

ONLINE APPENDIX FOR
“REDRAWING THE MAP OF GLOBAL CAPITAL FLOWS:
THE ROLE OF CROSS-BORDER FINANCING AND TAX HAVENS”

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This appendix contains eleven sections:

- Appendix Section [A.I](#) of this appendix outlines various reasons why companies choose to raise capital using tax haven affiliates.
- Appendix Section [A.II](#) details our classification of countries as tax havens.
- Appendix Section [A.III](#) provides further detail on our mapping of parents and affiliates.
- Appendix Section [A.IV](#) describes how we estimate the share of equity positions in CPIS that are common stock holdings.
- Appendix Section [A.V](#) reviews foreign investments by residency that are domestic investments by nationality, which we term “Spurious Foreign Investment”.
- Appendix Section [A.VI](#) reviews how we calculate the currency composition of the bonds issued by several large emerging markets and held by foreigners in our data.
- Appendix Section [A.VII](#) explores in detail the structure of China’s VIEs and details our estimate for how they impact China’s NFA.
- Appendix Section [A.VIII](#) covers the key role played by micro data in our analysis.
- Appendix Section [A.IX](#) explores how investors disproportionately buy securities issued in tax havens by foreign affiliates of their domestic firms, a phenomenon we refer to as “Home Bias in Tax Havens.”
- Appendix Section [A.X](#) gives additional details on the domestic investment position estimation underlying our full nationality restatements.
- Appendix Section [A.XI](#) offers additional details on how we construct our sales-based restatement.

A.I Why Do Companies Issue in Tax Havens?

We discuss in this section how firms commonly choose to issue through affiliates in tax havens in order to reduce taxation, get around capital controls, avoid regulations, and access a different investor base. In all of these cases, data that are restated to reflect nationality seem more useful for nearly all economic analyses.

Reducing withholding taxes. Among the most common reason for companies to issue securities through subsidiaries in tax havens is that doing so allows them to reduce the withholding tax on payments to foreigners of dividends and interest. Statutory withholding rates on dividend payments from Chilean, French, and Spanish companies to non-resident equity holders can be as high as 35, 30, and 19 percent, for example, while withholding rates on interest payments from Australian, Canadian, and Italian companies to non-resident bond holders can reach 10, 25, and 26 percent.¹ By contrast, there is no withholding on dividends and interest payments to non-residents from companies in Bermuda, the Cayman Islands, Guernsey, or Jersey.

Consider the case of Petrobras International Finance (PIFCO), the Caymans-based financing subsidiary of Petrobras discussed in the paper. Since all interest payments made by Brazilian companies to non-residents are subject to a 15 percent withholding tax, U.S. mutual funds directly holding bonds issued by the Brazilian parent firm would have to subtract such withholdings from their returns since U.S. tax law prevents the funds from themselves claiming a foreign tax credit. The funds would send their investors the IRS form 1099-INT so that they may themselves claim the tax credit with the IRS. By contrast, if a U.S. fund earns interest payments from a bond issued by PIFCO, there is no withholding and the full interest payment is reflected on the funds' returns.²

Reducing corporate taxes. Tax havens also offer low corporate tax rates. Tax inversions, a common tactic in which a company acquires a foreign target in a lower-tax jurisdiction in order to relocate its legal headquarters and lower its tax rate, account for a large amount of equity positions that are Irish under residency but American under nationality.³ In fact, as noted in [Hines and Rice \(1994\)](#), companies may choose to finance themselves through tax haven subsidiaries, borrowing at a given interest rate, and transfer the funds to the parent company with an inter-company

¹The details can be complicated and bilateral investment treaties between the investor's and the issuer's countries leave many (and, often, most) foreign investors exempt. For details, see [taxsummaries.pwc.com/ID/Withholding-tax-\(WHT\)-rates](https://taxsummaries.pwc.com/ID/Withholding-tax-(WHT)-rates).

²The prospectus for PIFCO bonds with CUSIPs 71645WAT8, 71645WAR2, and 71645WAS0 states: *"Except as provided below, PIFCO will make all payments of amounts due under the notes and the indenture [...] without withholding or deducting any present or future taxes, levies, deductions or other government charges of any nature imposed by Brazil [...]"*.

³As an example, consider Medtronic, one of the world's largest medical technology firms that 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. More generally, see [Zucman \(2013\)](#) and [Desai et al. \(2006\)](#) for helpful overviews of the demand for tax haven services.

loan, offered at a higher rate, in order to shift after-interest corporate profits from high to low tax jurisdictions.

Getting around capital controls. China’s IT and telecommunications sector offers the most important example of firms that issue through foreign affiliates in order to avoid capital controls. Foreign ownership in the sector is forbidden, so firms cannot directly issue securities on global markets. Instead, as discussed extensively in this paper, firms are organized following a “Variable Interest Entity” (VIE) structure, whereby they raise financing through an affiliate that is resident in the British Virgin Islands, the Cayman Islands, or Hong Kong (see also [Ziegler, 2016](#) and [Hopkins et al., 2017](#)). In Section III and Appendix Section A.VII we review the VIE structure in detail and draw out the macro and policy implications stemming from its use. Here we note that VIEs, designed to avoid capital controls, constitute an important share of cross-border investment in tax haven issuances. Foreign investment in China’s corporate giants Alibaba, Baidu, JD.com, and Tencent all, by residency, flows through the Cayman Islands.

Avoiding regulation. Some firms issue through subsidiaries in tax havens to avoid various regulations such as requirements on the number of outside directors, on the frequency with which the board must meet, or on what must be disclosed. For example, in July 2016, the European Union (EU) introduced the Market Abuse Regulation (MAR), which enhances companies’ obligations to disclose inside information as well as any trades made by persons acting in a managerial capacity. The MAR applies to all companies issuing securities registered on any EU trading venue, but does not apply to the Channel Islands (Guernsey and Jersey). The regulation caused an immediate and sizable shift in the issuance of high yield bonds, which are more informationally sensitive than investment grade bonds, toward trading venues in the Channel Islands.⁴ Some of this shift reflected the establishment of new subsidiaries in the Channel Islands that benefited from proximity to the exchanges. Whereas a total of less than \$1.5 billion in high yield bonds were issued by Channel Islands subsidiaries during the six years prior to the introduction of the MAR, nearly \$6 billion in high yield bonds were issued in the two years thereafter.⁵

Accessing foreign investors. Issuing abroad, including through subsidiaries located in tax havens, appears to enable emerging market firms to access capital from developed market investors.

⁴Far less than 1 percent of Europe-resident high-yield bonds were issued on Channel Islands trading venues in any year prior to the introduction of the MAR. In the 12 months following the new regulation, however, these venues accounted for 5 percent of all Europe-resident high-yield bond issuances, and this percentage climbed above 10 percent by the end of 2017. The International Stock Exchange (TISE) in Guernsey, the largest exchange in the Channel Islands, advertised that: *“TISE is becoming an increasingly popular listing venue for high yield bonds as issuers discover how the onerous nature of MAR contrasts with the robust and proportionate rules of our recognized exchange.”*

⁵For example, the automaker Aston Martin set up a Channel Islands subsidiary called Aston Martin Capital Holdings Ltd. in March 2017 and, in April, issued a \$400 million bond. Our procedure reallocates this bond from the Channel Islands under residency to the United Kingdom under nationality.

Even though Petrobras itself has more than \$3 billion of bonds outstanding, our data on developed market fund positions suggest that advanced economy investors hold essentially none of it. U.S. and EMU funds instead get all their exposure to Petrobras through tax haven subsidiaries like PIFCO. In fact, aggregating over the entire Brazilian corporate sector, we find that 52 percent of the value of total bond issuance is done by the Brazilian parent company, with 40 percent issued through subsidiaries in tax havens and 8 percent through affiliates in other countries. Developed market mutual fund and ETF holdings of these bonds, however, are significantly skewed away from the parent’s issuances and toward those of foreign affiliates, with tax havens issuances accounting for 70 percent. In fact, nearly 90 percent of developed market holdings of bonds that are Brazilian by nationality are issued by entities whose residency is outside of Brazil.

A.II Which Countries are Classified as Tax Havens?

Table A.I reports the list of countries that are treated as tax havens in this paper for the purpose of securities issuance. This list serves as an input both to our analysis in the paper, and to the parent-assignment algorithm detailed in Appendix Section A.III. Our tax haven list is based on Hines (2010) with the addition of the Netherlands and the deletion of Switzerland.⁶ The list in Hines (2010) is an update on the classic list by Hines and Rice (1994) and is commonly used in the tax haven literature: see also Dharmapala, Foley and Forbes (2011) and Desai, Foley and Hines (2006). We follow Tørsløv, Wier and Zucman (2018) and add the Netherlands to the Hines list because it has become in recent years a large tax haven for bond issuance by multinational companies. For example, we estimate that, in 2017, 47 percent of all corporate bonds issued by entities registered in the Netherlands are reclassified on a nationality basis to be issued by foreign firms. We add Curaçao since this small island-state attracts the registration of major multinationals like Schlumberger, which is one of the world’s largest oilfield services providers. Differently from other studies, we remove Switzerland from the list because our focus is on security issuance rather than taxation or illicit bank accounts, and securities issuance in Switzerland is carried out nearly entirely by domestic firms. For example, 97 percent of Swiss outstanding corporate bonds on a residency basis were also issued by Swiss firms on a nationality basis in 2017.

A.III Methodological Details

In this section we provide details on our sources and on the methodology we use to establish issuers’ ultimate parents and their associated countries of nationality. We also discuss examples of the specific corporate reallocations that underlie our reallocation matrices. We consider this parent-matching algorithm a valuable contribution of interest for many applications, and we encourage

⁶Curaçao, which we consider a tax haven, was implicitly included in the list in Hines (2010) as it was part of the Netherlands Antilles until 2010.

the interested reader to refer to our website globalcapitalallocation.com for our code implementing the procedure.⁷

Our algorithm constructs mappings of issuers to their ultimate parents or operational headquarters, i.e. links of one CUSIP6 to another, for each of our data sources. For those sources listing ownership stakes, we consider an entity to be a parent if it owns more than 50 percent of the equity of the subsidiary.⁸ 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

A.III.A Overview of Data Sources

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).¹⁰ CGS assigns a 9-digit CUSIP identifier to the vast majority of securities issued globally. We take the universe of relevant securities to be the 26,027,455 securities present in the CUSIP master file.¹¹ These include various types of securities: equity, sovereign bonds, corporate bonds, structured finance products, commercial paper, exchange traded funds, and so forth. The first 6 digits of a CUSIP 9-digit code identify the issuing entity; we refer to this issuer number as the CUSIP6 code, and to the full security identifier as the CUSIP9 code. Six-digit issuer CUSIP codes do not correspond one-to-one to firms or other legal entities such as sovereigns, since frequent issuers are assigned multiple CUSIP6 codes. In order to aggregate the CUSIP6 codes to unique entities, we use the CGS associated issuers (AI) master file, which

⁷Other papers that look at ownership chains around the world include [Fuentes and Serena \(2016\)](#) and [Aminadav and Papaioannou \(2020\)](#).

⁸Our data sources vary in the extent to which they provide granular ownership information. While some sources (for example, Orbis) provide the exact percentage ownership figures for many corporate ownership chains, other sources only indicate whether certain ownership stakes exceed the 50 percent threshold. Regardless, we apply the common 50 percent ownership criterion to all subsidiary-to-parent links that we establish.

⁹For 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.

¹⁰For securities by issuers resident outside of the U.S. 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 U.S. and Canada. For simplicity, we refer to both the North American CUSIP codes and the CINS codes as CUSIP codes. We keep track of the small minority of securities that do not have a CUSIP but have an alternative ISIN identifier via a separate procedure that only uses data from Factset.

¹¹We consolidate the CGS ISIN_db issues master file, the CUSIP/CINS_db issues master file, the CGS mortgage backed securities issues master file, and the CGS 144A issues data files. The resulting consolidated file contains entries for 26,027,455 individual CUSIPs as of October 2018.

records all CUSIP6 codes assigned to a single entity.

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

The SDC, Capital IQ, and Dealogic databases focus on worldwide securities issuance, but they also record details of the corporate ownership chains of the firms involved in the transactions that they cover. Our procedure makes use of these latter data. The Orbis and Factset databases record analogous data on corporate ownership chains. The Morningstar holdings data are self-reported to Morningstar by the funds and include for each security an identifier, most often the CUSIP (but ISINs are also used), as well as the name and country of the issuer. The latter two entries are not standardized by Morningstar (see [Maggiori et al., 2020](#) for a full description). Consider the case of two U.S. mutual funds buying the same security, a bond issued in the Cayman Islands by PIFCO, the subsidiary of the Brazilian oil firm Petrobras. Most funds might report Brazil as the country of the issuer, because the ultimate exposure is to the parent company located there. We found that in practice this human input is quite valuable, since each fund reveals what its managers think is the true underlying exposure.

For the Morningstar holdings data we develop an algorithm to extract from the universe of security holdings by all funds the best prediction of the ultimate parent country of operation for each CUSIP6 code. We proceed in two steps. First, for each fund we extract the modal country assignment for each CUSIP6 code that ever appears in its holdings. Second, across funds we extract the modal country assignment for each CUSIP6 code obtained from the first step. In each step we penalize entries that assign a tax haven as the country of operation. If the modal assignment is a tax haven but a less frequent assignment is not, we resort to the latter. The logic behind this choice, as well as other choices related to the treatment of tax haven countries that we make throughout our procedure, is that little or no economic activity takes place in tax havens compared to the size of security issuance. If a security has been issued in a tax haven, we presume that the true country of operation is different – in this case, we presume it is most likely to be another country reported by funds in the Morningstar data.

All datasets are ultimately matched to one another using CUSIP codes as the primary identifier. In certain instances, some datasets identify issuing entities and securities via ISIN or LEI codes, without reporting a CUSIP. In these cases, we translate these identifiers to CUSIP codes using the CUSIP-to-ISIN mapping data contained in the consolidated CGS issue master files and in the CGS

LEI Plus master file.

A.III.B Our Security-Level Procedure: Algorithm Specification

Here we describe in detail the algorithm that we use to build our mapping from issuer CUSIP6 codes to the CUSIP6 codes of their ultimate parents, and their corresponding countries of nationality.

Step 1: Building ultimate-parent matches within each data source. We begin by constructing tables that map subsidiary CUSIP6 codes to ultimate parent CUSIP6 codes within each source, separately for each of Capital IQ, SDC, Orbis, Dealogic, and Factset. Separately, we construct a table that maps each immediate issuer CUSIP6 to its associated issuers' CUSIP6 codes using the CGS AI master file.¹²

Step 2: Establishing ultimate-parent matches across data sources and harmonizing country of nationality field. Occasionally, the various sources may report different country codes for the same issuer. This happens particularly often in the case of companies with multiple headquarters or countries of incorporation, one of which may serve a merely tax-related function. In these cases, we harmonize the country codes and hence establish an ultimate place of nationality as follows:

1. For a given ultimate parent CUSIP6, if three or more sources agree on a non-tax haven (non-TH) ultimate parent country assignment, we adopt it.¹³
2. For a given ultimate parent CUSIP6, if two out of the ownership data sources agree on a non-TH country, with no competing majority, we adopt it.
3. Otherwise, if only one source reports a non-TH country code, we use it.
4. Otherwise, if multiple sources report a non-TH country code, the sources disagree, and there is no decisive majority, we use in descending order of preference: (i) the source that agrees

¹²We ensure that all child-to-parent chains *within* the above tables are completely resolved: for example, if Dealogic identifies entity x as a subsidiary of y , and y in turn as a subsidiary of z , we ensure that within the Dealogic table we link entity x to entity z rather than to entity y . We perform this resolution procedure iteratively, until all ownership chains are completely resolved. In case any cycles arise, we break these at random. In Phase 2, we perform the same ownership-chain resolution procedure *across* all data sources.

