and to Russia (*panel B, right side of figure*). The *top plot* in each panel shows the local currency share in portfolio debt flows from the nine developed countries in our sample to Brazil and Russia, under residency and under nationality. The *middle plots* show the local currency share under residency and nationality separately for corporate and sovereign debt flows. The *bottom plots* show the share of portfolio debt flows that are corporate under residency and nationality. On a nationality basis, the shift of aggregate portfolio debt flows toward local currency is mitigated, which happens nearly entirely because of the higher weight placed on corporate flows.
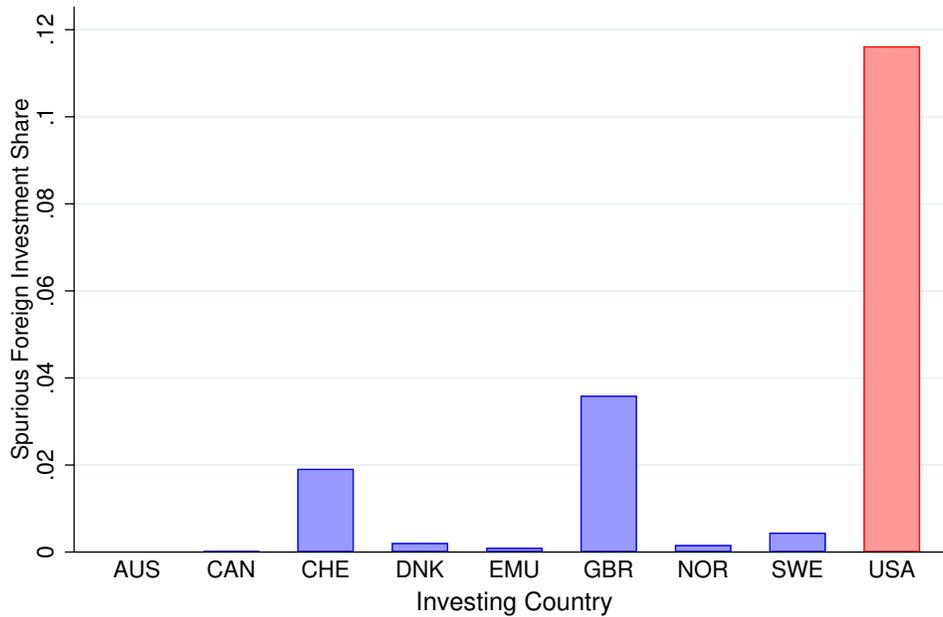
(a) Bond Investments
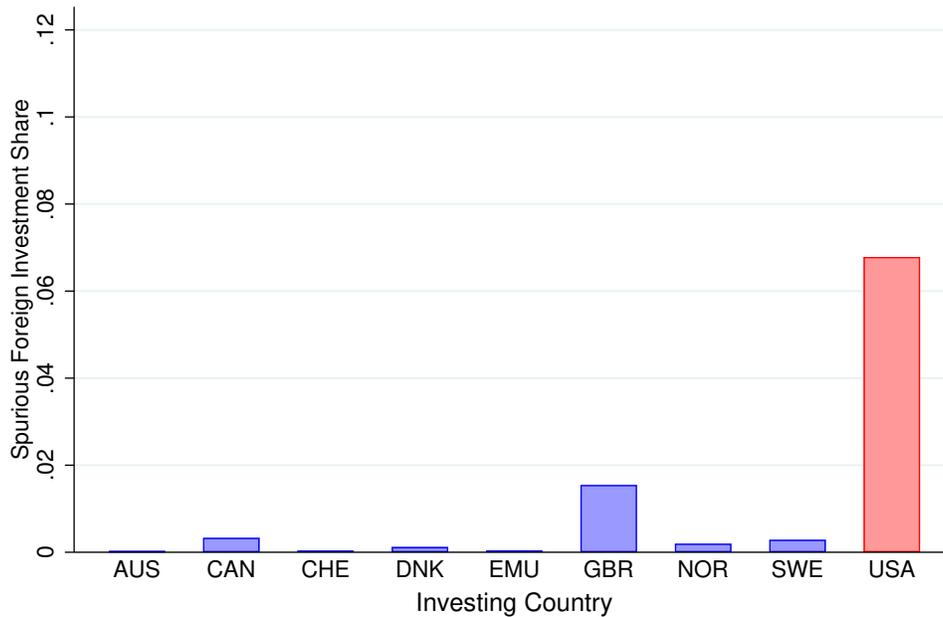
(b) Equity Investments

Figure 7: **Spurious foreign investment due to tax haven issuance.** This graph 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.
