Improving the Measurement of Tax Residence: Implications for Research on Corporate and Shareholder Taxation*

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Abstract

We propose an improved measurement of a key data item in corporate and shareholder tax research, a firm's tax residence. Prior research uses one of three proxies, which are in conflict with tax laws around the world. We use a novel algorithm that embeds the residency laws of 179 countries over 32 years to accurately assign tax residence and reassign a considerable fraction of firms relative to standard proxies. We provide evidence from two applications that reassignment significantly affects inferences. For instance, 19.7% of cross-border mergers and acquisitions involve an acquiror or target that is reassigned. Reassigned firms are systematically different from other firms along several dimensions, including effective tax rates.

Keywords: Corporate taxation, shareholder taxation, tax residence, tax law, M&A, tax havens.
JEL classification: C81, H25, H73, G34, K33, K34.

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1 Introduction

On January 31, 2022, Shell (at the time, the most valuable company in the British stock market) moved its global headquarters from the Netherlands to the United Kingdom so that it could move its global tax residence from the Netherlands to the United Kingdom, too. As a consequence, Shell can take advantage of lower withholding taxes on distributions to shareholders even though the company only relocated 11 employees (including, however, the chief executive officer and the chief financial officer).[1]

Zooming out from this anecdote to the bigger picture, there is a substantial and growing body of research in accounting, economics, and finance on corporate and shareholder taxation in cross-country settings (for surveys, see Dharmapala 2014; Dyreng and Hanlon 2021). Much of this research exploits geographic variation in tax regimes, so assigning the correct tax residence to firms is key for valid inference. Prior research typically assigns tax residence by uniformly adopting one of three proxies: a firm's (1) country of incorporation, (2) location of headquarters, or (3) center of business activities. However, the issue of a firm's global tax residence–as the Shell anecdote illustrates–is not only important, but much more complicated and not fully captured by the aforementioned proxies.

What are the difficulties when measuring the tax residence of a firm? There are 23 different unilateral tax laws involving combinations of 10 factors. The most common factors that countries consider when determining tax residence are (1) a firm's location of incorporation (e.g., considered by France, Japan, the US), (2) a firm's location of headquarters (e.g., considered by China, Germany, the UK), (3) a firm's location where shareholder control is exercised (e.g., considered by Australia), and (4) a firm's center of activity (e.g., considered by Italy). Moreover, additional consideration must be given with regards to the tie-breaking rules in scenarios where a company can be claimed as a tax resident in two countries (e.g., if incorporated in France but headquartered in the United Kingdom). Complicating things

[1]Financial Times (2021): "Shell to shift tax base to UK and ditch dual share structure," November 15, https://www.ft.com/content/da1e14c9-2a4a-4b1e-8f44-7b4eae14f7f9/ (accessed February 1, 2022).

further, no database exists that provides firms' tax residence, and only a small subset of firms disclose their tax residence.

We develop a novel algorithm to accurately assign tax residence by taking into account the tax residence laws of 179 countries, making this paper the first to actually measure firms' tax residence instead of proxying for it. The algorithm reassigns tax residence for a meaningful fraction of firms relative to the standard assignments employed by the literature. Importantly, reassigned firms are systematically different from other firms—in particular, they are aggressive tax avoiders.

To quantify the number of papers that might benefit from the tax residence algorithm, we conduct a literature search of 18 accounting, economics, and finance journals from 2001 to 2023, and identify 113 such papers (Table 1). These papers span 12 topics, with the top three being "Regulations, Laws, Transparency," "General Corporate Tax Avoidance," and "Worldwide Tax, Territorial Tax, Repatriation Tax" (Table 2).

The reassignment of firms can reduce bias and variance in estimated regression coefficients in multiple ways. For example, if a researcher is studying country-level variation in tax incentives (e.g., through changes in tax laws), reassignment will lead to fewer firms coded as treated when they actually belong to the control group, and vice versa. Additionally, reassigned firms tend to be economically different, implying they might be especially sensitive or insensitive to a change in tax incentives. Thus, their wrongful inclusion or exclusion from a sample can also impact cross-sectional tests. Lastly, researchers might try to measure membership in certain categories. For example, how many firms are tax resident in tax havens, or what is the total amount of non-repatriated foreign cash holdings for a country. Here, reassignment has a clear and direct benefit in making the analysis more accurate. Moreover, since reassigned firms are particularly aggressive tax avoiders, their influence on empirical inferences in past work is likely to be larger than indicated by the percentage reassignment rate for a particular dataset.

We now provide a short summary of this tax residence algorithm and its application in

an example. We define the tax residence of a firm as the tax residence of its global legal parent. If all four of the following locations of a company coincide in the same nation, then it is a tax resident in that nation: headquarters, incorporation, center of activity, place of shareholder control (collectively, the "four firm-level locations"). Otherwise, determining tax residence is more complicated. Since no database exists that provides information on firms' tax residence, we use tax guides such as PwC's Worldwide Tax Summaries for Corporate Taxes from 1982-2023 to construct a panel of tax laws for 179 countries. This allows us to establish which combinations of the 10 unique factors a country considers when determining tax residence. Moreover, looking at historical tax laws is important since there were 79 unilateral tax residence law changes from 1982-2023. Next, we allocate the tax residence of a firm to a single country when the unilateral application of tax residence rules would render it a dual resident. For example, in which country is a firm tax resident if it is headquartered in a country that considers headquarters, and incorporated in a country that considers incorporation when determining tax residence? Since there is no comprehensive source of tax treaties that stipulates the appropriate tie-breaking provisions, we manually search annual reports of firms where at least some of the four firm-level locations are split across countries with various residency rules. A small set of firms report their tax residence, allowing us to formulate empirical tie-breaking provisions and validate and train our algorithm. Using the tax residence laws and tie-breaking provisions, we create an algorithm that assigns a historical tax residence to any firm in any year from 1982-2023 given data on the 27 input variables.