¹³For the purposes of our algorithm, we treat the four tax havens that have large local economies (Hong Kong, Ireland, Luxembourg, and the Netherlands) in a special way, since security issuance in these countries is particularly likely to also originate from firms that are truly headquartered and operating there. For Hong Kong and Luxembourg, we compiled and manually inspected lists of the largest firms headquartered and operating locally, based on the Factset database. These lists include companies such as Cathay Pacific, which is genuinely a Hong Kong company. Whenever a reallocation involves these firms or their subsidiaries we do not treat Hong Kong or Luxembourg as tax havens. For Ireland and the Netherlands, we found that in practice our procedure is by itself effective at identifying genuinely local issuance if we simply do not apply a tax haven penalty – we therefore treat Ireland and the Netherlands as “non-TH” countries throughout our algorithm.

with the modal country code reported in the Morningstar holdings data, if any; (ii) the source that appears first in the preference ordering

$$\text{Dealogic} \succ \text{Factset} \succ \text{SDC} \succ \text{Orbis} \succ \text{Capital IQ}. \quad (\text{A.1})$$

This preference ordering gives priority to sources that explicitly attempt to resolve the principal place of operations of each firm. The country codes reported in Capital IQ and Orbis correspond to the place of incorporation that each firm reports in its regulatory filings or local firm registry, and hence will often miss the effective place of operations in the cases of companies that maintain dual headquarters or countries of incorporation, such as in the “tax inversion” cases that we discuss in the main text. On the other hand, all of Dealogic, Factset, and SDC assign firms to a place of operations using operational data – most commonly, and for all three sources, this corresponds to the location of the firm’s senior management. For this reason, these latter three sources come before the rest in our preference ordering. The rest of the preference ordering above reflects our assessment of the relative quality of the data sources in this particular dimension.

5. If none of the data sources in (A.1) report a non-TH country code, we then use, in descending order of preference: (i) the modal country report in Morningstar, if this is non-TH; (ii) the residency of the issuer reported in the CGS data, if this is non-TH; (iii) the country code reported by the source that appears first in (A.1).
6. Lastly, if there is no other country information available we default to the residency information in the CGS data.¹⁴

One of the ownership data sources or the CGS associate issuers (AI) master file may also report a parent CUSIP6 code for which another of the sources reports, in turn, a further parent. In these cases, we update ultimate ownership in the former source to reflect this information, as long as we are not reassigning ownership away from a non-TH country and towards a tax haven. In cases in which there are two or more valid further parents that we could in principle update towards, we prioritize the one that is supported by the largest number of sources.¹⁵

Step 3: Final ultimate parent estimate. Finally, we estimate each issuer’s ultimate parent via the following procedure:

¹⁴We make two exceptions to the country resolution procedure described here. First, if any of our sources report that an issuer is a sovranational entity then we use the sovranational designation (ISO3 code XSN) for that issuer. This is because we want to avoid assigning sovranational entities to any particular country. Second, if the set of countries from which we are choosing only contains Ireland in addition to countries that are commonly involved in tax inversions (USA, EMU, Switzerland), and the modal Morningstar report is not Ireland, we use the country code reported by Morningstar. This is because the Morningstar human reports are very effective in these cases in resolving the tax inversions.

¹⁵In the case of ties, we use the source preference ordering in (A.2). Any cycles that may arise are also broken according to the preference ordering in (A.2).

1. For a given CUSIP6, if three or more sources agree on a CUSIP6 ultimate parent code that corresponds to an entity domiciled in a non-TH country, we use it.
2. Otherwise, if two out of the ownership data sources agree on a CUSIP6 ultimate parent code that corresponds to an entity domiciled in a non-TH country and there is no competing majority, we use it.
3. Otherwise, if only source reports a non-TH ultimate parent CUSIP6 code, we use it.
4. Otherwise, if multiple sources report a non-TH ultimate parent CUSIP6 code, the sources disagree, and there is no decisive majority, we use the source that appears first in the following source preference ordering, which reflects our assessment of the relative data quality of each of the sources:

$$\text{Dealogic} \succ \text{Orbis} \succ \text{Factset} \succ \text{Capital IQ} \succ \text{SDC}. \quad (\text{A.2})$$

5. If none of the sources report a non-TH ultimate parent country code, we use in descending order of preference (as available):
 - (a) The CUSIP6 code of the company’s primary associated issuer from the CGS AI master file, if this corresponds to a non-TH entity.
 - (b) The immediate issuer’s own CUSIP6 code, if the immediate issuer is not resident in a tax haven.
 - (c) The (tax haven-resident) CUSIP6 code reported by the source that appears first in the preference ordering in (A.2).
 - (d) The CUSIP6 code of the company’s associated issuer.
 - (e) The immediate issuer’s own CUSIP6 code.

A.III.C Firm-Level Reallocations

Table A.II lists the issuer-parent mappings generated by our algorithm that constitute the largest reallocations away from key tax havens when we change from a residency to a nationality basis. For example, the top row of Panel A shows a \$14.9 billion reallocation of bonds issued by one of the Cayman Islands affiliates of Alibaba, the Chinese online retail giant. In the third row, we see that Vale SA, the Brazilian mining and logistics company, has a subsidiary called Vale Overseas Ltd. with a CUSIP6 of 91911T that is resident in the Cayman Islands. This latter entity issues \$9.3 billion of bonds which, using our algorithm, we instead associate with the Brazilian ultimate parent company. We emphasize that Vale might have multiple issuing affiliates in the Cayman Islands corresponding to multiple CUSIP6 values, so this is a lower bound on the value of reallocated bond positions from the Cayman Islands to Brazil that our algorithm identifies with Vale’s offshore issuance.

Panel B of Table A.II focuses on equities. The largest reallocations from the Cayman Islands are all Chinese VIE companies, including reallocations for Tencent and Alibaba valued at \$494 billion and \$435 billion, respectively. 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.

Overall, we see an interesting mix of parent companies from Brazil, China, Japan, Russia, Switzerland, and the United Arab Emirates, among others, in these large-scale reallocations. Our procedure successfully reallocates to the United States bonds issued by Weatherford International, an oil and gas services company with legal registration in Bermuda but with 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 the fact that the firm's operations are based in London. We link to Switzerland the debt financing raised by UBS and Credit Suisse through special purpose vehicles (SPVs) set up in Jersey and Guernsey, jointly referred to as the Channel Islands, allegedly to avoid Swiss withholding tax on interest payments (Reuters, 2016). We also associate with Switzerland the equity of Glencore, a multinational commodity trading and mining company that is headquartered in Baar, Switzerland, even though it is registered in Jersey. Similarly, we associate Shire plc, which is registered in Jersey, with Japan because it was acquired by Takeda, a Japanese pharmaceuticals company. One of the largest reallocations 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, and the issuances of Netherlands-based financing subsidiaries of BMW and Volkswagen with their German parents.

A.IV Estimating Common Equity Positions

While TIC separately reports U.S. holdings of foreign common listed equities and fund holdings, equity holdings in CPIS are not broken down into these sub-categories: CPIS combines common equities, fund shares, as well as holdings in any other type of equity assets such as investment trusts. Since our equity reallocations pertain to common shares, we obtain from other sources or estimate the percentage of tax haven equity investments that are in common equities for all countries in CPIS other than the United States. We only apply our reallocation matrices to these estimated common equity positions, leaving the remaining equity positions unaltered. In this section we detail how we construct these common equity positions. We start by discussing the cases of Ireland and the Cayman Islands, where the presence of fund shares and other non-common types of equity assets is most prominent. We then describe our treatment of the remaining tax havens.

Common equity in the Cayman Islands. As of 2017, TIC shows that 40 percent of U.S. equity holdings (\$547 billion) are in common shares, with the remaining 60 percent (\$815 billion) accounted for by fund shares or other special types of equity. The high prominence of non-common equity in the Cayman Islands is a feature of U.S. holdings, since the U.S. fund industry, particularly hedge funds and private equity funds, frequently use feeder entities in the Cayman Islands that U.S. investors hold positions in. Using security-level data, we observe a total market capitalization of \$2,363 billion for common equities outstanding in the Cayman Islands, while CPIS reports a total of \$3,100 billion in global investments in Cayman Islands equities, inclusive of both common and non-common equities.

From the \$2,363 billion in outstanding common equities, we subtract the \$547 billion in U.S. common equity holdings, as well as the \$164 billion position that Naspers holds in Tencent: this leaves a total common equity stock of \$1,652 billion to be accounted for. Next, we subtract all U.S. equity holdings in the Cayman Islands from the global \$3,100 billion position in CPIS, leaving a residual \$1,738 billion. We assume that all Cayman Islands common equity outstanding other than the known Naspers stake (which we know to be counted as FDI) is accounted for in CPIS as portfolio equity: in other words, we assume that all wealth not accounted for in CPIS is held in fund shares or other types of non-listed equity. Under this assumption, the share of equity holdings in the Cayman Islands that are in common equities for countries other than the United States and South Africa is estimated to be 95 percent, the ratio of the \$1,652 billion in residual common equity outstanding to the the \$1,738 billion residual CPIS position. We repeat this exercise for years prior to 2017, and estimate common equity shares for countries other than the United States and South Africa that range from 49 percent to 100 percent.

Common equity in Ireland. The Securities Holdings Statistics (SHS) of the European Central Bank break down EMU holdings of equity in Ireland into its sub-categories. Using SHS data, we observe that in 2017 only 8 percent (\$71 billion) of EMU equity holdings in Ireland are in common equities, with the remaining 92 percent (\$772 billion) held in fund shares or other non-listed equities. In contrast, TIC shows that 92 percent of U.S. equity holdings in Ireland (\$385 billion) are in common equities, while 8 percent (\$36 billion) are in non-common equities. This heterogeneity between EMU and U.S. holdings reflects the fact that Ireland is a prominent place of incorporation for UCITS investment funds, which by and large collect investments by EMU investors. Using security-level data, we observe a total market capitalization of \$643 billion for common equities outstanding in Ireland. CPIS reports a total of \$1,629 billion in global investments in Irish equities, inclusive of both common and non-common equities: of these, \$692 billion are investments by EMU countries. The \$151 billion gap between total equity investments in Ireland in SHS and CPIS likely reflects the fact that domestic holdings are not included in CPIS: we take this gap, which accounts for 18 percent of total EMU holdings as reported in SHS, as an estimate of the Irish position in domestic equities.

From the \$643 billion in outstanding common equities, we subtract the \$385 billion of U.S. common equity holdings as well as 82 percent of the \$71 billion EMU common equity position: this assumes that the 18 percent figure for domestic holdings within the EMU position applies homogeneously across common and non-common equities. We are therefore left with a residual common equity stock of \$200 billion to be accounted for. We next subtract the EMU positions reported in CPIS and the U.S. positions reported in TIC from the \$1,629 global CPIS position, which leaves a residual \$516 billion. As above for the case of the Cayman Islands, we assume that all wealth not accounted for in CPIS is held in fund shares or other types of non-listed equity. This assumption implies that the share of equity holdings in Ireland that are in common equities for countries other than the United States and the EMU is given by the ratio of the \$200 billion in residual common equity outstanding and the \$516 billion residual CPIS position: it is therefore equal to 39 percent. We repeat this exercise for years prior to 2017, noting that SHS data only becomes available starting in 2013: for years before 2013, we extrapolate EMU positions based on the average of the holdings reported in SHS for the years 2013 and 2014. For the years between 2007 and 2017, we estimate common equity shares for countries other than the United States and the EMU that range between 46 percent and 100 percent.

Common equity in other tax havens. We apply the same estimation procedure as in the cases of the Cayman Islands and Ireland to the other tax havens in our analysis. We are able to use SHS data to directly observe EMU holdings of common equities in Cyprus and in the Netherlands. For Cyprus, the EMU common equity share, the U.S. common equity share, and the rest of the world's common equity share in 2017 are 93 percent, 86 percent, and 100 percent respectively, with little time series variation in the preceding years. For the Netherlands, the EMU common equity share, the U.S. common equity share, and the rest of the world's common equity share in 2017 are 26 percent, 98 percent, and 100 percent, again with little time series variation.

For the special case of Luxembourg, where the investment fund sector overshadows common equity issuance, we drop EMU equity holdings altogether since these investments are accounted for by the foreign investments of Luxembourg. We also assume that any non-EMU holdings in Luxembourg are entirely in fund shares, and as a result we do not reallocate Luxembourg-resident equities for any non-U.S. investor country in our analysis.

For the remaining tax havens, the observed or estimated common equity shares for both the United States and the rest of the world are consistently high, in the 80 percent to 100 percent range, with the exception of the Bahamas, the British Virgin Islands, and Guernsey, where the U.S. observed common equity share and the rest of the world's estimated common equity share have ranged more widely. For each investor country, year, and destination we report our estimate of common equity holdings for CPIS in the detailed estimates files provided on our website.

Alternative estimates. Our estimates for the split between common equity and fund shares in CPIS have to rely on limited and imperfect data. Therefore in Table [A.X](#), we also repeat

our baseline estimates for equity portfolios under an alternative assumption: we assume that all countries hold the same common equity shares in non-EMU tax havens (i.e. tax havens other than Cyprus, Ireland, Luxembourg, and the Netherlands) as the United States. For example, in these estimates we assume that only 40 percent of all countries’ equity holdings in the Cayman Islands in 2017 are in common equities. It is likely that U.S. investments in the Cayman Islands are more heavily concentrated in fund shares due to the specific structure of the U.S. fund industry. Even under this alternative assumption the same qualitative and, to a large extent, quantitative patterns that we highlight throughout the paper are evident.

A.V Spurious Foreign Investment

Our nationality-based tables reallocate significant investment positions from one overseas destination to another. Some of these positions, however, are in fact reallocated back to the investor’s country, and therefore we refer to them as “spurious foreign investment.” For instance, value in the “CYM” row and “USA” column of the reallocation matrix presented in Table I shows that 13.3 percent of U.S. investment in the Cayman Islands under residency is associated with U.S. parent companies and so for many purposes might not be considered foreign investments at all. The key drivers of spurious foreign investment have been recognized for some time, including U.S. corporate tax inversions to Ireland and the use of the Cayman Islands as a hub for U.S.-based structured finance products. Our work quantifies the scale of these positions and demonstrates that they are large for the United States, moderate in the United Kingdom and Switzerland, and quite muted in our other investor countries.

Figure A.VIIa 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 11 percent of all foreign bond holdings in TIC, an amount totaling nearly \$370 billion, should not even be considered foreign investment on a nationality basis. The bulk of these holdings are CLOs, a type of structured finance product that securitizes corporate loans, issued by SPVs registered in the Cayman Islands.¹⁶ 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.¹⁷

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,

¹⁶The 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.

¹⁷Our corresponding restatement of U.S. external asset-backed securities holdings is shown in Table A.VIII.

Southern Water, and Yorkshire Water. A similar four percent of Swiss foreign bond investment is spurious, reflecting Swiss holdings of bonds issued by the Guernsey and Jersey financing affiliates of banks such as Credit Suisse and UBS, as well as of bonds issued by Luxembourg-based subsidiaries of Swiss multinationals such as Glencore. No other bars exceed two percent in the upper panel.