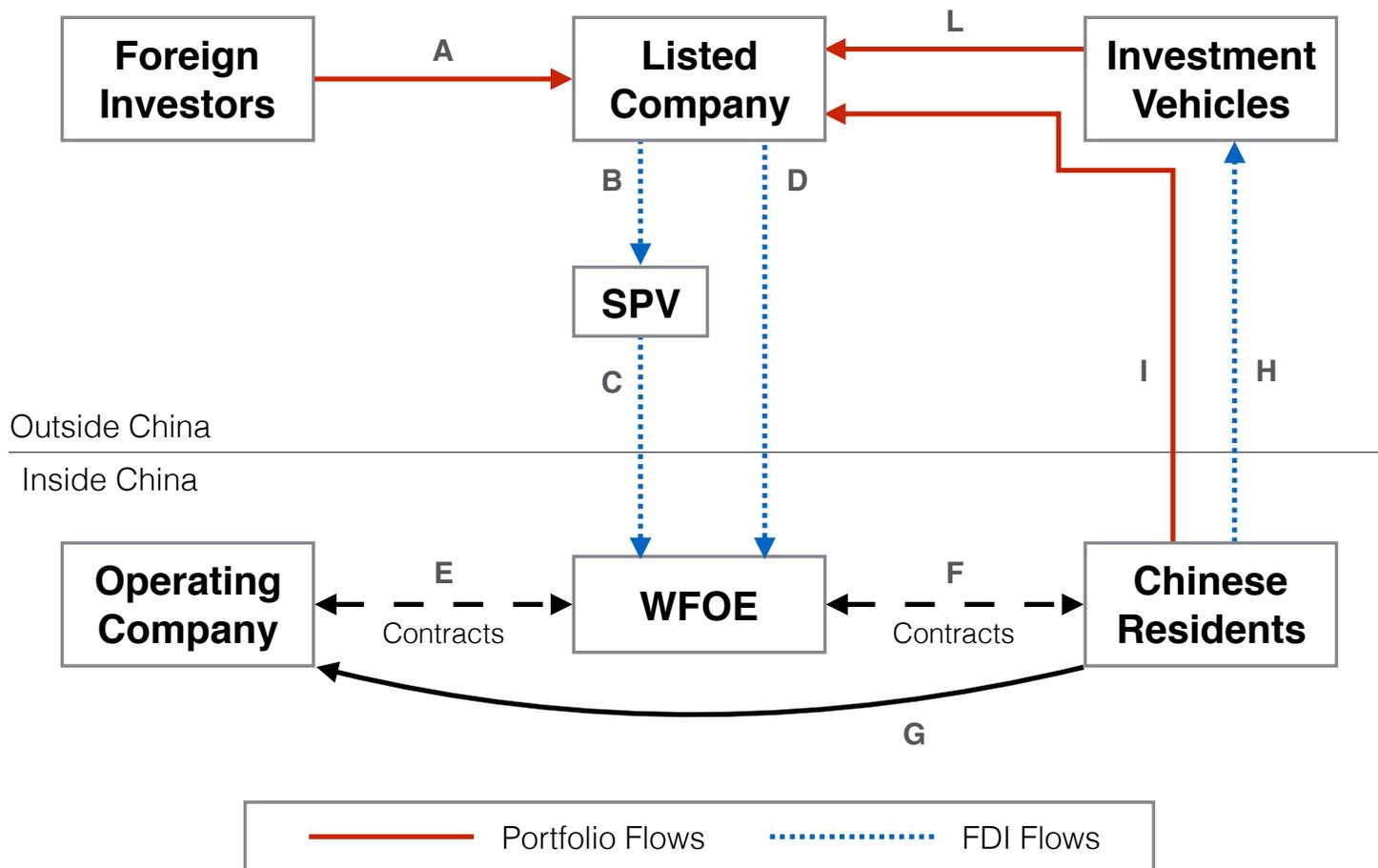
Figure 8: **VIE structure.** This figure displays a simplified characterization of the Variable Interest Entity (VIE) structure used by Chinese firms in order to access foreign capital. The Operating Company in China is fully owned by Chinese residents (*arrow G*). The public Listed Company is located offshore, 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 flows (*solid red arrows*) and FDI flows (*dashed blue arrows*) in the diagram.