To demonstrate the application of the algorithm, consider the example in Figure 1. Suppose a firm is headquartered in the UK. Its tax residence depends on where it is incorporated. Suppose it were incorporated in the US. Having a US incorporation is both necessary and sufficient for having a US tax residence. Thus, in the absence of a tax treaty, both the UK and the US would claim the firm as a tax resident. In this case, however, there is a treaty between the UK and the US stipulating that the firm is resident in the US. What if, instead,

it were incorporated in the Netherlands? The Netherlands, like the UK, considers both the locations of incorporation and headquarters in its tax residence determination. Thus, once again, in the absence of a tax treaty, both the Netherlands and the UK would claim the firm as a tax resident. In this case, the treaty states that the firm is tax resident in the country where it is headquartered. Thus, the firm would be tax resident in the UK.

While the prior example illustrates the complexity of classifying a firm's tax residence correctly, the prevalence of this issue in the data is an empirical question. We document the algorithm's reassignment rate when the initial residence assignment is only based on the location of incorporation or the location of headquarters. In a 1988 to 2023 sample from Compustat Global with minimal data filters, 4.86% (1.95%) of firms are reassigned when the initial assignment is based purely on the location of incorporation (headquarters). These numbers are 0.91% (3.10%) for Compustat North America (henceforth, "Compustat NA"). There is significant variation in reassignment rates across countries. For tax-haven firms, the corresponding reassignment rates are 34.39% (16.83%) for Compustat Global and 12.71% (41.81%) in Compustat NA. The reason for the higher reassignment rates for tax havens is that havens have many firms that relocated there, so that their four firm-level locations do not coincide in one country, making the use of our algorithm particularly important. Additionally, reassignment rates generally increase over time, with Compustat NA firms having substantially higher reassignment rates in 2023 compared to the overall sample average.

When conducting a univariate comparison of the combined sample of firms in Compustat Global and Compustat NA, we find that reassigned firms have cash effective tax rates (henceforth cash ETRs) that are, on average, 3.92 and 3.33 percentage points lower than those of other firms when the initial assignment is based only on the location of incorporation and the location of headquarters, respectively. The differences are even larger among firms with market capitalizations above $1 billion. We find consistent results using a multivariate regression framework. Compared to non-reassigned firms, reassigned firms based on incor-

poration (headquarters) have cash ETRs that are 3.39 (4.08) percentage points lower in the overall sample and 6.78 (5.53) percentage points lower for large firms.

Using reassignment as a dependent variable, we document that, among other things, reassigned firms hold more cash relative to their assets. Thus, in addition to its effect on sample composition, reassignment is likely correlated with many of the variables of interest in corporate and shareholder taxation papers.

Next, we apply our tax residence algorithm to cross-border M&A. We include an M&A application for three reasons. First, it is an important application. Second, the available data is comprehensive. Third, M&A is well suited to tease out that the firms that are reassigned by our algorithm are a non-random subset of all firms–they are, for instance, more aggressive tax avoiders and more acquisitive. As is standard in the literature, we use M&A data from SDC Platinum (we also provide evidence that the use of M&A data by Zephyr likely results in even more measurement issues).

9.7% (8.8%) of deal value (count) involve an acquiror whose SDC nation does not equal its tax residence. On the target side, the reassignment rate is 8.9% (10.8%) for deal value (count). Overall, 18.1% (19.7%) of deal value (count) involves an acquiror or target whose tax residence differs from its SDC nation. Accurately classifying tax residence can mean the difference between a deal being intra-country or cross-border. Of the deal value (count) classified by SDC as intra-country, 5.8% (4.2%) is reclassified by our algorithm as cross-border (via a target or acquiror reassignment). Moreover, of the deal value (count) that is cross-border according to SDC, 3.0% (4.3%) is reclassified as intra-country by our algorithm.

We decompose the reassignment rates by country based on whether a firm was not assigned to a country when it should have been ("missed" transactions) or whether the firm was "wrongly added" to a country when it should not have been. In addition, when examining deals based on the acquiror (target) location, we also report the reassignment rate for the target (acquiror) on the other side of the transactions. The rate and type of reassignment rates vary greatly across countries. Focusing on the acquiror side, the United States has

a missed percentage of 3.3% of its cross-border deal value, a wrongly added percentage of 23.1%, and a target reassignment rate of 16.1%, resulting in a total reassignment rate of 42.5% of its cross-border deal value. Some other large developed countries such as Germany and Japan have much lower reassignment rates. Many tax havens such as Ireland, Singapore, and Hong Kong not only have abnormally high volumes of cross-border M&A activity (Meier et al., 2025), but also have some of the highest reassignment rates (sometimes approaching a 100% reassignment rate), consistent with the firm-level results from Compustat. Among the non-haven countries, the biggest outlier is China with a total reassignment rate of around 100% of its cross-border deal value.

These numbers highlight that when studying the taxation of cross-border M&A, not using our tax residence algorithm likely implies biased coefficient estimates. Moreover, these numbers also demonstrate that firms that have their tax residence reassigned by our algorithm are a non-random subset of all firms, and these corporations in particular are more aggressive tax avoiders as can be inferred from the abnormally large reassignment rates involving tax-haven M&A (see Meier et al. (2025) for an analysis of tax avoidance through cross-border M&A involving tax havens). Lastly, we observe higher reassignment rates when the data is aggregated based on deal count compared to deal value, which implies that reassignment rates are higher for small(er) transactions. This suggest that transactions for which our algorithm cannot be applied due to missing public data likely have higher reassignment rates than those with observable inputs.

Turning to the institutional details, one question could be why the tax residence of a firm's global legal parent (GLP) matters and not the concept of a permanent establishment (also called nexus). This concept determines whether a firm has a local "footprint" in a country (in the case of Shell, e.g., oil refineries and gas stations). If a firm has such a footprint in a country, then it has to pay local taxes on this footprint. The Shell example illustrates that the relocation of a firm's tax residence, while holding its permanent establishments constant, can result in significant changes in tax payments. Moreover, the so-called "inversions" are

exactly about firms relocating their tax residence to a different country (Babkin et al., 2017; Col et al., 2020). Another concern could be whether the algorithm misses changes in tax laws or tie-breaking provisions. The tax guides that form the starting point for the algorithm serve as marketing material to generate sales leads from potential customers. Consequently, these guides comprehensively mention even small changes to tax law, since any change in tax laws is a business opportunity for firms such as PwC. Moreover, the tax residence of a firm matters even if it would be reassigned from one country with a territorial tax system to another country with a territorial tax system. We also discuss the issue of "stateless income." In addition, while our tax residence algorithm applies to both GLPs and subsidiaries, it is most useful empirically for GLPs, since the necessary inputs are often not readily available for subsidiaries.