Figure A.VIIb shows the share of foreign equity investment that is spurious. Again, the United States stands out, with nearly 9 percent of all foreign investment – more than 700 billion dollars – considered under nationality to be domestic investment. Close to half of the United States’ spurious foreign equity positions reflects Irish tax inversions, in which a U.S. company acquires an Irish target to relocate its headquarters there and lower its tax rate.¹⁸ 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, Foley and Hines (2006) and Zucman (2013), U.S. multinationals have historically been particularly prone to tax invert because the United States has had a high corporate tax rate and a worldwide tax system, where even profits earned outside of the United States are taxed by the U.S. government. The recent U.S. tax reform likely reduced the scale of both of these incentives.

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

A.VI Details on Currency Exposures Calculations

In this section we detail the calculations that underlie our results regarding the share of aggregate portfolio debt liabilities of large emerging markets that are denominated in local currency, which are discussed in Section III. We construct the local currency share LC_i^{Agg} in the aggregate portfolio debt liabilities of a given country i (for example, Brazil) as a weighted average of the local currency share LC_i^C in corporate debt portfolio liabilities and the local currency share LC_i^S in sovereign debt portfolio liabilities:

$$LC_i^{Agg} = \omega_i^C LC_i^C + (1 - \omega_i^C) LC_i^S,$$

¹⁸For 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.

where $\omega_i^C \in [0, 1]$ is the share of country i 's portfolio debt liabilities issued by the corporate sector. We calculate all these quantities both on a nationality and on a residency basis, as we detail below. For all nationality-based results, we only reallocate bonds that are issued by corporate subsidiaries in tax havens, as in our baseline restatements.

We let $D_{i,j}$ denote the overall position of country j 's investors in country i 's bonds, where j is one of the nine developed countries in our sample. We let $\omega_{i,j}^C$ denote the share of $D_{i,j}$ accounted for by corporate rather than sovereign bonds, making total investment in country i 's bonds as $D_i \equiv \sum_j D_{i,j}$. We then construct the weight on the corporate bond holdings in i , ω_i^C , as

$$\omega_i^C = \sum_j \omega_{i,j}^C \alpha_{i,j},$$

where $\alpha_{i,j} \equiv D_{i,j}/D_i$. Similarly, we construct the local currency shares within asset classes $k \in \{C, S\}$ as

$$LC_i^k = \sum_j LC_{i,j}^k \alpha_{i,j}^k,$$

where $LC_{i,j}^k$ is the local currency share of j 's investments in i 's bonds of type k , and the weights $\alpha_{i,j}^k$ are the shares of investment in country i 's bonds of type k that originate from j :

$$\alpha_{i,j}^C = \frac{\omega_{i,j}^C D_{i,j}}{\omega_i^C D_i}, \quad \alpha_{i,j}^S = \frac{(1 - \omega_{i,j}^C) D_{i,j}}{(1 - \omega_i^C) D_i}.$$

To compute these statistics on a residency basis, we obtain data on bilateral holdings $D_{i,j}$ from TIC and CPIS. Data on the share of outward bond investments accounted for by the corporate sector, $\omega_{i,j}^C$, is available for U.S. outward investments from TIC and is taken from Morningstar for countries other than the United States, since CPIS does not separate corporate and sovereign bond positions for those countries. For the United States, we observe the local currency shares $LC_{i,j}^k$ in TIC.¹⁹ For all other countries, we estimate the share of local currency in each bond type and for each bilateral, $LC_{i,j}^k$, using the Morningstar data, expressed on a residency basis.²⁰ Estimates for a set of large emerging markets are shown in Table A.XI.

¹⁹TIC reports the local currency share of bilateral holdings for sovereign and private debt: we take the private debt values as our estimates for the local currency share in corporate bonds.

²⁰When computing statistics on a nationality basis, we obtain bilateral holdings $D_{i,j}$ and the U.S. corporate share $\omega_{i,USA}^C$ from our restated TIC and CPIS tables. We estimate the non-U.S. corporate shares $\omega_{i,j}^C$ for $j \neq USA$, the corporate local currency shares $LC_{i,j}^C$, and the sovereign local currency shares $LC_{i,j}^S$ using the Morningstar data, expressed on a nationality basis. For the United States only, we use the TIC local currency shares for sovereign bonds to establish $LC_{i,j}^S$: since sovereigns nearly always issue under their own name, the TIC shares can be effectively used for our nationality-based calculations.

A.VII Additional Details on China’s VIEs and NFA

As noted in Section III, 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 first provide a further of discussion how the VIE structure uses offshore shell companies to evade China’s restrictions on foreign investment and why these investments carry unique risks. Second, we examine at greater length how the VIE structure leads to a bias in China’s external liabilities. Lastly, we detail our analysis of Chinese residents’ ownership of VIE equities, which underlies our assessment of the extent of bias in China’s external assets. We find bias in China’s external liabilities to be much larger than in its external assets, hence leading on net to a significant upward bias in China’s net foreign asset (NFA) position.

A.VII.A Contractual Arrangements and Risks in China’s VIEs

The VIE structure offers a way for firms to avoid the Chinese government’s restriction on foreign investment in strategically important industries such as internet platforms, financial services, telecommunications, energy, agriculture, transportation, and education. Figure VI, which is also discussed in the main text, provides a schematic overview of the VIE structure. Here we give further details on the contractual arrangements involved in the VIE structure, and the risks that these entail for investors.

The first step in the VIE 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 special purpose vehicle (SPV), itself often based in Hong Kong, as shown with arrows B and C. Sometimes, as shown with arrow D, this ownership is direct. These foreign equity stakes in the WFOEs are the cross-border positions in mainland China for the purposes of national statistics.

The most tenuous links in the corporate structure are represented by arrows E and F. In these links, the WFOE, the Operating Company, and the Chinese owners of the Operating Company enter into a series of contractual relationships designed to mimic equity ownership while satisfying the requirement that regulators consider the Operating Company to be Chinese owned. For example, the WFOE provides the Chinese owners of the firm a zero-interest loan with their equity in the firm pledged as collateral (arrow F). In addition, the Chinese owners grant the WFOE an exclusive option to buy the Operating Company at a pre-specified price and may sign over a proxy agreement or power of attorney. Taken together, these contracts offer the WFOE “equity-like” control over the Operating Company. Further, in order to transfer the Operating Company’s profits to the WFOE, they enter into an exclusive agreement (arrow E) in which the Operating Company hires the WFOE to provide technical services such as “website maintenance, programming, sales support, fulfillment services, curriculum development, etc.” (Gillis, 2019). The WFOE charges a fee for providing these

services that is approximately equal to the entire profits of the Operating Company.²¹

Indeed, many of the risks faced by investors arise from the possibility that the Chinese authorities may recognize such structures as illegal, leaving foreign investors without the ability to claim the Operating Company's assets and cash flows and holding worthless shares in an empty shell company in the Cayman Islands. The Chinese owners could take control of the assets of the firm in a perceived contravention of the bilateral contracts with the WFOE.²² Additionally, the Chinese authorities could prevent or change the tax treatment on the profit transfers from the Operating Company to the WFOE.²³

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.²⁴ Our results suggest that this risk may be under-appreciated by regulators due to the understatement of its scale in official statistics.

A.VII.B VIEs and China's External Liabilities: Discussion

As we noted in Section III, recording FDI at market values is challenging.²⁵ In the specific case of China's VIEs this difficulty is compounded: since the VIE structure dissociates the onshore Operating Company from the rest of the corporate chain, it raises reasonable questions as to the relationship between the market price of the publicly Listed Company and the value of the WFOE, the Chinese entity that is foreign owned. Chinese law does not recognize the listed shares as equity claims on the Chinese Operating Company, therefore China's statisticians may reject the notion that the value of owning the WFOE equals the market value of the Listed Company.

²¹In 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."

²²The 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.

²³If 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).

²⁴Companies 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, Figure A.VI 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.

²⁵As further commentary on this issue, 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."

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

As discussed in Section III, in order to quantify the implications of the VIE structures for China's external liabilities we must make an assumption about how China's statisticians book the value of VIE-related inward FDI positions. We argue that changes in the foreign stock market value of the VIEs are not captured in China's external accounts, but the accounts should reflect at least the cumulative value of any financial transfers or actual flows that cross China's border. In our baseline adjustment of China's NFA for the bias due to offshore issuance, we assume that at the time of each Listed Company's initial public offering and follow-on equity offerings, the capital raised is transferred from outside to inside of China; therefore, the value associated with each foreign-held VIE position equals the cumulative value of all equity offerings made by that VIE. As seen in Figure VIIa, we estimate that under this assumption, China's reported external liabilities are biased downward by an amount that has grown rapidly from a few billions in 2009 to nearly \$1.4 trillion in 2018. We reach this estimate by calculating the market value of the Listed Companies as \$1.55 trillion at the end of 2018 but measuring the total capital raised from public offerings at only \$167 billion.²⁶

A.VII.C Estimating Chinese Ownership in VIE Equities and Bias in China's External Assets

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

²⁶Our assumption that the value of VIEs are reflected in China's external liabilities as the accumulation of their equity offerings may in fact be conservative. If the Chinese statisticians only estimated the value of the WFOEs as consulting firms and the holding companies never transfer the funds raised offshore back onshore, their value in China's external liabilities may be even lower.

(arrows H and L) or directly (arrow I) if held by company insiders. The Bloomberg data have the advantage of including both institutional holdings, such as BlackRock holdings in Alibaba, and insiders' holdings, such as Jack Ma's stake in Alibaba. 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 18.4 percent of the market capitalization of VIEs via offshore investment vehicles or via shares held directly by company insiders.²⁷ In our baseline treatment, we assume that these holdings have been booked in China's foreign asset positions using the same notion of value as was used for the liabilities, specifically the cumulative value of equity offerings by the firm. Further, using data from the Hong Kong Stock Exchange (HKEX), we also observe direct holdings of traded equities by Chinese households and institutions via the HKEX StockConnect program equal to 1.1 percent of the outstanding market value of the VIEs. Because this 1.1 percent is unambiguously portfolio equity investment of Chinese residents from the perspective of balance of payments accounting, we assume throughout that it is recorded at market value.

Since Bloomberg only provides comprehensive ownership data as of the latest available reporting period, the holdings of various individuals and institutions are measured at different points in time – nearly always at the end of 2018 or in the middle of 2019. The Bloomberg data collate ownership stakes coming from 13-F filings (for large U.S. investors), other analogous international regulatory filings, shares disclosed in individual holder reports, and beneficial ownership shares disclosed in the Chinese firms' SEC filings or company reports. Altogether, these known ownership shares account for more than 80 percent of the outstanding market value of the 40 largest VIEs.²⁸ We express all positions in Bloomberg as shares of the total market value of the VIE firms, which includes all outstanding shares rather than just floating shares.

We manually assigned a country of residency to the positions for which this field was missing. In most of these cases this procedure is necessary because the holder is an individual and the Bloomberg ownership data do not provide a country of residency for individuals. We performed manual searches aided by research assistants using Bloomberg, the SEC's EDGAR platform, Factset, and web queries to gather information about the relevant individuals and establish a place of residency, defaulting to China when in doubt.

We also manually reassigned to China large positions by tax haven-resident offshore investment vehicles that are wholly owned by Chinese individuals. Large holders in the Cayman Islands and in the British Virgin Islands are usually companies entirely owned by founders or board members of the Chinese VIEs. For example, the ownership stake of Alibaba's founder Jack Ma in Alibaba (6.4 percent in 2018) is held primarily via offshore vehicles resident in the British Virgin Islands

²⁷This finding is consistent with the evidence in Edison and Warnock (2004) and Ammer et al. (2012) that investors from large developed countries hold significant stakes in foreign companies that are cross-listed on U.S. exchanges.

²⁸The Bloomberg data provide coverage for 82.3 percent of the outstanding value of the VIEs, and a further 2.3 percent is accounted for by holdings included in Morningstar data but not present in Bloomberg that we add to our analysis (see footnote 29). The total share that remains unaccounted for is therefore 15.4 percent.

(JSP Investment Limited, JC Properties Limited, Yun Capital Limited, and Ying Capital Limited, accounting for a total 5.1 percent stake in Alibaba) and in the Cayman Islands (APN Limited, accounting for a 1.3 percent stake in Alibaba), as detailed in Table A.XII. We assigned to China any positions of a VIE company (such as Alibaba or Baidu) in other VIEs.

In order to confirm the validity of the Bloomberg ownership database, we cross-referenced it against the holdings data from Morningstar, covering the positions of funds domiciled in the nine developed economies that constitute our paper’s sample. Bloomberg reports holdings at the fund-family level as of the end of 2018 or the middle of 2019, while Morningstar provides fund-by-fund information and is only available to us through the end of 2017. Since these two datasets don’t share common identifiers, we performed a fuzzy match on fund family names and compared the resulting matched data in order to ensure the positions in Bloomberg align with the ones in Morningstar. Because of the differences in measurement periods, we do not expect an exact match between the positions reported in Bloomberg and in Morningstar. However, the correlation between the positions in Bloomberg and Morningstar was high at 72 percent. Dropping the positions with the five largest discrepancies, the correlation was 84 percent.

We confirmed that the positions in Morningstar and Bloomberg are similarly well-aligned in dollar levels. For example, total holdings in Tencent by BlackRock are \$9.2 billion in Bloomberg and \$8.5 billion in Morningstar. Similarly, holdings in Tencent by the Vanguard Group are \$13.6 billion in the Bloomberg database and \$11.2 billion in Morningstar, while holdings by the T. Rowe Price Group are \$5.8 billion in Bloomberg and \$4.2 billion in Morningstar. The alignment in dollar levels between the Bloomberg and Morningstar data also mitigates the potential concern that Bloomberg’s fund family-level data might include significant holdings by funds domiciled in China (or in offshore tax havens such as the Cayman Islands), since the Morningstar data that we use only include holdings by funds domiciled in the nine developed economies in our sample. The largest discrepancies for the two most significant VIEs, Alibaba and Tencent, were in the positions of JPMorgan Chase. While Bloomberg reports that JPMorgan holds about 2.5 percent and 3.7 percent of the outstanding market value of these two companies, holdings in Morningstar were significantly lower (below 1 percent). Using both supplementary data from Bloomberg and (in the case of Tencent) Tencent’s June 2018 interim shareholder report, we confirmed that this discrepancy arises because Morningstar only takes into account shares held by funds within JPMorgan’s investment management arm, while Bloomberg includes positions that are held directly by JPMorgan on its own behalf and outside of its investment management business.²⁹

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

²⁹After verifying the alignment between the Bloomberg and Morningstar reports, we also augmented the Bloomberg holdings data with the ownership shares of fund families that were present in Morningstar but not Bloomberg. We only added positions of fund families that were entirely absent in Bloomberg. In practice, this type of holdings is small (2.3 percent of the outstanding market value of the largest 40 VIEs).

stock in China’s foreign assets.³⁰

The methodology laid out in this section implies that 1.1 percent of the outstanding value of the largest 40 VIEs is owned by Chinese residents directly via the Hong Kong Stock Exchange StockConnect program, while 18.4 percent of their value is owned by Chinese residents via other means, including shares held by founders and insiders outside of the StockConnect program, and shares held via offshore investment vehicles. This implies overall Chinese ownership of the Listed Companies at 19.5 percent. In contrast, 65.2 percent of the value of the VIEs is held by non-Chinese individuals and institutions either directly or via investment funds domiciled outside of China.³¹ A residual 15.4 percent ownership share remains unaccounted for: in the scenario labeled “Upper Bound on Chinese Holdings” in Figure VIII, we assign these holdings entirely to China.³² We take these numbers as our (time-invariant) estimates of the composition of the Chinese VIEs’ shareholder base. As a result, we estimate that China’s reported external assets are biased downward by \$256 billion by 2018. Table A.XIII provides a list of the largest positions included in our analysis at the fund-family or individual-investor level.