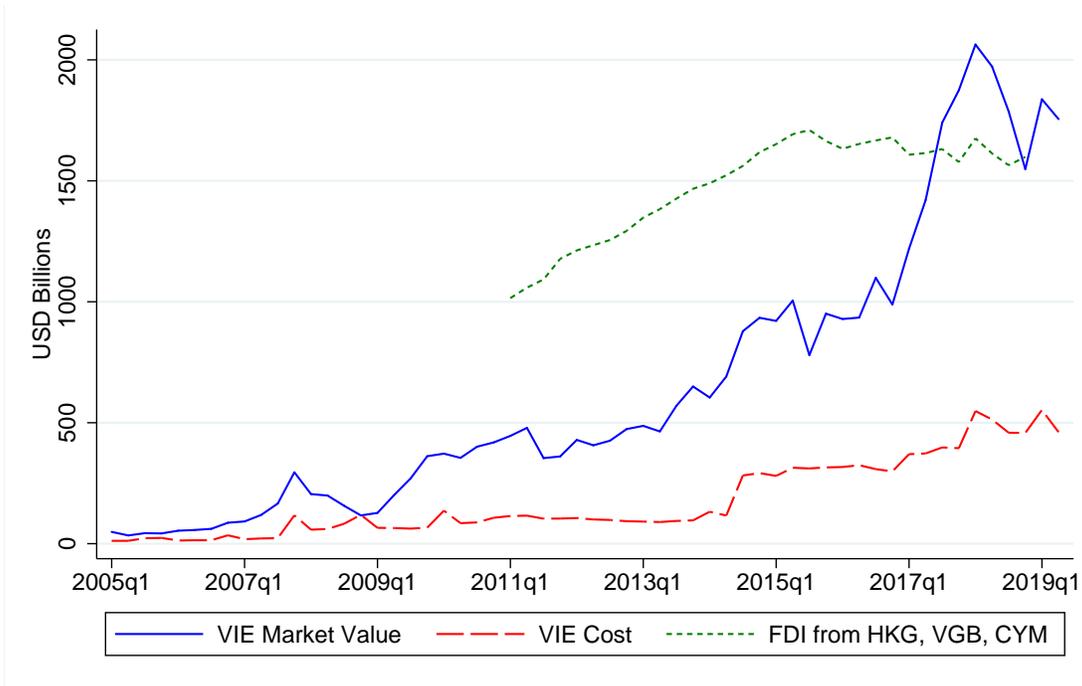
(a) VIE Market Value, Cost, and Inward FDI Flows
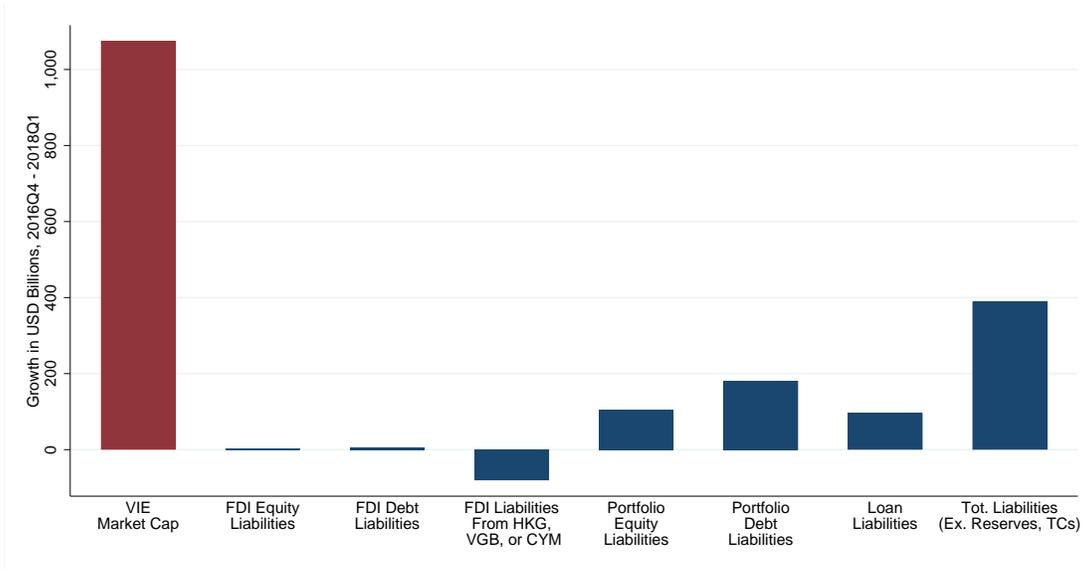
(b) VIE Market Value is Not
Booked in Other Liability Categories

Figure 9: **China's VIEs: market value, cost, and implausibility of market value accounting.** Panel A plots the total market value of all Chinese companies listed offshore via VIE structures (*blue solid line*), together with a measure of the value of those same