Our algorithm should be used for any setting related to (corporate or shareholder) taxation. Importantly, our algorithm is not only needed for multi-country settings, but also single country ones to ensure that the right firms are included in the sample. For research questions that are *not* related to taxation, other assignment approaches might be preferable, such as, for instance, the country of a firm's main stock market listing.

We make a measurement contribution to the literature on (corporate or shareholder) taxation. We improve the measurement of a key data item in tax research; a firm's tax residence. We create a novel algorithm that embeds the residency laws of 179 countries and associated tie-breaking provisions to accurately assign tax residence, making this the first paper to actually measure firms' tax residence instead of proxying for it. Accurately measuring a firm's tax residence is key to understanding the tax incentives it faces when making operating, investing, and financing decisions. Uniformly proxying for tax residence using a single location definition results in a systematic measurement error, since the most aggressive tax avoiders are also the firms for which the four firm-level locations are most likely to differ. Depending on the research design employed and the countries studied, implementation of the algorithm can therefore reduce bias and variance in estimates. Our

evidence suggests that researchers might benefit significantly from improved measurement of tax residence. We suggest our tax residence assignment algorithm as a tool that researchers can easily employ to accurately assign a firm's tax residence and advance the literature. Our plan is to make the algorithm and associated data publicly available. Ideally, as Hribar and Collins (2002) do with measurement of accruals and Coppola et al. (2021) do with measurement of bilateral investment positions, this paper will update best practices in its domain.

2 The Tax Residence Algorithm

2.1 Construction of the Algorithm

In this section, we explain how we define the tax residence of a company when its headquarters, incorporation, center of activity, and shareholder control are in different countries. Our paper is the first to actually measure a firm's tax residence instead of proxying for it.

2.1.1 Unilateral Tax Residence Laws

First, we construct a panel of tax laws for 179 countries[2] primarily based on the following tax guides: Coopers and Lybrand (1982-1998), Ernst & Whinney (1982-1988), Ernst & Young (1990-2023), Price Waterhouse (1982-1997), and PricewaterhouseCoopers (1999-2023). In addition, when the tax residence laws of a country are missing from these guides or are unclear, then we also consider tax guides from Deloitte (2014-2023) and PKF (2018-2023), as well as residence criteria from the OECD (2023). We report the most popular unilateral tax laws below. All laws except NO (bullet 4) require that the country has a positive tax rate for corporate income taxes, capital gains taxes, or withholding taxes.

1. Incorporation (INC): A company is a tax resident in the country if it is incorporated[3]

[2]We use the terms nation and country broadly to include both sovereign nations and dependent territories and regions. In short, if the global tax guides of EY or PwC provide information on the tax laws of a jurisdiction, we include it as a "country" in this paper.

[3]We consider the following as synonymous with incorporated: "established," "registered," and "legal headquarters."

in the country. This law applies to 33.0% of all country-years, including France (1986-2023), Japan (1986-2023), and the United States (1982-2023).

2. Incorporation or management and control (INC/MC)[4]: A company is a tax resident in the country if it is incorporated or managed and controlled[5] in the country. 32.5% of all country-years have this law, including China (2008-2023), Germany (1982-2023), India (1986-2023), and the UK (1994-2023).

3. No taxes (NO): The country has a general tax rate of 0%[6] for corporate income taxes, capital gains taxes, and withholding taxes. 10.9% of all country-years fall under this classification, which mainly includes jurisdictions considered as tax havens, including Bermuda (1982-2023), the British Virgin Islands (1984-2023), and the Cayman Islands (1982-2023).

4. Management and control (MC): A company is a tax resident in an MC country if it is managed and controlled in that country. This applies to 10.0% of all country-years, including Malaysia (1982-2023), Mexico (2016-2023), and Singapore (1982-2023).

5. Does not matter (DM): Residency does not matter in determining taxes owed in the country.[7] This law applies to 5.1% of all country-years, including Costa Rica (1986-

[4]When abbreviating unilateral residence laws, we use the symbols "/" and "&" to mean "or" and "and," respectively.

[5]Countries use several different terms to refer to the location of the firm's strategic decision makers, including "administrative headquarters," "head office," "the place of effective management," "the place where management and control is exercised," and "the place where the central management is located." The latter term refers to where the board meets, while the former terms are broader. Ultimately, the relevant tax authorities make a judgement call as to whether a firm meets their criteria. We assume that all of these locations coincide and use these phrases synonymously with the term "headquarters." This approach is supported by the arguments in Couzin (2002). Moreover, we are not aware of any data vendor that separately reports data on these slightly different concepts. Instead, a single headquarters variable is reported. This likely also reflects the fact that very few firms have different locations for their headquarters compared to where the company's board meets (supported by anecdotal evidence from more than 1,000 different annual reports of firms we read).

[6]As long as the general rate is 0%, there can be exceptions for certain industries. For example, many NO countries have an exception for oil/mining industries, which could be taxed at a positive rate.

[7]This requires (1) corporate income taxes to be territorial, (2) a 0% rate on outbound withholding taxes or to be the same withholding rate regardless of whether the money is going to a domestic or foreign corporation, and (3) (when considering inbound payments) the country has no double taxation agreements with any country that alter the standard withholding tax rate. In lieu of conditions (2) and (3), it is sufficient

2023) and Paraguay (1982-2023).

6. Incorporation or Business and Management and Control or Business and Shareholder Control (INC/[BZ&(MC/SH51)]): A company is a tax resident in the country if (1) it is incorporated in that country or (2) it carries on a business in the country and meets one of the following conditions: it is managed and controlled or has its place of shareholder control in the country. This applies to 2.5% of all country-years, including Australia (1982-2023) and Papua New Guinea (1982-2023).

7. Incorporation or Management and Control or Center of Activity (INC/MC/CA): A company is a tax resident in the country if it is incorporated, managed and controlled, or has its center of activity in the country. This applies to 1.5% of all country-years including Italy (1986-2023) and Moldova (2002-2009).

8. Incorporation and Management and Control (INC&MC): A company is tax resident in the country if it is incorporated and managed and controlled in the country. This applies to 1.4% of all country-years, including Brazil (1982-2023) and Bulgaria (1982-1998).