If we consider an alternate methodology that uses the nationality-based restatements of TIC and CPIS that we introduced in Section III, we obtain similar results. We sum the estimated holdings of Chinese equities based in the Cayman Islands from both the nine developed countries in our investor sample, using our holdings-based reallocation matrices, and for the rest of the countries in CPIS other than China and Hong Kong using the global equity issuance distribution matrix.³³ We exclude Hong Kong because much of Hong Kong’s portfolio equity positions in the Cayman Island reported in CPIS may reflect holdings by mainland China’s investors: indeed, China’s own reported Caymans equity investment is very small at \$24 billion in 2017, as compared to the much larger Hong Kong position of \$581 billion. We augment this total with Naspers’ investment in Tencent, which is not captured in CPIS. The foreign holdings in this calculation account for 78.9 percent of the market value of the VIEs in 2017, implying that the share of VIEs owned by Chinese investors

³⁰Chinese 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 (StockConnect).

³¹As in the rest of the paper, we maintain the assumption that investment positions domiciled outside of China belong to non-Chinese investors, other than for the special wholly-owned Caymans and British Virgin Island vehicles discussed above. For example, we consider the entire stake of Naspers in Tencent as owned by South Africans and we consider the entire stake of Softbank in Alibaba as owned by Japanese. It is of course possible that these firms manage assets on behalf of foreign investors. On the liabilities side, we assume that all claims from the Cayman Islands Listed Company are on operating assets located in China, such that it is appropriate to associate all investments in the VIEs’ Listed Companies to underlying activity in China. As shown in Figure A.V, this is an imperfect approximation. While the bulk of the operational activity is diagrammed to reside within China, there are two boxes on the top-left of the organization chart that allow for the possibility that Alibaba’s Listed Company also owns assets outside of China.

³²An ownership share of 0.7 percent remains associated with investment funds domiciled in the Cayman Islands or in the British Virgin Islands that we cannot affirmatively confirm are wholly owned by Chinese individuals. The “Upper Bound on Chinese Holdings” scenario in Figure VIII also attributes these holdings to China for conservativeness.

³³We apply the issuance distribution matrices to countries’ estimated common equity positions in the Cayman Islands, which we construct from CPIS data as discussed in Appendix Section A.VII.

is 21.1 percent, in the same range as our baseline estimate.

A.VIII Further Details on Key Role of Micro Data

Section IV in the main text explains why it would be difficult to use the BIS IDS data to transform residency-based positions to nationality-based positions. One simple approach might be to scale all bilateral investments in a country k under residency by the ratio of bonds outstanding under nationality (B_k^N) to bond outstanding under residency (B_k^R). For example, if one knew from the IDS data that the value of international debt securities issued by Brazil under nationality was twice the value issued under residency, one might simply double U.S. holdings of Brazilian bonds under residency in TIC to estimate the value of U.S. holdings of Brazilian bonds under nationality. Below, we discuss why results from this approach would have significant shortcomings, but stress that this is a criticism of this hypothetical approach and not of the IDS data.

This method implies that every restated position in an issuing country will change by the same percentage, regardless of the investor. This symmetric adjustment is at odds with the data as our baseline methodology implies highly heterogeneous percentages are reallocated to a given issuer, depending on the investor country. This method also generally changes the total value of each investor country's position. In other words, unlike our baseline approach, this method of translating bilateral positions under residency to nationality will – artificially – make countries richer or poorer.

When we implement this method using the IDS data, it indeed produces results at odds with our baseline results. Countries like Brazil, Germany, and Japan, which receive large increases in positions under nationality in our baseline receive vastly smaller increases using this alternate method.³⁴ One reason for this more muted increase using the BIS method is that U.S. investors are often underweight issuance by local firms. For example, the share of Brazil in overall U.S. holdings under residency is smaller than the share of Brazil in global issuance under residency as U.S. investors do not typically buy the bonds issued locally by Brazilian firms like Oi, the largest local fixed telephone operator, or Votoratim Cementos, the largest local cement company.³⁵ U.S. bond holdings in other countries like the United Kingdom increase with our baseline restatement but decrease with this multiplicative method.³⁶

³⁴The nationality-based holdings for tax havens like the Cayman Islands are of course similar, and close to zero, with this method as well as in our baseline. Nearly all securities are transferred away from the Cayman Islands under nationality so that most methods produce a similar outcome.

³⁵To see the relevance of this force, imagine that U.S. investors only purchased the bonds issued by offshore affiliates of Brazilian companies and did not purchase any bonds that are Brazilian under residency. In this extreme case, using the multiplicative matrix will generate a nationality-based position equal to zero, regardless of the value of B_{BRA}^N/B_{BRA}^R .

³⁶Many foreign companies issue in London, including Deutsche Bank London, the foreign affiliate of the European bank. As a result, B_{GBR}^N/B_{GBR}^R is less than one, so all bilateral holdings of U.K. private bonds are reduced.

A.IX Home Bias in Tax Havens: A Formal Test

In this section we provide a formal test of the “home bias in tax havens” hypothesis discussed in the main text. We run the following cross-sectional regressions:

$$\omega_{i,k,j} = \alpha + b_{i,k} + \beta \cdot \text{Home}_{k,j} + \varepsilon_{i,k,j}, \quad (\text{A.3})$$

where j indexes investor countries, i indexes issuer residency, and k indexes issuer nationality. The term $\omega_{i,k,j}$ is simply an entry in the reallocation matrix Ω_j , for either equities or corporate bonds: it measures the share of investor j ’s investments in securities issued by country i on a residency basis that on a nationality basis are associated with issuer country k . $\text{Home}_{k,j}$ is an indicator variable for whether the investments of country j in nationality k are domestic or not: that is, whether these investments are domestic on a nationality basis.³⁷

In order to use this specification to measure home bias within tax havens, we apply a number of sample restrictions. First, we only consider observations for which country i is a tax haven. Second, we restrict country k to be one of the nine investor economies in our sample. To understand the mechanics of these regressions, consider the example of investments in U.S. equities by nationality ($k = \text{USA}$) that are issued in the Cayman Islands on a residency basis ($i = \text{CYM}$). The regressions will include exactly nine observations corresponding to this case: eight for non-U.S. investor countries ($j \neq \text{USA}$), and one for the United States itself ($j = \text{USA}$). In this example, we want to measure how much higher the share $\omega_{i,k,\text{USA}}$ is for the U.S. observation, relative to the eight non-U.S. observations: this quantifies how much U.S. investors prefer U.S. equities when they are buying Cayman Islands-resident securities relative to the rest of the investor in our sample. The coefficient β estimates this degree of home bias in tax havens.

We show the estimates from specification (A.3) in Table A.XV under several weighting schemes.³⁸ For both equities and bonds, these estimates show large and significant degrees of home bias in tax havens.

A.X Domestic Positions 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

³⁷In the regressions we present here, the fixed effects $b_{i,k}$ are estimated freely from the data. An alternative specification in which the terms $b_{i,k}$ are fixed using the issuance distribution matrix b yields analogous results, which are available upon request.

³⁸The first weighting scheme is $q_{i,j}^R$, the dollar value of holdings in TIC or CPIS of investor country j in securities issued by country i on a residency basis. This measures the relative importance of each bilateral investment flow from country j to i . The second weighting scheme is $q_i^R \sum_j q_{i,j}^R$, which measures the relative importance of each tax haven i while placing different investors on equal footing. Lastly, we report estimates from unweighted regressions.

in TIC and CPIS based on the ratio of domestic to foreign investment in the Morningstar data. Specifically, we calculate:

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

Intuitively, we assume that mutual funds and ETFs in the Morningstar data have a similar share of domestic investments as does the universe of all investors covered in TIC and CPIS. 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. Table A.IX provides a sensitivity analysis for this imputation of domestic positions by showing our full nationality estimates for U.S. external portfolios without performing the imputation and instead setting unobserved domestic positions to zero. In the case of Norway, we exclude the Norwegian sovereign wealth fund holdings when performing the domestic position imputation since the fund does not invest in domestic securities by mandate.

A.XI Constructing the Sales-Based Restatements

We construct the sales-based reallocations discussed in Section V using the Factset Geographic Revenue Exposure (“GeoRev”) dataset to measure each company’s revenue exposure to countries around the world. This dataset reports the estimated percentage of the firm’s revenue derived from each country. As part of both GAAP and IFSR accounting, firms are required to report the geographic segments where they earn their revenues.³⁹ The Factset data begins with this geographic segment reporting and supplements it with additional information when available, such as footnotes and in-text disclosures of other filings.⁴⁰

The requirement to report the geographic segment data applies to firms with publicly traded equity or bonds (Deloitte, 2019). Companies are required to report the specific country of their sales if they earn more than 10 percent of their revenue in a specific destination or if they have material interests in a specific location. If a firm reports a geographic region rather than a country (for example, “East Asia”), Factset approximates country-level sales shares using relative GDP weights within the reported region. While this imputation is reasonable and probably approximates well the geographic exposure, it will attribute relatively high sales shares to larger countries (such as China in the case of “East Asia”) when company reporting covers only a fraction of total sales.

Factset includes a variable (“Certainty_Class”) that ranks the precision of their reported values via a letter rating. The baseline results in the paper use the data as reported by Factset at the

³⁹Whenever possible, we use the sales revenue of the entity itself for the calculation of the sales weight. However, if the sales shares of the entity itself is unavailable from Factset, we use the sales data for the ultimate parent firm. In the event that neither the entity itself or its ultimate parent has sales data in Factset, we omit the firm bond from our calculation of the sales-based reallocation matrix.

⁴⁰We also investigated the Thomson Reuters Worldscope Segments data. Factset provides additional geographic breakdowns whenever it is disclosed by firms in addition to the segment information.

country level, which includes records with all ratings, from the most stringent certainty class (A) to the broadest one (E). Factset also includes a confidence score (“Conf”) where a score of 1 denotes a directly declared value and any level below represents a country where Factset augmented the raw segment information in some way, regardless of how minor. Certainty class A predominantly includes entries with a confidence score of 1, but it also includes some entries with scores below this level. For instance, JD.com, a Chinese VIE, reports in its 2017 annual report that: “As most of the Group’s long-lived assets are located in the PRC and most of the Group’s revenues are derived from the PRC, no geographical information is presented.” Factset then reports the share of revenue earned in China as 97 percent with a certainty class of A and a confidence of 0.97. Records with lower certainty classes still contain a significant amount of information. For Ctrip, also a Chinese firm, Factset rates the China entry a “B” where the annual report writes: “The Company primarily generates its revenues from end users in Great China Area, and assets of the Company are also primarily located in Great China Area. Accordingly, no geographical segments are presented.”

When we repeat the reallocations to China in Figure XI only using Factset GeoRev country shares where the certainty class is A, and reallocate all shares for countries rated B, C, D, or E to a firm’s country of residency, the sales-based reallocation is closer to the nationality estimate than the sales-based estimate using the full dataset. For our baseline year of 2017, U.S. equity investments in China are \$1,844 billion under our sales-based reallocation, \$627 billion using certainty class A, and \$696 billion under nationality.

For every issuing entity m based in country i , the share of its total sales that go to country k is denoted $\phi_{i,k,m}$. These sales shares are from annual reporting data, and all of our sales-based calculations are dynamic. We suppress the time subscript t to minimize on notation. The sum of each entity’s sales shares is one by construction, $\sum_k \phi_{i,k,j} = 1$. Denoting the market value of country j ’s ownership of securities issued by entity m as $x_{i,j,m}^{\mathcal{R}}$, we can calculate the sales exposure this position generates to country k as

$$x_{i,k,j,m}^{\mathcal{R} \rightarrow \mathcal{S}} = \phi_{i,k,m} x_{i,j,m}^{\mathcal{R}}. \quad (\text{A.5})$$

This defines a corporate-entity level reallocation to each possible country, in contrast to the nationality reallocations in which an entity was always mapped into exactly one location. We then sum over all issuers m based in country i to estimate the exposure of country j to country k via their security holdings resident in country i , $x_{i,k,j}^{\mathcal{R} \rightarrow \mathcal{S}} = \sum_m x_{i,k,j,m}^{\mathcal{R} \rightarrow \mathcal{S}}$. Analogously to equation (1) we can now define an entry $\omega_{i,k,j}^{\mathcal{S}}$ in our sales-based reallocation matrix for country j as

$$\omega_{i,k,j}^{\mathcal{S}} = \frac{x_{i,k,j}^{\mathcal{R} \rightarrow \mathcal{S}}}{x_{i,j}^{\mathcal{R}}},$$

where $x_{i,j}^{\mathcal{R}}$ is the total value of security holdings of country j in country i on a residency basis. Collecting $\omega_{i,k,j}^{\mathcal{S}}$ over all rows i and columns k , we can define country j ’s sales-based reallocation

matrix Ω_j^S analogously to our nationality-based measure:

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

where each row of Ω_j^S sums to one.⁴¹ Analogously to our baseline nationality analysis, we can transform our vector of residency-based positions of country j , q_j^R , into a sales-based exposure, q_j^S , by pre-multiplying the residency-based vector by the transpose of the reallocation matrix:

$$q_j^S = \Omega_j^{S'} q_j^R \quad (\text{A.6})$$

where $q_j^S = [q_{1,j}^S, q_{2,j}^S, \dots]'$ is the resulting estimate of sales-based positions for that dataset. As in Section III, we use this data to restate TIC and CPIS, this time on a revenue-based exposure measure.

⁴¹We calculate separate matrices for equities and bonds.

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ISO3 Code	Country Name	ISO3 Code	Country Name
ABW	Aruba	LBN	Lebanon
AIA	Anguilla	LBR	Liberia
AND	Andorra	LCA	Saint Lucia
ANT	Netherlands Antilles	LIE	Liechtenstein
ATG	Antigua and Barbuda	LUX	Luxembourg
BHR	Bahrain	MAC	Macao
BHS	Bahamas	MAF	Saint Martin (French part)
BLZ	Belize	MCO	Monaco
BMU	Bermuda	MDV	Maldives
BRB	Barbados	MHL	Marshall Islands
COK	Cook Islands	MLT	Malta
CRI	Costa Rica	MSR	Montserrat
CUW	Curaçao	MUS	Mauritius
CYM	Cayman Islands	NIU	Niue
CYP	Cyprus	NLD	Netherlands
DJI	Djibouti	NRU	Nauru
DMA	Dominica	PAN	Panama
FSM	Micronesia, Federated States of	SGP	Singapore
GGY	Guernsey	SMR	San Marino
GIB	Gibraltar	SYC	Seychelles
GRD	Grenada	TCA	Turks and Caicos Islands
HKG	Hong Kong	TON	Tonga
IMN	Isle of Man	VCT	Saint Vincent and the Grenadines
IRL	Ireland	VGB	Virgin Islands, British
JEY	Jersey	VUT	Vanuatu
JOR	Jordan	WSM	Samoa
KNA	Saint Kitts and Nevis		

Table A.I: **List of countries classified as tax havens.** This classification is used both in our parent-assignment procedure and in all the analysis we perform in this paper. See Appendix Section A.II for details on the construction of our list.