companies accounted for at cost (*long-dashed red line*). We take cost to be the equity capital raised during public equity offerings, valued at the latest public offering price. The graph also shows the total value of all inward FDI flows into China from Hong Kong, the Cayman Islands, and the British Virgin Islands (*short-dashed green line*). Panel B shows the valuation change for the VIE companies between 2016Q4 and 2018Q1, alongside the corresponding changes in various liability categories of China's IIP account (source: China's State Administration of Foreign Exchange).
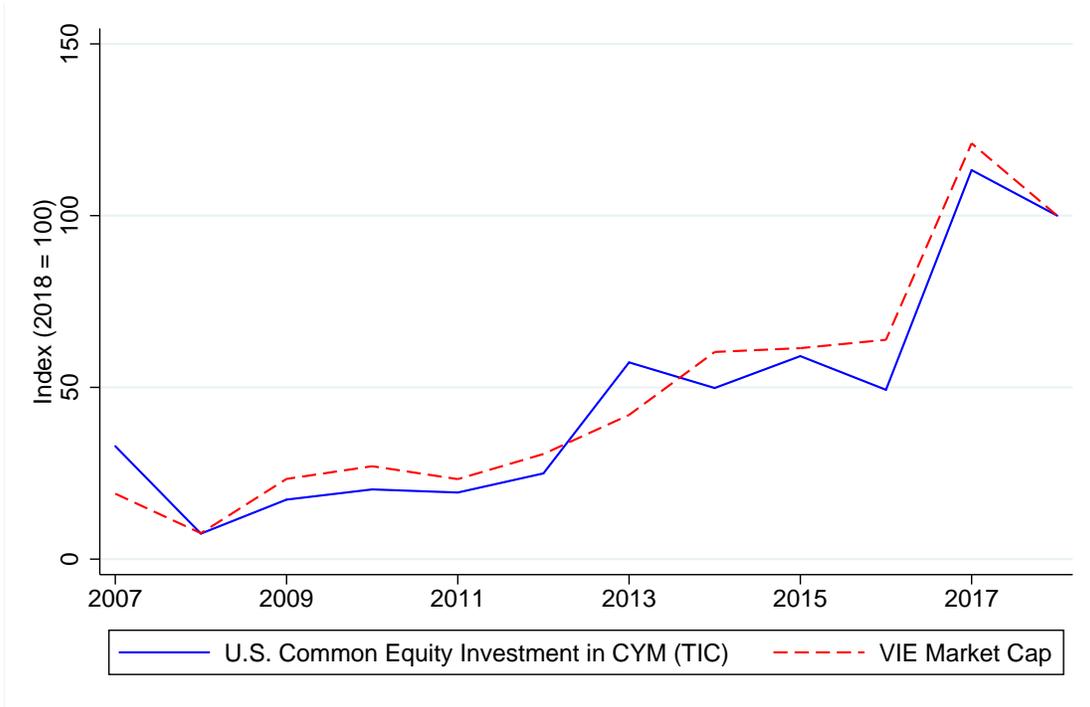
(a) U.S. Common Equity Investments in CYM
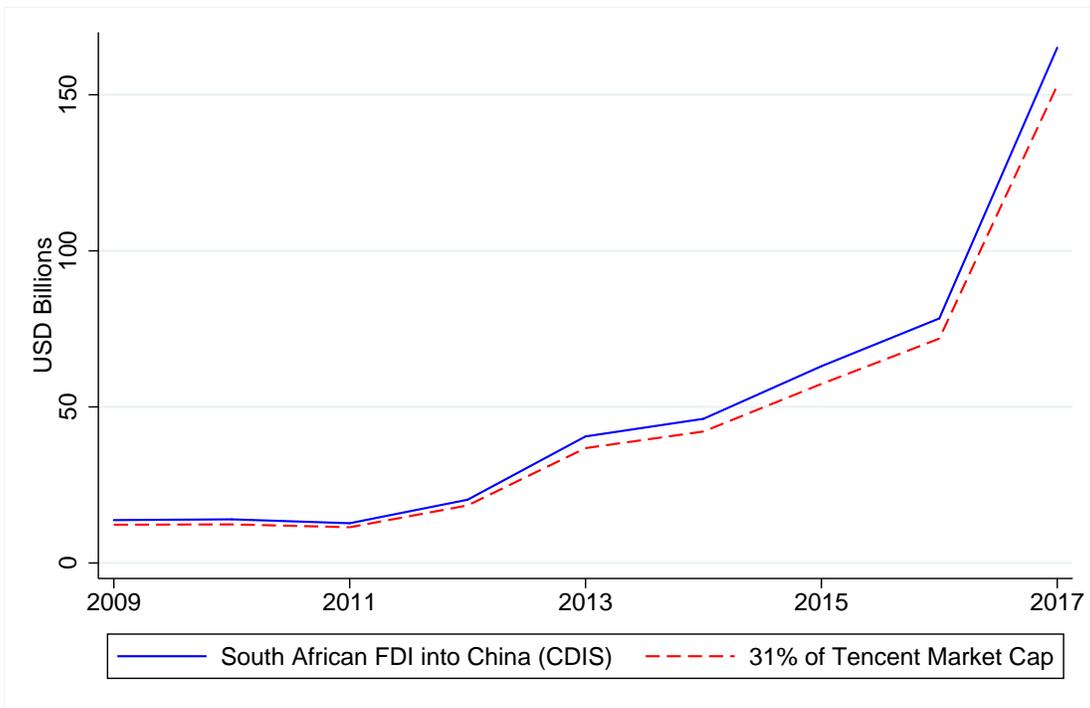
(b) South African FDI into China

Figure 10: **Counterexamples: VIEs are booked at market value 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% ownership share of South African multinational Naspers in Tencent.