9. All Other: 3.1% of all country-years have laws different than what is listed in the previous bullets. This includes countries with rules involving additional criteria, such as Egypt, which, from 2010-2023, had a "INC/GOV51/MC" law, meaning that a firm is resident in Egypt if it is incorporated in Egypt, majority-owned by the Egyptian government, or managed and controlled in Egypt. In addition, there are countries with rules involving different combinations of previously mentioned criteria, such as Israel, which, from 1993-2002, had a "(INC&CA)/MC" law, meaning that a firm is resident in Israel if (1) it is incorporated and has its center of activity in Israel or (2) it is managed and controlled in Israel.

if a country considers a firm as a resident if it has a permanent establishment in the country.

In total, there are 23 different unilateral tax residence laws. There is not only variation in tax residence laws across countries, but also within countries over time. There were 79 changes in unilateral tax residence laws from 1982 to 2023. We take these changes into account when creating our tax residence algorithm.

2.1.2 Tie-Breaking Provisions

One of the difficult aspects about determining tax residence is the appropriate tie-breaking provision. For example, if two countries can claim the same company as a tax resident, then where is the company tax resident? In rare cases, the company is a dual resident (tax resident in both countries). However, in most cases, the countries have a treaty in place that stipulates a single place of tax residence when both countries can claim the company as a tax resident. Many countries follow the OECD standard, which, in 2014, allocates the tax residence to the country of headquarters. However, there are countries that do not follow this approach, including the US, China, Ireland, India, and Mauritius.

We use a sampling of companies to determine the application of tax treaty rules in practice. To do so, we first collect a list of firms for which some combination of the following locations differ: incorporation, headquarters, center of activity, and shareholder control. We use three sources: Compustat Snapshot, data on SEC filings in WRDS, and Compustat Global. We then manually search annual reports for hundreds of these companies in EDGAR, which contains SEC filings, or the company's homepage. There is good coverage in SEC filings of firms that are neither incorporated nor headquartered in the US.[8] Mostly, the filings do not mention anything about tax residence. When they do, they typically state the place of residence with a brief description of why this is the case. Some of these cases we used to construct our algorithm, others we set aside to validate and test our algorithm once

[8]Foreign firms that have equity listed on a US exchange are required to file annual reports with the SEC. Canadian firms file form 40-F, and non-Canadian foreign firms file form 20-F. In addition, numerous foreign firms report 10-K filings. To give an idea of how common it is for foreign firms to file annual reports with the SEC, we searched for annual reports from the 10 largest publicly listed companies in each of the G20 countries. Excluding the US and the EU, this yields 180 companies. Of these, 51 filed an annual report (40-F, 20-F, or 10-K) with the SEC between 2019 and 2021.

we were finished with its construction.

During this process, we noticed that BZ (a company is tax resident in the country if it carries on a business there) alone is never sufficient for residency. Thus, for any country with a rule stipulating that BZ is sufficient, we remove the BZ criterion.[9]

2.1.3 Algorithm

Here are the inputs for the algorithm:

- Year
- A firm's location of...
  - Incorporation
  - Headquarters
  - Center of Activity
  - Shareholder Control
- Dummies for whether...
  - Firm was incorporated in Mauritius on 6/30/1998; Canada on 4/26/1965; the UK on 3/14/1988; Ireland on 12/31/2014
  - Firm carries on a business in each country that considers this factor (Australia, Canada, Seychelles, and eight others)
  - Firm has a majority of its operations in Uganda
  - Firm is managed by a Tunisian national
  - A majority of the board are Tunisian nationals
  - Firm is majority-owned by the Egyptian government

[9]This affects two rules (INC/BZ and MC/BZ) and the following five countries: Brunei, Dominca, Honduras, Senegal, and Tunisia. These rules are simplified as INC and MC, respectively.

– At least 10%, 30%, or 35% of the shareholders are from Oman

The algorithm is implemented according to the following rules, which are applied sequentially. Each rule from 2 to 11 only applies if residence is missing after applying the previous rule. Rule 12 always applies.

1. If the company is incorporated in the US, then it is tax resident in the US. For example, consider the 2017 10-K of MySize, Inc. At the time, this company was incorporated in the US with headquarters in Israel. Here is a statement in its 10-K about its tax position: "We are subject to federal, state and local taxes in the U.S., as well as local taxes in Israel in [sic] respect to our operations in Israel."

2. If the company is headquartered in China and incorporated in a NO country or a country such that (1) the country considers incorporation when determining residency, and (2) all conditions for the firm to be resident in the country of incorporation are satisfied,[10] then the firm is resident in the country of incorporation. For example, here is a quote from the 2017 20-F of YY Inc, which has its headquarters in China and its incorporation in the Cayman Islands: "We are not aware of any offshore holding companies with a corporate structure similar to ours ever having been deemed to be a PRC [People's Republic of China] 'resident enterprise' by the PRC tax authorities."

3. If a company is incorporated in Mauritius and headquartered in India, then it is resident in Mauritius. For example, Azure Power Global satisfies this criteria according to its 2017 20-F.

4. If a company is incorporated in Ireland and headquartered in a NO or DM country, then it is resident in the country of headquarters as long as one of the following conditions hold: (1) the year is 1982-2014, or (2) the year is 2015-2020, the firm has qualifying

[10] This includes countries with classifications where INC is sufficient (INC, INC/MC, INC/MC/CA, etc.) as well as classifications where, for instance, CA would need to be combined with INC for residency (e.g., the firm is incorporated and has their center of activity in a (INC&CA)/MC country).

ownership, and the firm was incorporated prior to 2015. Qualifying ownership is met if (1) the company or its parent is listed on a stock exchange in an EU country (other than Ireland itself) or a country with which Ireland has a double tax treaty or (2) the company is ultimately owned by an entity resident in an EU country (other than Ireland itself) or a country with which Ireland has a double tax treaty (Wooley, 2015). For example, the "double Irish" tax avoidance scheme used by many US firms involves a subsidiary that is incorporated in Ireland and headquartered and tax resident in Bermuda (a NO country).[11]

5. If the company is headquartered in a country that considers headquarters when determining residency, and all conditions for the firm to be resident in the country of headquarters are satisfied, then it is resident in that country. Here are some examples:

   (a) IHS Markit is incorporated in Bermuda and headquartered in the UK. Here is a quote from its 2017 10-K:

   > "It is the intention of the directors to conduct the affairs of IHS Markit Ltd. so that the central management and control of IHS Markit Ltd. is exercised in the United Kingdom such that IHS Markit Ltd. is treated as resident in the United Kingdom for U.K. tax purposes."