Issuer CUSIP6	Issuer Name	Issuer Residency	Parent CUSIP6	Parent Nationality	Parent Name	Value Outstanding (USD Billions)
<i>A. Corporate bonds reallocated away from selected tax havens</i>						
01609W	ALIBABA GROUP HLDG LTD	CYM	01609W	CHN	ALIBABA GROUP HLDG LTD	14.9
71645W	PETROBRAS INTL FIN CO	CYM	P78331	BRA	PETROLEO BRASILEIRO SA	10.8
91911T	VALE OVERSEAS LTD	CYM	P96620	BRA	VALE SA	9.3
893830	TRANSOCEAN INC	CYM	H8817H	CHE	TRANSOCEAN LTD	9.3
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
N1420M	BMW FINANCE NV	NLD	D0785N	DEU	BAYERISCHE MOTORENWERKE AG	33.8
N93695	VOLKSWAGEN INTL FIN NV	NLD	D9452L	DEU	VOLKSWAGEN AG	31.5
L4191B	GAZ CAPITAL SA LUXEMBOURG	LUX	368287	RUS	GAZPROM PJSC	28.6
71647N	PETROBRAS GLOBAL FIN BV	NLD	P78331	BRA	PETROLEO BRASILEIRO SA	27.5
<i>B. Equities reallocated away from selected tax havens</i>						
G87572	TENCENT HLDGS LTD	CYM	G87572	CHN	TENCENT HLDGS LTD	493.6
01609W	ALIBABA GROUP HLDG LTD	CYM	01609W	CHN	ALIBABA GROUP HLDG LTD	435.2
056752	BAIDU INC	CYM	056752	CHN	BAIDU INC	64.7
47215P	JD COM INC	CYM	47215P	CHN	JD COM INC	49.7
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 A.II: **Largest issuer-level reallocations away from selected tax havens, 2017.** Panel A shows corporate bond reallocations, while panel B shows equity reallocations. Within each panel, we show the largest four reallocations away from the following tax havens: (i) the Cayman Islands, (ii) Bermuda, (iii) the Channel Islands (Guernsey, Jersey, and the Isle of Man), and (iv) Ireland, Luxembourg, and the Netherlands. Amounts shown correspond to face value outstanding for bonds and market values outstanding for equities.

Destination	ISO Code	CPIS	Baseline		Full Nationality	
			Position	Δ	Position	Δ
A. Selected Non-Tax Haven Countries						
Argentina	ARG	3	3	0	3	0
Australia	AUS	34	35	1	37	3
Brazil	BRA	10	16	6	18	8
Canada	CAN	28	29	1	37	9
China	CHN	8	15	7	16	7
France	FRA	104	107	3	103	-1
Germany	DEU	96	126	29	123	27
India	IND	7	7	1	10	3
Indonesia	IDN	3	4	0	4	0
Italy	ITA	16	20	4	22	6
Japan	JPN	44	47	3	53	9
Mexico	MEX	12	12	0	14	2
Russia	RUS	2	5	3	5	3
Saudi Arabia	SAU	1	1	0	1	0
Spain	ESP	15	24	9	39	25
South Africa	ZAF	6	6	1	7	2
South Korea	KOR	6	6	0	6	0
Turkey	TUR	5	5	0	5	0
United States	USA	422	456	34	470	48
B. Selected Tax Havens						
Bermuda	BMU	2	1	-2	1	-2
Cayman Islands	CYM	36	0	-35	0	-35
Curaçao	CUW	0	0	0	0	0
Guernsey	GGY	3	0	-3	0	-3
Hong Kong	HKG	7	3	-4	6	-1
Ireland	IRL	57	19	-38	21	-36
Jersey	JEY	22	0	-22	0	-22
Luxembourg	LUX	28	0	-28	0	-28
Netherlands	NLD	75	33	-42	40	-35
Panama	PAN	0	0	0	0	0
British Virgin Islands	VGB	2	0	-2	0	-2
C. Total Foreign Holdings						
Total Foreign Holdings	—	1,278	1,225	-53	1,299	21
D. Domestic Reallocation						
United Kingdom	GBR	940*	993	53	919	-21

Table A.III: **Estimated nationality-based outward U.K total debt portfolios, 2017.** This table presents estimates of restated outward U.K total debt portfolio positions using a nationality-based criterion, which we compare to CPIS data. We present our baseline estimates, which only reallocate holdings away from tax havens (*Baseline*), as well as estimates obtained under our alternative estimation treatment that also reallocates holdings between countries that are not tax havens (*Full Nationality*). Positions in the *CPIS* column with an asterisk (*) are our estimates.

Destination	ISO Code	CPIS	Baseline		Full Nationality	
			Position	Δ	Position	Δ
A. Selected Non-Tax Haven Countries						
Argentina	ARG	1	1	0	1	1
Australia	AUS	44	44	0	57	13
Brazil	BRA	15	15	0	13	-2
Canada	CAN	34	35	1	37	3
China	CHN	48	97	49	97	49
France	FRA	104	105	1	107	3
Germany	DEU	83	83	0	84	1
India	IND	28	30	2	28	0
Indonesia	IDN	7	8	0	7	0
Italy	ITA	30	31	1	32	2
Japan	JPN	144	148	4	148	4
Mexico	MEX	7	7	0	10	3
Russia	RUS	11	12	1	12	1
Saudi Arabia	SAU	0	0	0	0	0
Spain	ESP	38	38	0	47	9
South Africa	ZAF	12	12	0	16	4
South Korea	KOR	40	40	0	40	0
Turkey	TUR	4	4	0	4	0
United States	USA	811	840	29	850	40
B. Selected Tax Havens						
Bermuda	BMU	10	0	-10	0	-10
Cayman Islands	CYM	41	2	-39	2	-39
Curaçao	CUW	0	0	0	0	0
Guernsey	GGY	16	15	-1	15	-1
Hong Kong	HKG	56	39	-17	39	-17
Ireland	IRL	199	176	-24	177	-22
Jersey	JEY	24	0	-24	0	-24
Luxembourg	LUX	85	85	0	85	0
Netherlands	NLD	54	42	-12	136	82
Panama	PAN	0	0	0	0	0
British Virgin Islands	VGB	0	0	0	0	0
C. Total Foreign Holdings						
Total Foreign Holdings	—	2,236	2,194	-42	2,337	101
D. Domestic Reallocation						
United Kingdom	GBR	1,557*	1,599	42	1,456	-101

Table A.IV: **Estimated nationality-based outward U.K equity portfolios, 2017.** This table presents estimates of restated outward U.K equity portfolio positions using a nationality-based criterion, which we compare to CPIS data. We present our baseline estimates, which only reallocate holdings away from tax havens (*Baseline*), as well as estimates obtained under our alternative estimation treatment that also reallocates holdings between countries that are not tax havens (*Full Nationality*). Positions in the *CPIS* column with an asterisk (*) are our estimates. We do not reallocate equity investments in Luxembourg for non-U.S. countries since these include a significant fund shares component.

Destination	ISO Code	CPIS	Baseline		Full Nationality	
			Position	Δ	Position	Δ
<i>A. Selected Non-Tax Haven Countries</i>						
Argentina	ARG	1	1	0	1	0
Australia	AUS	9	9	0	8	0
Brazil	BRA	3	4	1	5	2
China	CHN	1	2	1	3	2
France	FRA	6	7	0	5	-1
Germany	DEU	7	9	1	19	12
India	IND	1	1	0	2	1
Indonesia	IDN	2	2	0	2	0
Italy	ITA	3	3	0	3	0
Japan	JPN	7	8	0	22	15
Mexico	MEX	4	4	0	4	0
Russia	RUS	1	1	1	1	1
Saudi Arabia	SAU	0	0	0	0	0
Spain	ESP	2	2	0	3	1
South Africa	ZAF	1	1	0	1	0
South Korea	KOR	1	1	0	1	0
Turkey	TUR	1	1	0	1	0
United Kingdom	GBR	16	18	2	29	13
United States	USA	251	255	4	278	27
<i>B. Selected Tax Havens</i>						
Bermuda	BMU	1	0	0	0	0
Cayman Islands	CYM	4	0	-4	0	-4
Curaçao	CUW	0	0	0	0	0
Guernsey	GGY	0	0	0	0	0
Hong Kong	HKG	0	0	0	0	0
Ireland	IRL	3	2	-1	2	0
Jersey	JEY	1	0	-1	0	-1
Luxembourg	LUX	5	0	-5	0	-5
Netherlands	NLD	5	4	-2	5	0
Panama	PAN	0	0	0	0	0
British Virgin Islands	VGB	0	0	0	0	0
<i>C. Total Foreign Holdings</i>						
Total Foreign Holdings	—	364	364	0	433	69
<i>D. Domestic Reallocation</i>						
Canada	CAN	1,082	1,082	0	1,014	-69

Table A.V: **Estimated nationality-based outward Canadian total debt portfolios, 2017.** This table presents estimates of restated outward Canadian total debt portfolio positions using a nationality-based criterion, which we compare to CPIS data. We present our baseline estimates, which only reallocate holdings away from tax havens (*Baseline*), as well as estimates obtained under our alternative estimation treatment that also reallocates holdings between countries that are not tax havens (*Full Nationality*). Positions in the *CPIS* column with an asterisk (*) are our estimates.

Destination	ISO Code	CPIS	Baseline		Full Nationality	
			Position	Δ	Position	Δ
A. Selected Non-Tax Haven Countries						
Argentina	ARG	0	0	0	1	0
Australia	AUS	18	18	0	18	0
Brazil	BRA	12	12	0	10	-1
China	CHN	34	62	28	61	27
France	FRA	38	38	0	40	2
Germany	DEU	31	31	0	32	1
India	IND	18	18	0	17	0
Indonesia	IDN	4	4	0	3	-1
Italy	ITA	6	7	0	7	1
Japan	JPN	63	64	0	63	0
Mexico	MEX	6	6	0	5	0
Russia	RUS	2	3	0	3	0
Saudi Arabia	SAU	0	0	0	0	0
Spain	ESP	8	8	0	9	1
South Africa	ZAF	6	6	0	6	0
South Korea	KOR	22	22	0	21	0
Turkey	TUR	2	2	0	2	0
United Kingdom	GBR	81	87	5	78	-3
United States	USA	774	788	13	806	31
B. Selected Tax Havens						
Bermuda	BMU	9	0	-9	0	-9
Cayman Islands	CYM	31	2	-29	2	-29
Curaçao	CUW	2	0	-1	0	-1
Guernsey	GGY	2	2	0	2	0
Hong Kong	HKG	11	11	0	11	0
Ireland	IRL	16	12	-4	12	-4
Jersey	JEY	3	0	-3	0	-3
Luxembourg	LUX	8	8	0	8	0
Netherlands	NLD	21	19	-3	24	3
Panama	PAN	1	0	-1	0	-1
British Virgin Islands	VGB	1	1	0	1	0
C. Total Foreign Holdings						
Total Foreign Holdings	—	1,328	1,323	-5	1,335	7
D. Domestic Reallocation						
Canada	CAN	1,009*	1,014	5	1,002	-7

Table A.VI: **Estimated nationality-based outward Canadian equity portfolios, 2017.** This table presents estimates of restated outward Canadian equity portfolio positions using a nationality-based criterion, which we compare to CPIS data. We present our baseline estimates, which only reallocate holdings away from tax havens (*Baseline*), as well as estimates obtained under our alternative estimation treatment that also reallocates holdings between countries that are not tax havens (*Full Nationality*). Positions in the *CPIS* column with an asterisk (*) are our estimates. We do not reallocate equity investments in Luxembourg for non-U.S. countries since these include a significant fund shares component.

Destination	ISO Code	TIC	Baseline		Full Nationality	
			Position	Δ	Position	Δ
A. Selected Non-Tax Haven Countries						
Argentina	ARG	30	30	0	30	0
Australia	AUS	13	13	0	13	0
Brazil	BRA	26	26	0	26	0
Canada	CAN	76	76	0	76	0
China	CHN	2	2	0	2	0
France	FRA	45	45	0	45	0
Germany	DEU	34	34	0	34	0
India	IND	7	7	0	7	0
Indonesia	IDN	28	28	0	28	0
Italy	ITA	26	26	0	26	0
Japan	JPN	149	149	0	149	0
Mexico	MEX	37	37	0	37	0
Russia	RUS	13	13	0	13	0
Saudi Arabia	SAU	7	7	1	7	1
Spain	ESP	16	16	0	16	0
South Africa	ZAF	13	13	0	13	0
South Korea	KOR	11	11	0	11	0
Turkey	TUR	13	13	0	13	0
United Kingdom	GBR	56	56	0	56	0
B. Selected Tax Havens						
Bermuda	BMU	1	1	0	1	0
Cayman Islands	CYM	1	0	-1	0	-1
Curaçao	CUW	0	0	0	0	0
Guernsey	GGY	0	0	0	0	0
Hong Kong	HKG	0	0	0	0	0
Ireland	IRL	3	3	0	3	0
Jersey	JEY	0	0	0	0	0
Luxembourg	LUX	1	0	0	0	0
Netherlands	NLD	11	11	0	11	0
Panama	PAN	5	5	0	5	0
British Virgin Islands	VGB	0	0	0	0	0
C. Total Foreign Holdings						
Total Foreign Holdings	—	850	850	0	850	0
D. Domestic Reallocation						
United States	USA	8,059*	8,059	0	8,059	0

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

Destination	ISO Code	TIC	Baseline		Full Nationality	
			Position	Δ	Position	Δ
A. Selected Non-Tax Haven Countries						
Argentina	ARG	0	0	0	0	0
Australia	AUS	1	1	0	1	0
Brazil	BRA	0	0	0	0	0
Canada	CAN	18	23	6	38	20
China	CHN	0	1	1	6	6
France	FRA	0	3	3	6	6
Germany	DEU	0	3	3	71	71
India	IND	1	1	0	1	0
Indonesia	IDN	0	0	0	0	0
Italy	ITA	1	1	0	1	0
Japan	JPN	0	5	5	36	36
Mexico	MEX	1	1	0	1	0
Russia	RUS	0	0	0	0	0
Saudi Arabia	SAU	0	0	0	0	0
Spain	ESP	0	1	0	40	39
South Africa	ZAF	0	0	0	0	0
South Korea	KOR	0	0	0	6	6
Turkey	TUR	0	0	0	0	0
United Kingdom	GBR	18	30	11	61	43
B. Selected Tax Havens						
Bermuda	BMU	3	0	-3	0	-3
Cayman Islands	CYM	323	43	-280	43	-280
Curaçao	CUW	0	0	0	0	0
Guernsey	GGY	0	0	0	0	0
Hong Kong	HKG	0	1	1	1	1
Ireland	IRL	8	8	-1	8	-1
Jersey	JEY	2	0	-2	0	-2
Luxembourg	LUX	1	0	-1	0	-1
Netherlands	NLD	3	3	0	3	0
Panama	PAN	0	0	0	0	0
British Virgin Islands	VGB	0	0	0	0	0
C. Total Foreign Holdings						
Total Foreign Holdings	—	384	141	-243	422	38
D. Domestic Reallocation						
United States	USA	1,750*	1,993	243	1,713	-38

Table A.VIII: **Estimated nationality-based outward U.S. asset-backed security portfolios, 2017.** This table presents estimates of restated outward U.S. asset-backed security portfolio positions on nationality basis, which we compare to TIC data. We present our baseline estimates, which only reallocate holdings away from tax havens (*Baseline*), as well as estimates obtained under our alternative treatment that also reallocates holdings in countries that are not tax havens (*Full Nationality*). Positions in the *TIC* column with an asterisk (*) are our estimates.