47
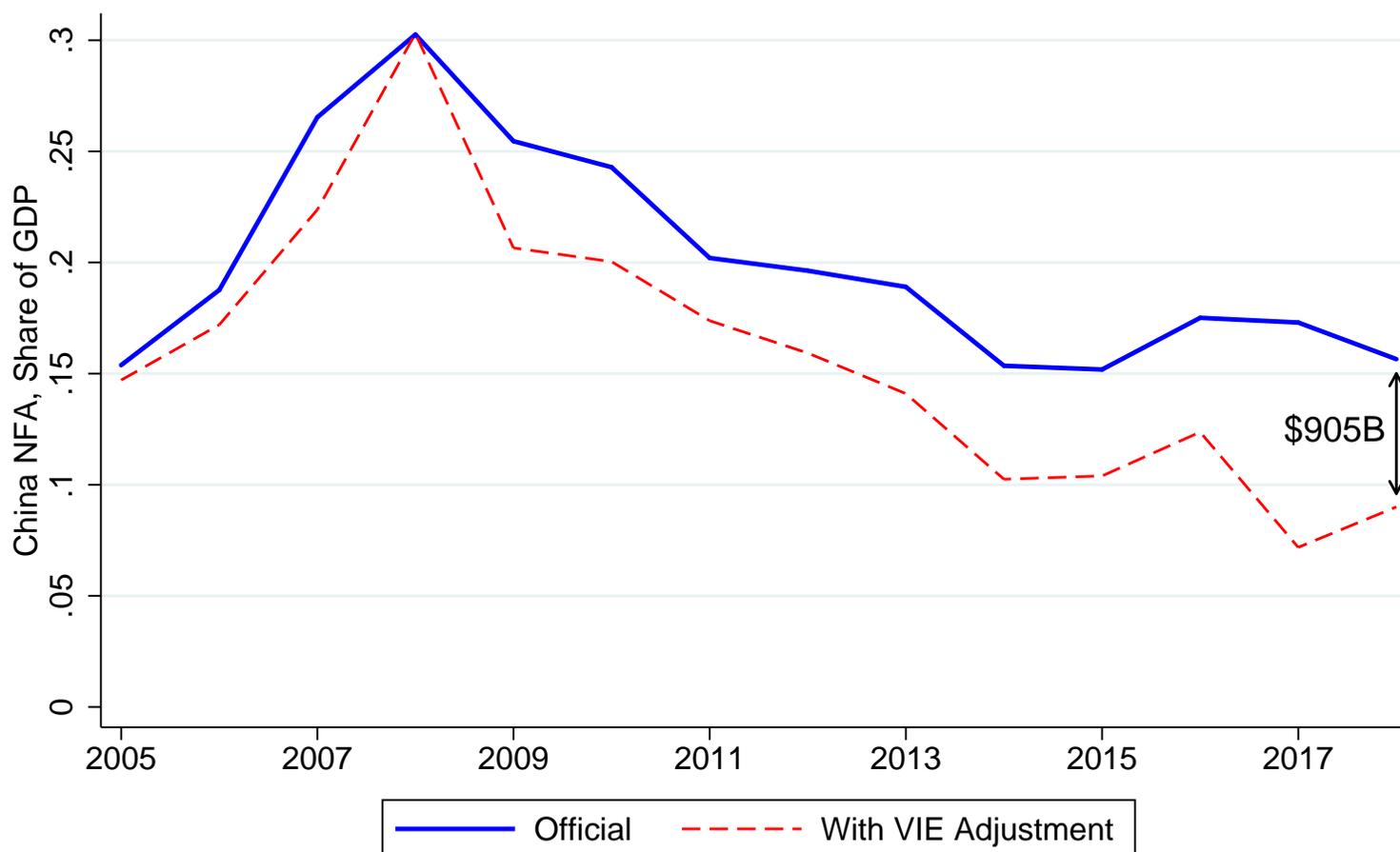
Figure 11: **Mismeasurement in China's Net Foreign Asset (NFA) position.** This graph shows China's official NFA position as a share of GDP (*solid blue line*), alongside our re-estimated NFA position which accounts for the valuation effects due to the market value gains of the Chinese companies listed offshore via VIE structures. Our restated NFA figure assumes that China's gross foreign liabilities are underestimated in the official data by an amount corresponding to the difference between the VIE's market value and their cost. It also assumes that China's official gross foreign assets are understated by an amount corresponding to the gap between market value and cost for insider holdings of the VIEs by Chinese residents. The gap between the official and adjusted NFA positions corresponds to $905 billion in 2018.