   (b) Delphi Automotive is incorporated in Jersey (an island territory that is a British Crown Dependency) and headquartered in the UK. Here is a quote from its 2014 10-K. "We will seek to run ourselves in such a way that we are and remain tax resident in the United Kingdom."

   (c) Invitel Holdings stated the following in its 2009 20-F: "Invitel Holdings is a Danish incorporated company, however is [sic] considered a tax-resident company in Hungary given that the effective place of management of Invitel Holdings is in Hungary."

[11] Financial Times (2014): "Q&A: What is the double Irish?" October 9, https://www.ft.com/content/f7a2b958-4fc8-11e4-908e-00144feab7de (accessed September 12, 2023).

(d) Amarin Corporation is incorporated in the UK and headquartered in Ireland. Here is a quote from its 2017 10-K:

> "Where a company is treated as tax resident under the domestic laws of both the UK and Ireland then the provisions of article 4(3) of the Double Tax Convention between the UK and Ireland provides that such enterprise shall be treated as resident only in the jurisdiction in which its place of effective management is situated. We have sought to conduct our affairs in such a way so as to be resident only in Ireland for tax purposes by virtue of having our place of effective management situated in Ireland."

6. If the company is incorporated in a country that considers incorporation when determining residency, and all conditions for the firm to be resident in the country of incorporation are satisfied, then it is resident in that country.

7. If the company has its center of activity in a country that considers the center of activity when determining residency, and all conditions for the firm to be resident in the country where the center of activity is situated are satisfied, then it is resident in that country.

8. If the company has its shareholder control in a country that considers shareholder control when determining residency, and all conditions for the firm to be resident in the country where shareholder control is exercised are satisfied, then it is resident in that country.

9. If at least two of the following three locations coincide in the same country, then the firm is resident in that country: (1) headquarters, (2) incorporation, and (3) center of activity.

10. If at least one of the following three locations are in the country where shareholder

control is exercised, then the firm is resident in the country of shareholder control: (1) headquarters, (2) incorporation, and (3) center of activity.

11. The firm is resident in the country of headquarters.

12. If the residence has been assigned to the US despite the incorporation not being in the US, then the residence depends on whether the headquarters is in the US. If the headquarters is in the US, then the firm is resident in the country of incorporation. Otherwise, if the headquarters is not in the US, then the firm is resident in the country of headquarters.

Rules 1-4 are exceptions to the general nature of rules 5-11. The order of rules 1-4 does not matter–all four rules are mutually exclusive except for rules 1 and 2, which are complementary. Rules 1 and 12 combined reflect the equivalence of incorporation and residence in the US. Rule 2 applies to many firms that are headquartered in China but raise financing from foreign investors. These firms usually pick the Cayman Islands but sometimes also the British Virgin Islands for their incorporation. Such a corporate structure is implemented through a so called "variable interest entity." For more details on these complicated legal structures, see Appendix A. This exception still applies in 2022. For instance, Alibaba is headquartered in China and incorporated in the Cayman Islands. Here is a quote from its 2022 20-F:

> "If we were to be considered a PRC resident enterprise, we would be subject to PRC enterprise income tax at the rate of 25% on our global income. In this case, our profitability and cash flow may be materially reduced as a result of our global income being taxed under the PRC Enterprise Income Tax Law. We believe that none of our entities outside of China is a PRC resident enterprise for PRC tax purposes. However, the tax resident status of an enterprise is subject to determination by the PRC tax authorities and uncertainties remain with respect to the interpretation of the term 'de facto management body.'"

Next, rule 3 is in contrast to the existing double tax treaty between India and Mauritius, which stipulates that the firm would be resident in the country of headquarters (Government of Mauritius, 1983). However, in all cases that we analyzed, Mauritius-incorporated firms that are headquarted in India are tax resident in Mauritius.

After the implementation of Ireland's tax law change called "Finance Act 2014" (Wooley, 2015), Ireland became an ordinary INC/MC country, and rule 4 is no longer applicable. The law change is effective starting on January 1, 2015 for companies incorporated on or after this date, and January 1, 2021 for companies incorporated prior to 2015.

The application of rule 5 is clear if a firm only satisfies the residence requirements in the country of headquarters, as illustrated by examples 5a and 5b. However, if the firm meets the residency requirements in the country of headquarters and another country, then the appropriate double tax treaty comes into play. The order of rules 5-8 reflects our finding that tax treaties tend to allocate tax residence to the country of headquarters in cases where two countries claim a firm as resident, as illustrated by examples 5c and 5d. This is consistent with article 4 of the 2014 OECD Model Tax Convention on Income and on Capital, which stipulates the following tiebreaking provision in the event the unilateral application of each country's laws renders a firm a dual resident: "It shall be deemed to be a resident only of the State in which its place of effective management is situated" (OECD, 2015). This was the OECD standard through 2017. Starting in 2018, The new tie-breaking rule, as stated in article 4, paragraph 3, is as follows:

> "Where by reason of the provisions of paragraph 1 a person other than an individual is a resident of both Contracting States, the competent authorities of the Contracting States shall endeavour to determine by mutual agreement the Contracting State of which such person shall be deemed to be a resident for the purposes of the Convention..." (OECD, 2017)

This change gives tax authorities more flexibility to determine tax residence based on the specific facts and circumstances. We sample firms after this change to see if there are any

systematic changes in tie-breaking provisions, and account for this when constructing the algorithm rules from 2018 to 2023.

After headquarters, the next most important factor in determining residency is incorporation (rule 6), followed by the center of activity (rule 7), with the place where shareholder control is exercised being the weakest condition (rule 8).

If residence is missing after applying rules 1-8, then this implies that the firm does not meet the residence requirements in any country. In this case, we assume that the firm is resident in the country where multiple residence factors coincide. The order of rules 9 and 10 again imply that shareholder control is the weakest of the four factors (headquarters, incorporation, center of activity, shareholder control). Otherwise, if all four locations are in different countries, then we assume that the headquarters location takes precedence (rule 11) given its importance as a tie-breaking factor in tax treaties.