Destination	ISO Code	Corporate Debt			Equities		
		TIC	Restated	Δ	TIC	Restated	Δ
<i>A. Selected Non-Tax Haven Countries</i>							
Argentina	ARG	5	5	0	9	10	0
Australia	AUS	144	145	1	181	184	3
Brazil	BRA	8	54	45	119	105	-14
Canada	CAN	390	375	-15	493	482	-11
China	CHN	3	51	48	154	689	535
France	FRA	118	103	-15	434	456	23
Germany	DEU	60	77	17	375	387	12
India	IND	6	14	8	179	173	-6
Indonesia	IDN	5	9	4	40	31	-8
Italy	ITA	16	33	17	96	115	19
Japan	JPN	80	97	17	895	900	6
Mexico	MEX	58	56	-2	64	60	-4
Russia	RUS	0	12	12	55	61	7
Saudi Arabia	SAU	1	2	1	0	0	0
Spain	ESP	16	38	22	123	126	4
South Africa	ZAF	1	6	5	100	101	1
South Korea	KOR	11	11	0	226	225	-2
Turkey	TUR	4	4	0	22	22	0
United Kingdom	GBR	308	292	-16	1019	1001	-18
<i>B. Selected Tax Havens</i>							
Bermuda	BMU	30	0	-30	195	1	-194
Cayman Islands	CYM	80	1	-79	547	0	-547
Curaçao	CUW	3	0	-3	68	0	-68
Guernsey	GGY	13	0	-13	14	0	-14
Hong Kong	HKG	8	9	0	147	134	-12
Ireland	IRL	63	24	-39	385	71	-314
Jersey	JEY	14	0	-14	94	0	-94
Luxembourg	LUX	72	3	-69	33	4	-29
Netherlands	NLD	179	109	-71	339	371	32
Panama	PAN	3	0	-3	26	0	-26
British Virgin Islands	VGB	14	0	-14	15	0	-15

Table A.IX: **Estimated nationality-based outward U.S. portfolios, full nationality excluding domestic reallocation, 2017.** This table presents estimates of restated outward U.S. corporate debt and equity portfolio positions, which we compare to TIC data. These positions are computed on a “full nationality” basis but exclude our the domestic investment reallocation, as outlined in equation (A.4). Domestic U.S. positions are instead set to zero.

Destination	ISO Code	EMU			United Kingdom			Canada		
		CPIS	Restated	Δ	CPIS	Restated	Δ	CPIS	Restated	Δ
A. Selected Non-Tax Haven Countries										
Argentina	ARG	4	4	0	1	1	0	0	0	0
Australia	AUS	61	62	1	44	44	0	18	18	0
Brazil	BRA	53	53	0	15	15	0	12	12	0
China	CHN	96	212	116	48	79	31	34	48	14
India	IND	86	94	9	28	30	2	18	18	0
Indonesia	IDN	18	19	0	7	8	0	4	4	0
Japan	JPN	314	327	12	144	148	4	63	64	0
Mexico	MEX	19	19	0	7	7	0	6	6	0
Russia	RUS	46	51	4	11	12	1	2	3	0
Saudi Arabia	SAU	2	2	0	0	0	0	0	0	0
South Africa	ZAF	33	33	0	12	12	0	6	6	0
South Korea	KOR	95	95	0	40	40	0	22	22	0
Turkey	TUR	11	11	0	4	4	0	2	2	0
United States	USA	1,666	1,731	65	811	839	28	774	787	13
B. Selected Tax Havens										
Bermuda	BMU	38	6	-32	10	1	-8	9	1	-7
Cayman Islands	CYM	223	134	-89	41	24	-16	31	18	-12
Curaçao	CUW	7	0	-7	0	0	0	2	0	-1
Guernsey	GGY	20	13	-8	16	10	-6	2	1	-1
Hong Kong	HKG	64	45	-19	56	38	-18	11	9	-2
Ireland	IRL	707*	678	-30	199	176	-24	16	12	-4
Jersey	JEY	50	6	-44	24	3	-21	3	0	-2
Netherlands	NLD	333*	320	-13	54	42	-12	21	19	-3
Panama	PAN	3	0	-3	0	0	0	1	0	-1
British Virgin Islands	VGB	10	7	-3	0	0	0	1	1	0
C. Total Foreign Equity Holdings										
Total Foreign Holdings	—	4,246		55	2,236	2,195	-41	1,328	1,324	-4
D. Domestic Position										
Domestic Position	—	4,791*	4,736	-55	1,557*	1,598	41	1,009*	1,013	4

Table A.X: **Estimated nationality-based outward equity portfolios, alternative assumptions for common equity share estimation, 2017.** We show restated outward EMU, U.K, and Canadian equity portfolio positions under the alternative assumption that these countries hold the same common equity shares in non-EMU tax havens as the United States, as discussed in Appendix Section A.IV. The estimates only reallocate holdings away from tax havens.

Issuer	Corporate Share		All Bonds		Local Currency Share		Sovereign Bonds	
	Corporate Share		All Bonds		Corporate Bonds		Sovereign Bonds	
	Residency	Nationality	Residency	Nationality	Residency	Nationality	Residency	Nationality
ARG	0.16	0.16	0.22	0.22	0.07	0.06	0.24	0.24
BRA	0.20	0.57	0.63	0.33	0.07	0.00	0.77	0.77
CHL	0.61	0.62	0.25	0.23	0.02	0.00	0.61	0.61
CHN	0.64	0.95	0.06	0.01	0.02	0.00	0.14	0.12
IDN	0.17	0.23	0.49	0.45	0.04	0.02	0.58	0.58
IND	0.50	0.59	0.66	0.57	0.39	0.34	0.90	0.90
ISR	0.22	0.65	0.24	0.11	0.00	0.00	0.30	0.30
MEX	0.51	0.51	0.33	0.33	0.02	0.03	0.66	0.66
MYS	0.29	0.32	0.72	0.68	0.05	0.02	0.98	0.98
RUS	0.02	0.44	0.70	0.40	0.39	0.01	0.70	0.70
THA	0.19	0.24	0.87	0.82	0.15	0.12	1.00	1.00
TUR	0.22	0.22	0.36	0.36	0.03	0.02	0.45	0.45
ZAF	0.09	0.24	0.72	0.60	0.13	0.04	0.78	0.78

Table A.XI: **Currency composition of external portfolio debt, residency vs. nationality, across countries, 2017.** The first two columns, “Corporate Share,” report the shares of corporate bonds in total external portfolio debt under residency and nationality for selected large emerging markets. The nationality concept we use only reallocates bonds issued in tax havens, as in our baseline restatements. The next six columns show the shares of external bonds that are denominated in local currency for “Overall Bonds”, “Corporate Bonds”, and “Sovereign Bonds” issued by each country, under residency and nationality. See Appendix Section A.VI for additional details.

Company	Beneficial Owner	Holdings Structure	Country of Registration of Holdings Structure	Share Held via Structure (%)
Alibaba	Jack Yun Ma	Direct Holdings	—	0.0
		APN Limited	Cayman Islands	1.3
		Yun Capital Limited	British Virgin Islands	0.5
		Ying Capital Limited	British Virgin Islands	0.5
		JC Properties Limited	British Virgin Islands	2.1
		JSP Investment Limited	British Virgin Islands	2.0
		<i>Total</i>	—	<i>6.4</i>
Alibaba	Joseph C. Tsai	Direct Holdings	—	0.1
		APN Limited	Cayman Islands	0.6
		Joe and Clara Tsai Foundation Limited	Guernsey	0.2
		Parufam Limited	Bahamas	0.8
		PMH Holding Limited	British Virgin Islands	0.7
		<i>Total</i>	—	<i>2.3</i>
Tencent	Ma Huateng	Advance Data Services Limited	British Virgin Islands	7.6
		Ma Huateng Global Foundation	Cayman Islands	1.0
		<i>Total</i>	—	<i>8.6</i>
Tencent	Lau Chi Ping	Unknown	—	0.5
		<i>Total</i>	—	<i>0.5</i>

Table A.XII: **Holdings structures for largest Chinese VIE insider ownership stakes.** This table shows the detailed structure of the insider ownership shares in the two largest listed Chinese VIEs: Alibaba and Tencent. These insider shares are mostly held through offshore special-purpose vehicles rather than as direct portfolio investment. For example, the 6.4 percent ownership share in Alibaba of founder Jack Yun Ma is primarily held through offshore vehicles in the British Virgin Islands (5.1 percent) and in the Cayman Islands (1.3 percent). Ownership data is as of the end of 2018 and was collected from the companies' 20-F SEC filings (for Alibaba) and annual shareholder reports (for Tencent). We show all reported insider shares greater than 0.1 percent.

Fund Family or Individual Investor	Chinese Investor?	Position in Top 40 VIEs (\$bn)	Share of Top 40 VIEs Owned
Naspers Ltd.	No	153	10.1%
SoftBank Group	No	83	5.5%
Ma Huateng	Yes	42	2.8%
Altaba Inc.	No	40	2.7%
JPMorgan Chase	No	38	2.5%
BlackRock Inc.	No	36	2.4%
Xin Xin (BVI) Ltd.	Yes	33	2.2%
Vanguard Group	No	31	2.1%
Ma Jack Yun	Yes	21	1.9%
Skywalk Finance GK	No	28	1.8%
Yang Huiyan	Yes	23	1.5%
T Rowe Price Group	No	21	1.4%
Lei Ding	Yes	21	1.4%
Capital Group Companies	No	20	1.3%
Baillie Gifford & Co	No	15	1.0%
Invesco Ltd.	No	15	1.0%
Yanhong Li	Yes	13	0.9%
State Street Corp.	No	13	0.8%

Table A.XIII: **Largest ownership stakes in largest 40 VIEs at the fund-family or individual-investor level.** This table shows largest ownership stakes that underlie our analysis of the ownership compositions of the largest 40 Chinese VIEs, discussed in Appendix Section A.VII. As outlined in Appendix Section A.VII, the ownership data come from Bloomberg and report holdings of fund families or individuals who are company insiders, and are collected at staggered points in time (nearly always the end of 2018 or the middle of 2019). We augmented the Bloomberg data with data from Morningstar for fund families not covered in Bloomberg. Jack Yun Ma’s and Ma Huateng’s positions are inclusive of all the shares held via offshore vehicles, as reported in Table A.XII.

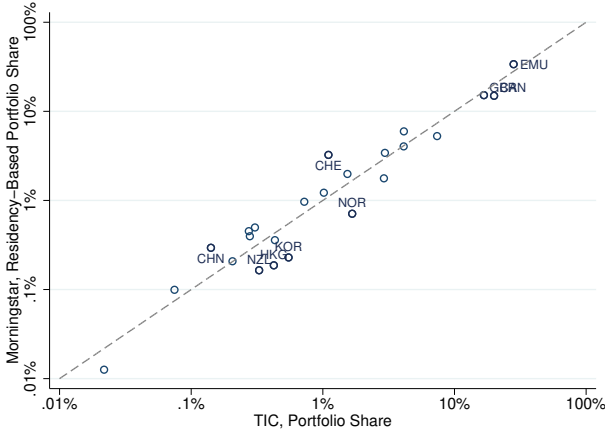
Line #	Firm Name	Residency	Nationality	Country of Max Sales	% Sales
<i>A. Nationality Corresponds to Sales</i>					
1	Tencent Holdings	CYM	CHN	CHN	96.6%
2	Alibaba Group Holding	CYM	CHN	CHN	88.7%
3	Medtronic Plc	IRL	USA	USA	56.2%
4	Schlumberger	CUW	USA	USA	26.6%
5	Accenture Plc	IRL	USA	USA	45.0%
6	Chubb Ltd	CHE	USA	USA	59.6%
7	Baidu	CYM	CHN	CHN	100.0%
8	Johnson Controls Intl	IRL	USA	USA	48.0%
9	TE Connectivity	CHE	USA	USA	31.0%
10	Allergan	IRL	USA	USA	79.1%
<i>B. Residency Corresponds to Sales</i>					
1	T-Mobile US	USA	DEU	USA	99.5%
2	TD Ameritrade Holding	USA	CAN	USA	100.0%
3	GGP	USA	CAN	USA	100.0%
4	SMC	JPN	TWN	JPN	31.6%
5	China Life Insurance	CHN	TWN	CHN	100.0%
6	Maruti Suzuki India	IND	JPN	IND	92.4%
7	Ambev	BRA	BEL	BRA	55.0%
8	Lululemon Athletica	USA	CAN	USA	73.7%
9	Imperial Oil	CAN	USA	CAN	84.9%
10	Walmart de Mexico	MEX	USA	MEX	92.7%

Table A.XIV: **Sales-based reallocations: firm-level comparisons, 2017.** We show the largest firms for which nationality corresponds to the country of maximum sales and and for which residency corresponds to the country of maximum sales.

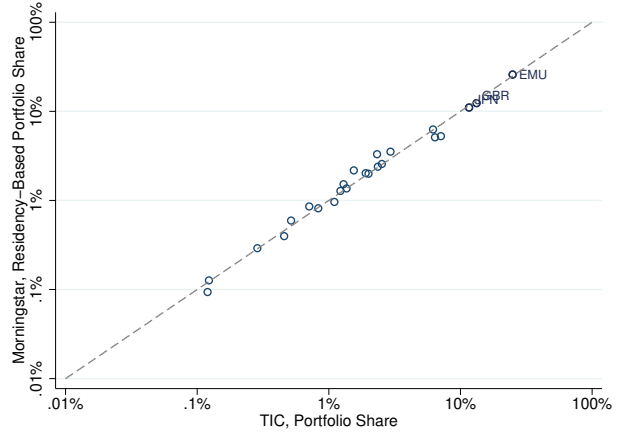
	Corporate Bonds			Equities		
	(1)	(2)	(3)	(4)	(5)	(6)
Estimated Home Bias, $\hat{\beta}$	.09** (.03)	.05** (.01)	.03** (.01)	.12** (.03)	.06** (.02)	.04** (.01)
Includes Zeros		Yes			Yes	
Weighting	$q_{i,j}^{\mathcal{R}}$	$q_i^{\mathcal{R}}$	None	$q_{i,j}^{\mathcal{R}}$	$q_i^{\mathcal{R}}$	None
Observations	1,782	1,782	1,782	1,881	1,881	1,881
R^2	.95	.89	.71	.94	.79	.89

	Corporate Bonds			Equities		
	(7)	(8)	(9)	(10)	(11)	(12)
Estimated Home Bias, $\hat{\beta}$	.10** (.03)	.08** (.03)	.07* (.03)	.14** (.04)	.13** (.05)	.10** (.02)
Includes Zeros		No			No	
Weighting	$q_{i,j}^{\mathcal{R}}$	$q_i^{\mathcal{R}}$	None	$q_{i,j}^{\mathcal{R}}$	$q_i^{\mathcal{R}}$	None
Observations	469	469	469	494	494	494
R^2	.95	.88	.75	.93	.74	.86

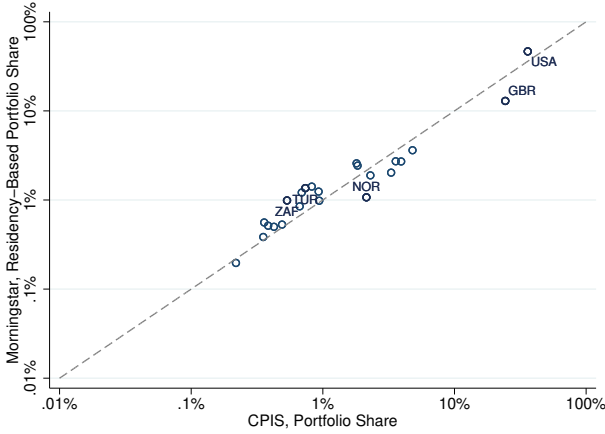
Table A.XV: **Estimates of home bias in tax havens, 2017.** Standard errors in parentheses are clustered at the level of investors by residency country. Columns 1 through 6 include data points for which $\omega_{i,k,j}$ equals zero, while columns 7 through 12 exclude these observations. The weights $q_{i,j}^{\mathcal{R}}$ correspond to the dollar value of holdings in TIC or CPIS of investor country j in securities issued by country i on a residency basis. This measures the relative importance of each bilateral investment flow from country j to i . The weights $q_i^{\mathcal{R}} \sum_j q_{i,j}^{\mathcal{R}}$ measure the relative importance of each tax haven i while placing different investors on equal footing. Stars indicate the following: * $p < 0.05$, ** $p < 0.01$.