2.2 Does the Algorithm Miss Changes in Tax Laws or Tie-Breaking Provisions?

The starting point for our tax residence algorithm are the aforementioned tax guides by firms such as PwC and EY, which serve as marketing material to generate sales leads with potential customers. These tax guides include the contact details of a professional service firms' tax experts prominently placed throughout the whole document (these contact persons are usually at the level of partners or one-level level lower and thus of high seniority). For example, see Panel A of Figure 2, which shows a part of one of four pages of contact details for the EY 2015 Guide for Ireland, and Panel B of Figure 2 with some of the contacts for transfer pricing from the PwC 2013 guide. In particular, the idea behind the tax guides is that a potential customer uses them as a quick reference document and then reaches out to the firm with follow-up questions, which the firm will then use as an opportunity to pitch its services.

The country overviews in the tax guides are well suited to understand countries' unilateral

tax laws (for example, see Panel C of Figure 2 with the tax residence information for France in the PwC 2013 guide). The PwC guide for 2016 has, for instance, about 15 pages per jurisdiction. Any change in a tax law is an opportunity to generate sales for these firms, since a non-specialist might be unsure how a change to tax law affects her firm. Thus, these tax firms have strong incentives to mention even small changes in tax law (for example, see Panel D of Figure 2 from the PwC 2013 guide and the changes to the tax code in Uzbekistan). Obviously, these tax guides do not lay out every intricate detail of tax law because these firms want to sell their services, but these tax guides are a comprehensive source for alerting us to changes in tax law, even if we have to do further background reading in another source document (such as the SEC filings or other references provided above) to construct the tie-breaking provisions or the changes in tie-breaking provisions. (Note that if a country signs a bilateral or multilateral tax treaty, then to implement this treaty into domestic law, a country has to introduce a domestic law or regulation that mirrors the changes in the bilateral or multilateral treaty.)

As mentioned, we construct the tie-breaking provisions in case a firm is claimed by two countries by looking at firms' SEC filings and by looking into further sources on a case-by-case basis. Because of these tax guides, when sampling SEC filings, we do not have to hope to strike gold, but we know for which country-pair-years we have to take particular care to sample a sufficient number of cases for the construction and validation of our tax residence algorithm.

3 Prior Work Affected by Tax Residence Algorithm

To quantify the importance of the tax residence algorithm for prior research, we need to determine the number of papers that might be affected by the tax residence algorithm. Accordingly, we search for affected papers in 18 accounting, economics, and finance journals from 2001 to 2023. The details of the literature search are described in Table 1. In addition, we use our subjective assessment of whether the results in an empirical paper are affected

by the tax residence algorithm. For a paper to be considered affected, one of the following criteria has to apply: the dependent variable is about taxation, the independent variable of interest is about taxation, or the research design/treatment/identification is directly linked to taxation. In addition, the empirical results in the paper must rely on the assignment of firms to countries. For example, if the sample in a particular paper involves large publicly listed firms, we often (but not always) consider this applicable. If, however, a paper is about micro-enterprises in rural Kenya, for instance, then we would not consider the paper affected, even if the paper would satisfy all other criteria, since it is unlikely that there are many entities involved that would be reassigned by our algorithm. We find 113 papers whose results are likely sensitive to the tax residence algorithm, which includes 50 accounting papers, 22 finance papers, and 41 economics papers. The four journals with the most affected papers are the Journal of Public Economics, The Accounting Review, the Journal of Financial Economics, and the Journal of Accounting and Economics (with the latter two tied). The number of affected papers in a journal is driven by both the quantity of papers published in the journal and the scope of topics covered by the journal. This explains why the Journal of Public Economics leads this table, while most of the top five economics journals have no affected papers, since they are general interest journals that also publish relatively few papers.

In Table 2, we assign topics to the papers from Table 1. A paper can be assigned to more than one topic, with a paper having 2.2 topics on average. The top three topics are "Regulations, Laws, Transparency" (41%), "General Corporate Tax Avoidance" (40%), and "Worldwide Tax, Territorial Tax, Repatriation Tax" (30%). If one adds up the percentages of the four tax avoidance topics, then their aggregate share is 71% (73% when not accounting for double counting).

4 Institutional Details

4.1 Why Accurately Measuring Tax Residence is Important

Countries use both their tax residence and permanent establishment laws to determine which entities are taxable under their rules, which is of fundamental importance for many economic questions. For example, a common way to assess general tax avoidance (minimization) is to compare GAAP and cash effective tax rates against the statutory rates companies face. The tax residence of the parent entity also caries heightened importance in large companies given its role at the top of the corporate structure. For instance, if a parent company resides in a country that has implemented country-by-country reporting (CbCr), then it must file a report that disaggregates financial performance of its entire group by jurisdiction. In addition, if a company or part of a company is being sold in an M&A transaction, the tax residence of the acquiror and target will determine which tax laws and thus tax rates apply for issues such as capital gains tax at the corporate level.

While the prior paragraph lists several examples for why the measurement of tax residence matters, what are the research design implications for an academic paper? The reassignment of firms to different countries can reduce bias and variance in estimated regression coefficients along several dimensions. For instance, if a researcher is studying country-level variation in tax laws, reassignment will lead to fewer firms coded as treated when they actually belong to the control group, and vice versa. Moreover, as we will also show later on in the paper, reassigned firms are economically different, implying they might be especially sensitive or insensitive to a change in tax laws. Therefore, their wrongful inclusion or exclusion from a sample will impact empirical analysis. Lastly, researchers might try to measure membership in certain categories. For example, whether a firm has to implement CbCr or not. Reassignment makes such an analysis more accurate.

4.2 Tax Residence in a Worldwide vs. a Territorial Tax System

An institutional detail that warrants discussion is the concept of tax residence in a worldwide versus a territorial tax system. Three types of errors can occur regarding the assignment of firms to countries. First, assigning a firm's tax residence to the wrong country could imply assigning a firm as a tax resident in a country with a worldwide tax system when the firm is tax resident in a country with a territorial tax system, or vice versa. Second, a firm could be assigned to a country with a worldwide tax system when it should be tax resident in a different country with a worldwide tax system. Whether a firm is tax resident in a particular country with a worldwide tax system matters, since the rules on worldwide taxation imply that the firm has to pay the the tax rate of its "home" country on all foreign profits (accounting for foreign tax credits) once these profits are repatriated, thus significantly affecting the firm's foreign investment decisions. Third, a firm could be assigned to a country with a territorial tax system when it should be tax resident in a different country with a territorial tax system. Even in this case, the correct assignment matters. One reason is that the presence and content of controlled foreign corporation (CFC) rules (which limit a firm's ability to shift profits across different jurisdictions) depends on the tax residence of the firm's global legal parent. Another reason is that the rate of double taxation on foreign profits varies across countries (including countries with territorial and not just worldwide systems of taxation). Voget (2011) documents that firms account for both of these issues in assessing the attractiveness of different parent locations. These two points on CFC rules and double taxation also apply to the first and second error types.

4.3 Tax Residence vs. Permanent Establishment/Nexus

There are two related but distinct concepts that might be confused regarding the tax assignment of firms to countries–tax residence versus permanent establishment (also called nexus). This paper focuses on the concept of a firm's global tax residence. As the examples of Shell and Norwegian Cruise Line Holdings (an S&P500 firm with headquarters in Miami,

but incorporation and tax residence in Bermuda) illustrate, our tax residence algorithm is important in determining the tax residence of a firm's global legal parent. The concept of a permanent establishment or nexus determines whether a firm has a local "footprint" in a country (in the case of Shell, for example, oil refineries and gas stations). If the firm has such a footprint or nexus in a country, then it has to pay local taxes on this footprint. The example of Shell illustrates that the relocation of a firm's tax residence, while holding the permanent establishment of its local operations in different countries constant, can result in significant changes in corporate tax payments. Strikingly, the so-called "inversions" are exactly about firms relocating their tax residence to a different country (Babkin et al., 2017; Col et al., 2020). We would likely see significantly fewer inversions if the global tax residence of firms did not matter. Even more to the point, before a change in US tax law in 2004, a US firm could move its global tax residence out of the US through a so-called "naked inversion," thereby significantly lowering the effective tax rate paid on the profits of the entire corporate group even though none of the permanent establishments of the firm change (Marples and Gravelle, 2014). These arguments, especially those on corporate inversions, show that not only is the tax residence of the global legal parent of a firm important but also that the tax residence of the global legal parent is distinct from the concept of a permanent establishment/nexus. For a more detailed discussion of permanent establishments, see Appendix B.

The importance of tax residence as a concept can also be inferred from the fact that the "OECD Model Tax Convention on Income and on Capital" (a legal document that acts as a framework for international corporate taxation) discusses tax residence in article 4 of its 2014 version (the concept of permanent establishment is discussed in article 5 of the convention). Point 1 of article 4 defines the term "resident," point 2 discusses the tax residence of individuals, and point 3 is about the tax residence of corporate entities (OECD, 2015).

4.4 Stateless Income

One could be concerned that our algorithm is not applicable to so-called "stateless income generators." This term originates from the profit shifting literature, and refers to firms that generate a lot of "stateless income," which is defined as follows:

> [I]ncome derived for tax purposes by a multinational group from business activities in a country other than the domicile of the group's ultimate parent company, but which is subject to tax only in a jurisdiction that is neither the source of the factors of production through which the income was derived, nor the domicile of the group's parent company. (Kleinbard, 2016)

However, such a firm still has a tax residence. For example, suppose a US-tax resident does most of its business in the UK and the US, but books most of its profits in Bermuda. Profits booked in Bermuda are deemed "stateless," since Bermuda is neither the country of the firm's tax residence nor one of the countries where the firm conducts most of its business. However, the firm itself is not stateless–it is tax resident in the US. Moreover, the income is not, strictly speaking, "stateless," since it is booked in Bermuda. The term merely implies that the income is not booked in the US (location of tax residence) or the US/UK (location where most of the business is conducted).

As this example illustrates, tax residence is not sufficient to determine the taxes a firm pays, but it is necessary information. For instance, suppose a researcher is examining how a US law that limits profit shifting affects US firms. The firm described previously should be included in such a study since the law will affect the firm.

4.5 When Should One Apply the Algorithm and When Not?

As Desai (2009) laid out in his paper "The Decentering of the Global Firm," a firm can be incorporated in country A, headquartered in country B, have its main stock market listing in country C, while having most of its assets, employees, and customers in country D. To which country should such a firm be assigned for an empirical analysis? One example of such

a firm is Norwegian Cruise Line, with incorporation in Bermuda, headquarters in Miami, main stock market listing in the United States as an S&P 500 firm, and with most assets, customers, and employees being on the world's oceans. For further examples of prominent firms with headquarters and incorporation in different countries, see Appendix D.

The appropriate assignment depends on the purpose of the analysis undertaken. If one is interested in questions of corporate taxation, then the tax residence country of the global legal parent of the firm should be the country the firm is assigned to (which, depending on the relevant tax laws, can either be country A or B in the above example). Thus, for any setting related to corporate taxation, our tax residence algorithm should be used to assign firms to countries. Importantly, our algorithm is not only needed for multi-country settings, but also for single country settings to ensure that the right firms are included and removed from the sample (this issue can be easily resolved for some countries such as the United States, but for the vast majority of countries, one needs our algorithm since the rules determining tax residence for a country can depend upon what other country lays claim on a firm's tax residence).

For research questions that are *not* interested in corporate taxation, other assignment approaches might be preferable to our algorithm. For instance, if one is interested in the effects of stock market regulations, the country of a firm's main stock market listing might be the right country to assign a firm to. If one is interested in the "economic nationality" of a firm, the approach developed by Coppola et al. (2021) might be appropriate.

Examples of Single Country or Single Industry Settings Where Tax Residence Matters. What are some examples of single country settings where applying our tax residence matters? One example is the United States and, for instance, the large literature on the foreign cash holdings of "US" firms. These foreign cash holdings are driven by the repatration tax that would apply if these cash holdings were brought to the US. But what is a US firm in this case? Some "US" firms might have inverted out of the US tax residence so that the US worldwide tax no longer applies to their non-US cash holdings. Precisely

measuring such firms is crucial for any paper on this topic.