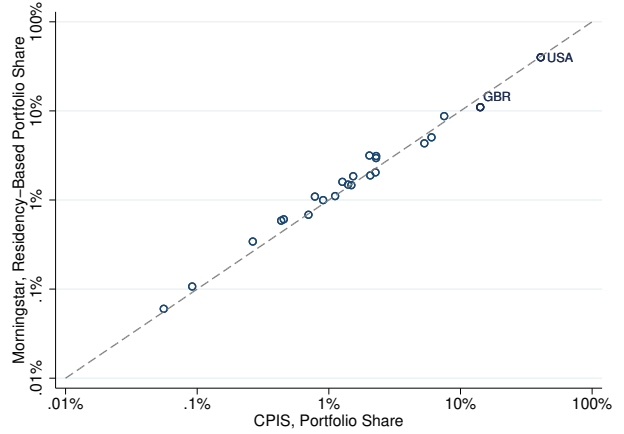
(a) USA: Corporate Bonds



(b) USA: Equities

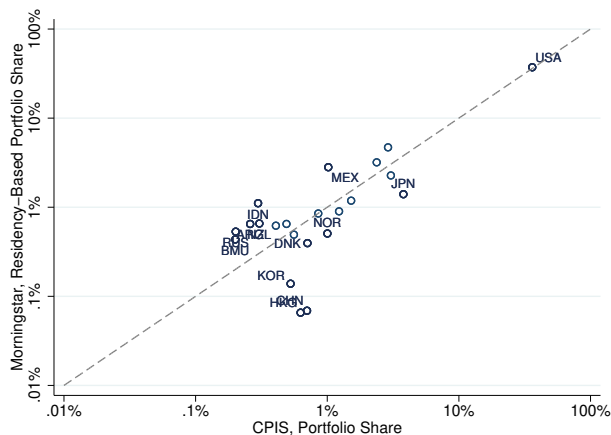


(c) EMU: All Bonds

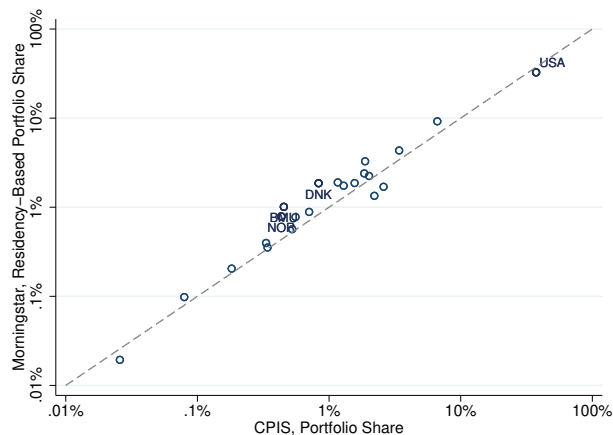


(d) EMU: Equities

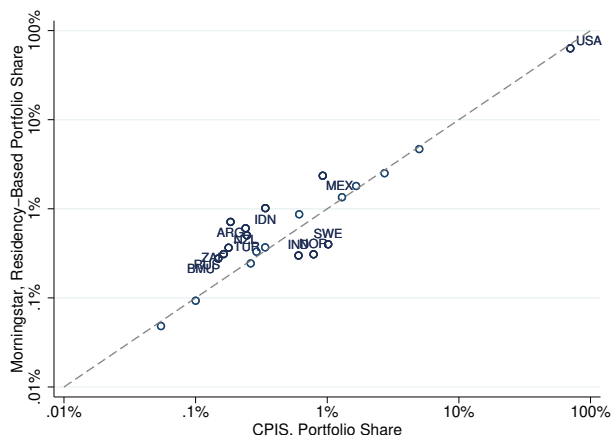
Figure A.I: Alignment between official bilateral external portfolio composition and residency-based Morningstar data: USA and the EMU, 2017. Panels A and B show the shares that each foreign destination country represents in USA outward portfolio holdings, both as computed in the Morningstar sample using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



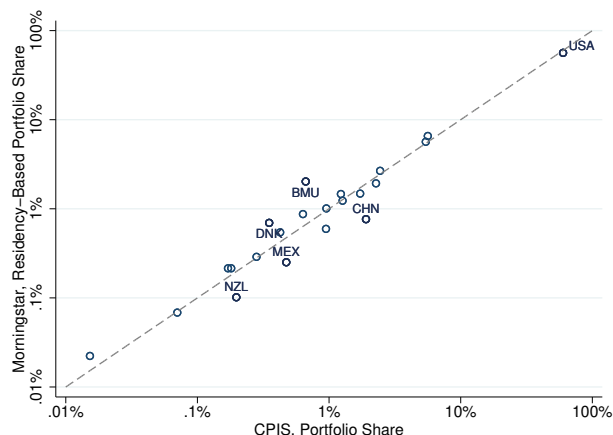
(a) United Kingdom: All Bonds



(b) United Kingdom: Equities



(c) Canada: All Bonds



(d) Canada: Equities

Figure A.II: Alignment between official bilateral external portfolio composition and residency-based Morningstar data: United Kingdom and Canada, 2017. Panels (a) and (b) show the shares that each foreign destination country represents in U.K outward portfolio holdings, both as computed in the Morningstar sample using a residency criterion (*horizontal axis*), and as reported in the CPIS data (*vertical axis*). Panel (a) includes all debt securities; panel (b) includes all equity securities. Panels (c) and (d) repeat the same exercise for the positions reported by Canada in CPIS. Panel (c) includes all debt securities; panel (d) includes all equity securities.

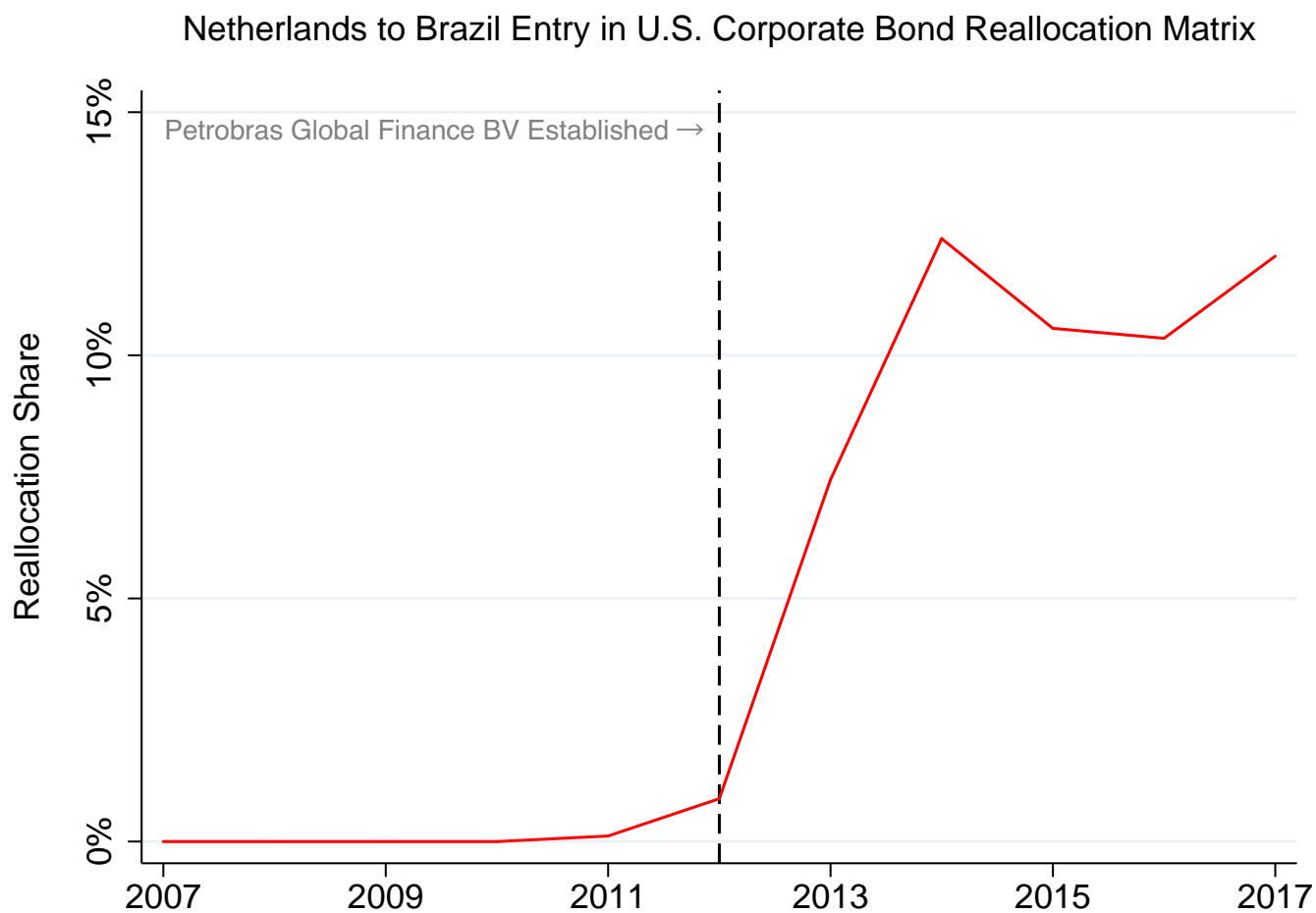
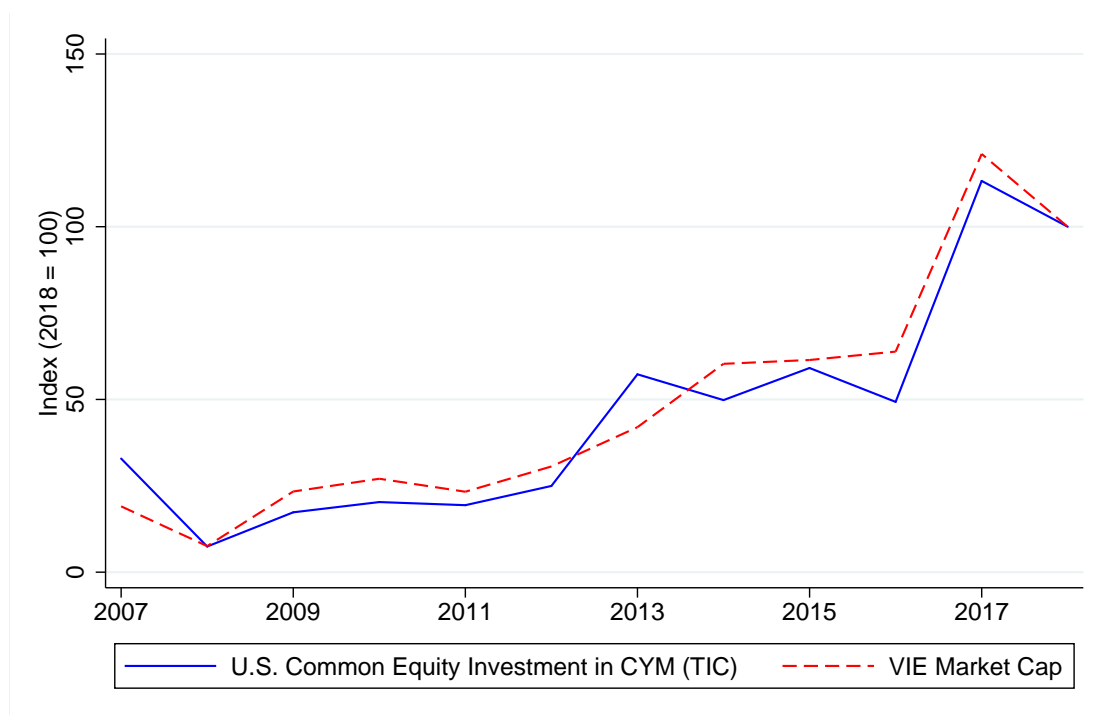
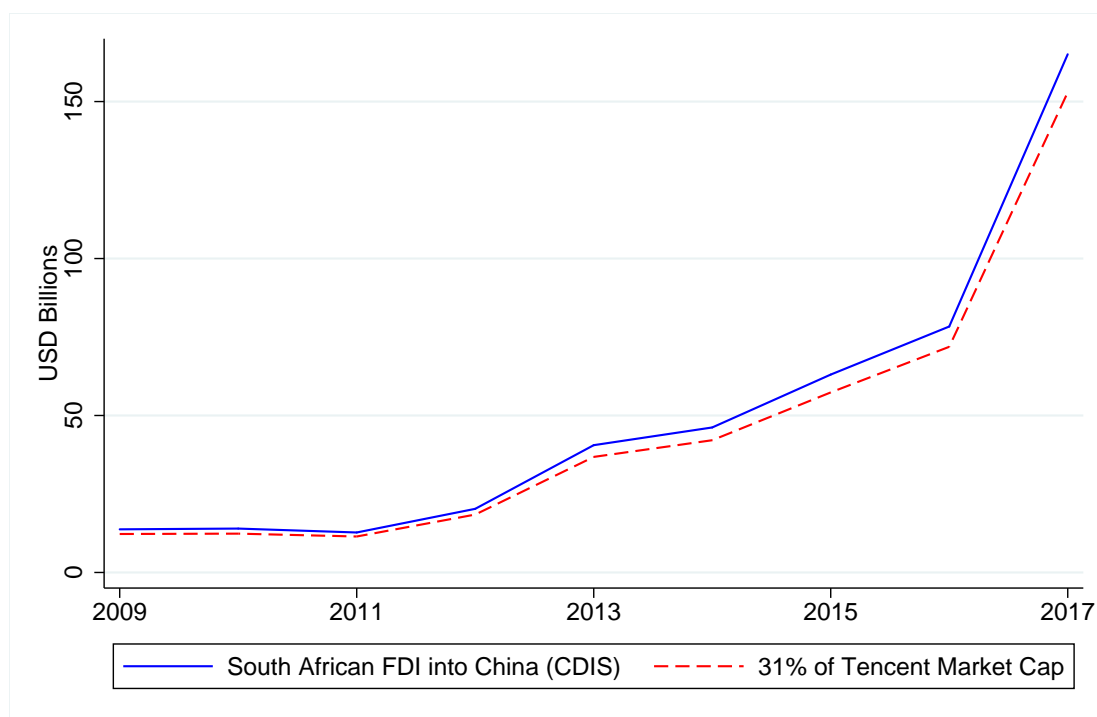


Figure A.III: **Example of time variation in the reallocation matrices.** Petrobras Global Finance BV, the Netherlands-based subsidiary that Petrobras uses to issue bonds, was established in August 2012. This graph plots the evolution of the relevant entry in our corporate bonds reallocation matrix for the USA, which jumps from near-zero to more than 10%.



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



(b) South African FDI into China

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

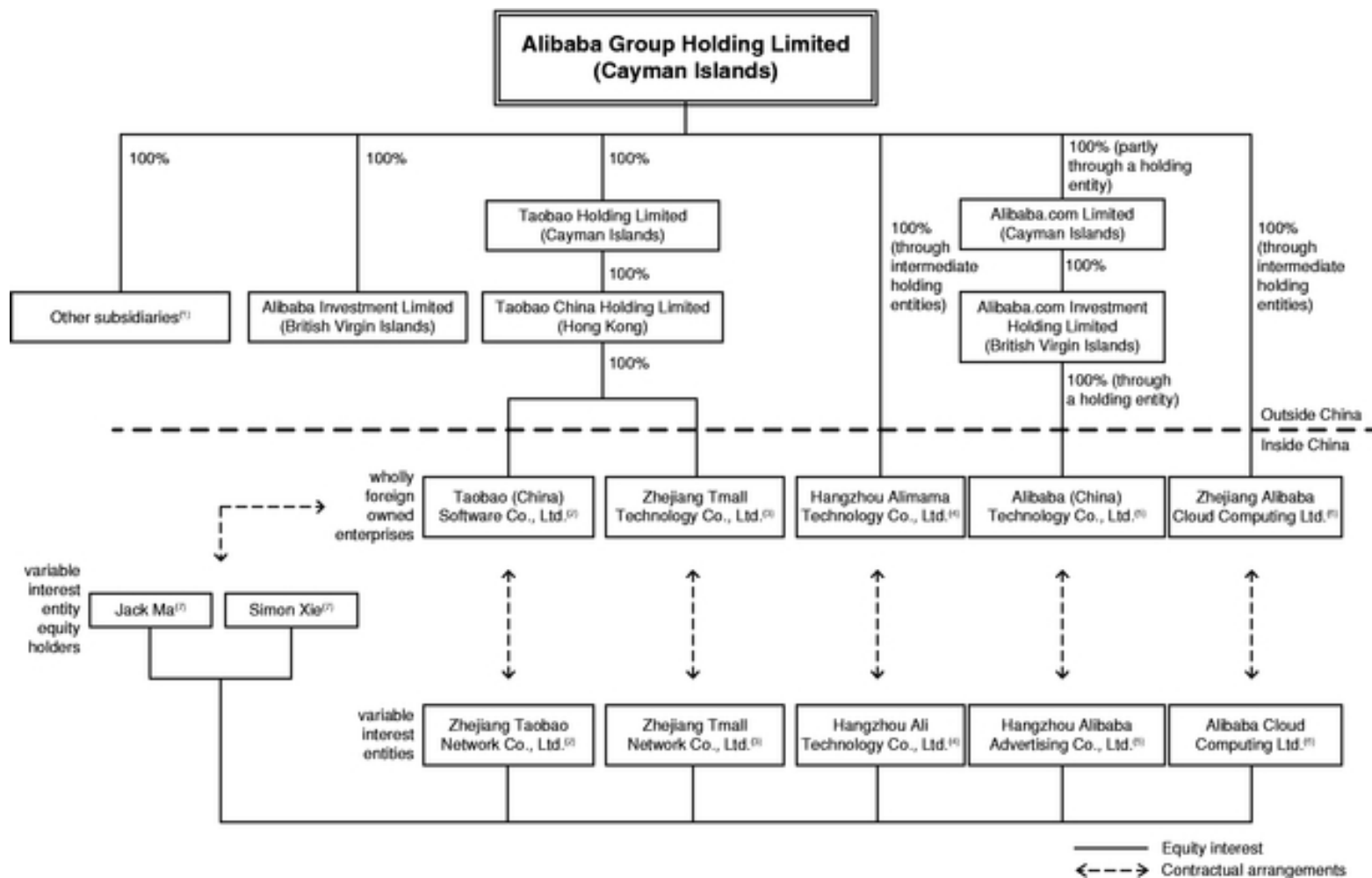
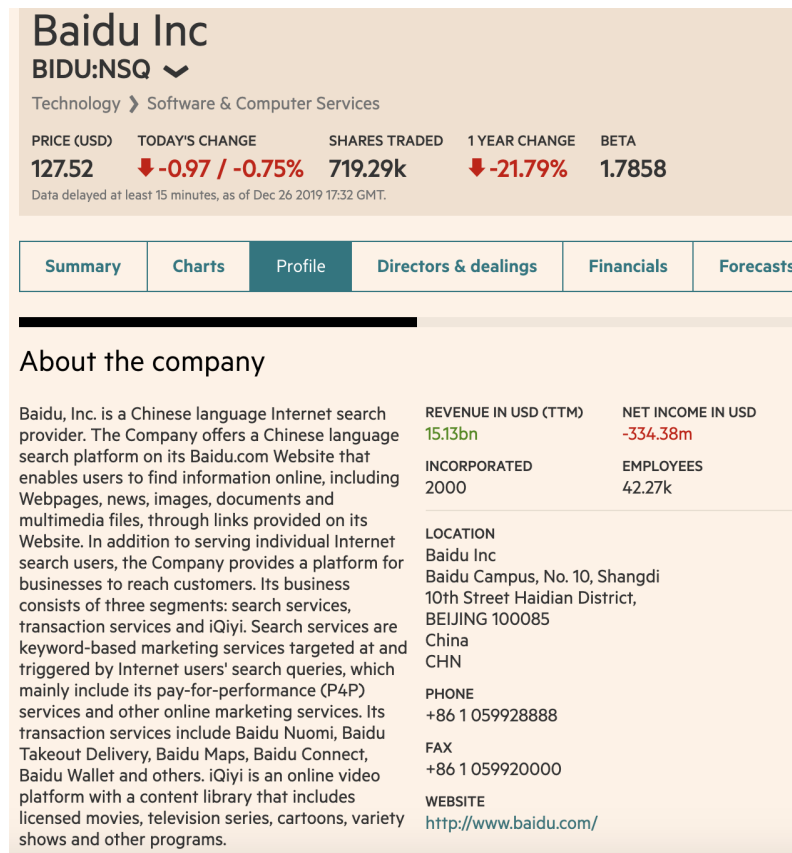


Figure A.V: **Alibaba's corporate structure.** This figure shows the corporate structure diagram reported by Alibaba in its SEC filings.

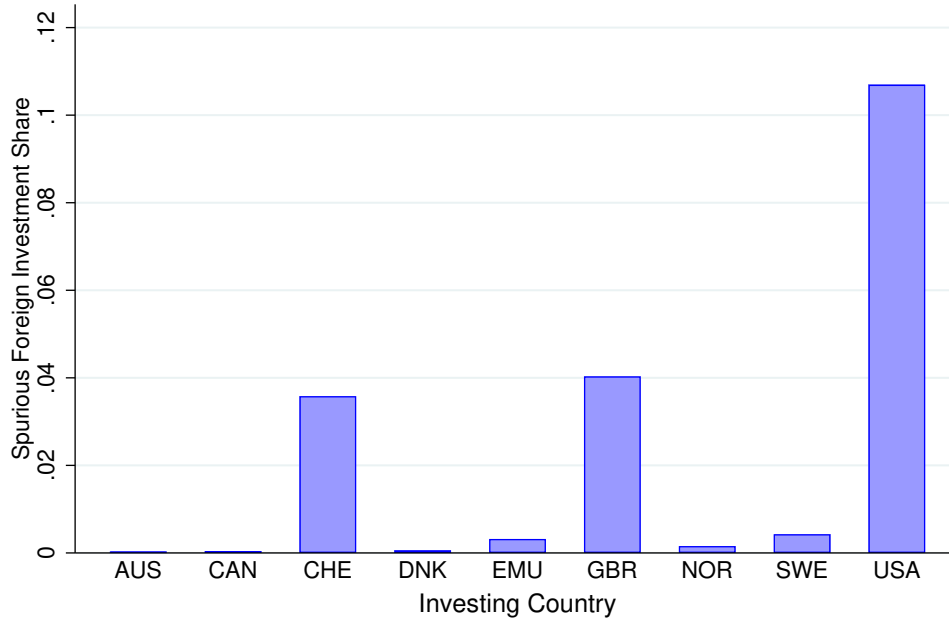


(a) Alibaba

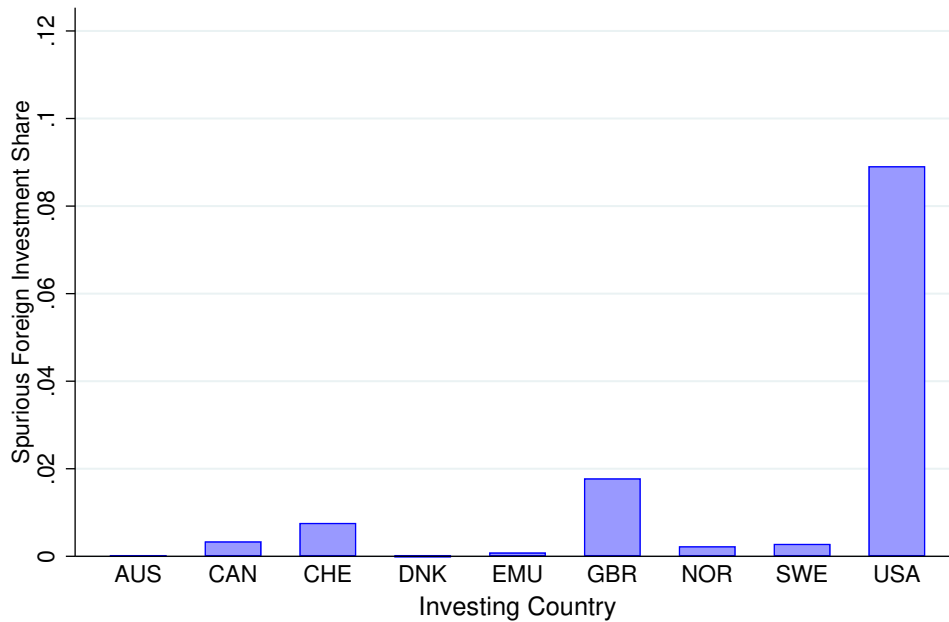


(b) Baidu

Figure A.VI: **Financial Times profiles of Chinese companies using VIE structures.** This figure displays the online profiles for the equities of Alibaba and Baidu on the website of the Financial Times.



(a) Bond Investments



(b) Equity Investments

Figure A.VII: **Spurious foreign investment due to tax havens, 2017.** This figure plots the share of all cross-border investment in bonds (*panel A*) and equities (*panel B*) of each of the nine investing countries in our sample that is reallocated away from tax havens and reclassified as domestic investment on a nationality basis. For the USA, we exclude equity investments in fund shares and other non-common equity.

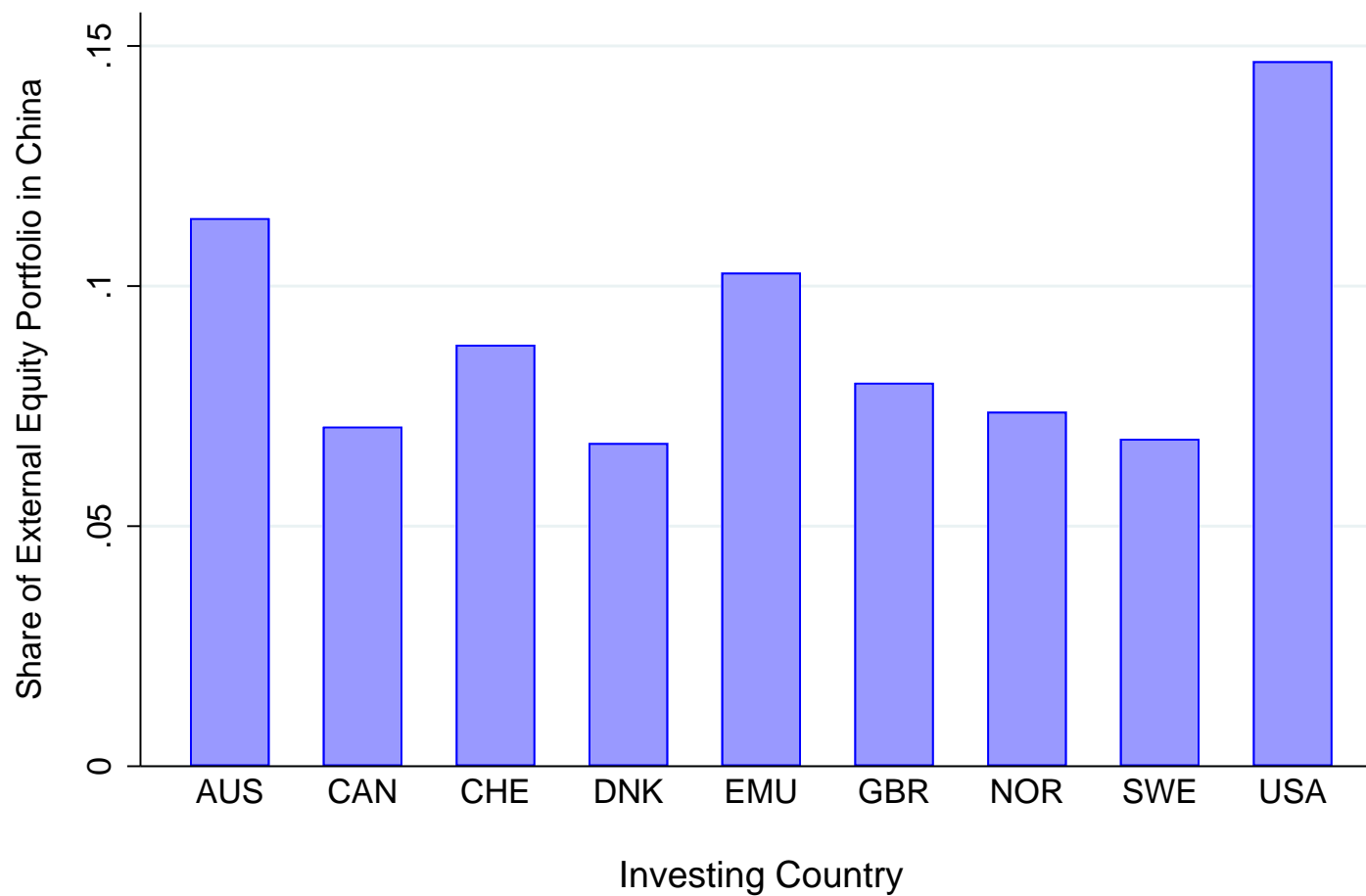


Figure A.VIII: **Share of external equity investment in China, sales-based reallocation, 2017.** We show the share of each country's external equity portfolio that is invested in China according to our sales-based measure.