Another example is China. In the past, many Chinese firms had to use a complicated legal structure called "variable interest entity" to raise equity from foreign investors. One implication of this complicated legal structure is that the tax residence of the global legal parent company is outside China.[12]

A related case are papers that focus on a single industry that has many firms residing in tax havens. As mentioned previously, tax havens have a very large number of firms with split headquarters and incorporation locations, so that our tax residence algorithm is of particular importance. Even if such single industry papers are not examing research questions related to taxation, not accounting for the fact that some or all firms in the industry are residing in tax havens might lead to inaccurate conclusions. Some industries that are particularly heavy users of tax havens are the pharmaceutical and biotech industry, (re)insurance, shipping, commodity trading, private equity, leasing, private banking, and asset management.

5 Application: Firm-Level Data

In this section, we compare firms for which the algorithm reassigns tax residence and firms for which it does not. The purpose of this comparison is to examine whether firms whose tax residence is reassigned by our tax residence algorithm to a different country are fundamentally different from those that are not reassigned by our tax residence algorithm. From the perspective of the tax literature, the most important difference would be if reassigned firms have significantly different effective tax rates from non-reassigned firms.

5.1 Data and Algorithm Proxies

Data for the firm-level analysis is primarily from Compustat NA, Compustat Global, and Compustat Snapshot (collectively, "Compustat"). When available, we obtain the data on historical incorporation, headquarters, and primary stock exchange from Compustat Snapshot for Compustat NA firms, and from historical versions of Compustat Global from 2009-2023

[12]For more a more detailed discussion of these "variable interest entities," see Appendix A.

for Compustat Global firms.[13] We augment our firm-level location data with hand-collected data on (1) the location of firms' headquarters from Duchin et al. (2024) and Duchin and Sosyura (2024), and (2) the locations of firms' incorporation and headquarters from Meier et al. (2025). We proxy for the location where shareholder control is exercised as the country of the firms' primary stock exchange listing. We proxy for the center of activity as the country where the most revenue was generated in the most recent year according to FactSet Revere Geographic Revenue Exposure (henceforth, "Revere"), which is merged to Compustat using ISIN, Sedol, and Cusip. If no match is made, then we use the headquarters from Compustat.

For several countries during particular time periods, it is relevant to know whether a firm was incorporated in the country before a particular date. For instance, to assess whether rule 4 of the algorithm applies from 2015-2020, one needs to know whether the firm was incorporated in Ireland prior to 2015. We assess this by checking whether the firm was incorporated in Ireland in 2014 according to Compustat. We similarly measure whether firms were incorporated in Canada, Mauritius, and the UK as needed to implement the algorithm.

Next, to assess whether a firm caries on a business in one of the 11 countries where this factor is considered, we consider two criteria. First, we use data from Revere and set each business dummy to 1 if the firm generated at least 1%[14] of its revenue in the country during the most recent year and the Certainty Rank corresponds to at least a B rating by Revere.[15] FactSet defines Certainty Rank as a reliability measure, with values ranging from 0 (lowest certainty) to 80 (firm-reported exposure). Values of 57 and above are given at least a B rating on scale from A to E.[16] Our goal with these thresholds is to formulate an estimate of

[13]Based on an analysis of unreported results, however, improving tax residence assignment with the algorithm is significantly more important than the backfilling of incorporation and headquarters data.

[14]This threshold is also used by Demirgüç-Kunt et al. (2021) to determine whether banks have an international subsidiary in the country and Martin (2025) to identify firms operating in particular countries.

[15]The results are not sensitive to the choice of cutoffs.

[16]FactSet Research Systems Inc., *Geographic Revenue Exposure (GeoRev) Data and Methodology Guide*, version 2.1 (January 12, 2024).

whether a firm conducts meaningful business in the country. Second, we set the dummy to 1 if the firm is headquartered in the country.

To simplify the analysis, we assume that all firms meet the qualifying ownership requirement as stipulated in rule 4 of the algorithm. Additionally, we set the dummy "majority owned by the Egyptian government" to 1 if the firm is incorporated or headquartered in Egypt. Thus, we are simplifying the residence law of Egypt from INC/GOV51/MC to INC/MC. Similarly, we assume that any firm with a majority of its operations in Uganda is headquartered in Uganda, implying that Uganda's residence criteria can be simplified from INC/MC/OP51 to INC/MC. Another simplifying proxy is to set each of the Oman dummies (whether at least 10%, 30%, or 35% of the shareholders are from Oman) to 1 if shareholder control is exercised in Oman. The final simplification concerns the Tunisian dummies (whether the firm is managed by a Tunisian national and whether a majority of the board are Tunisian nationals). We assume that these dummies are always 1 when a firm is headquartered and has its shareholder control in Tunisia. This simplifies Tunisia's residence criteria from MC&SH51&BD51&CEO to MC&SH51.

Table 3 contains a description of variable definitions (excluding those related to the algorithm) and data filters used. The sample period is 1988 to 2023. One question related to the MNC Dummy might be how a firm that is *not* a multinational corporation (MNC) can be reassigned to a different country or reassigned in the first place. Imagine a firm incorporated in Bermuda, headquartered in the United States, and therefore tax resident in Bermuda. Such a firm is likely considering the United States as its domestic home market and it might do 100% of its business there. This firm is assigned to the wrong country if assignment is based on headquarters. Another example is a firm headquartered in Germany (where it does 100% of its sales) but incorporated in Luxembourg and thus tax resident in Germany and which is classified as a Luxembourg tax resident if the assignment is based on the location of incorporation.

5.2 Summary Statistics

We start our analysis with a simple comparison of the reassignment rates, examining Compustat NA and Compustat Global separately and jointly. We consider initial, pre-algorithm assignments based only on the location of incorporation or based only on the location of headquarters (see Table 4, Panel A). We choose these two locations as proxies for tax residence to compare with our algorithm since they are commonly used as such in the literature, and they are available in Compustat. When applying the algorithm to Compustat NA, an initial assignment of tax residence based only on the location of incorporation results in a reassignment rate of 0.91%, while the corresponding number for an initial assignment based on the location of headquarters is 3.10%. For Compustat Global, these numbers are 4.86% and 1.95%, and for the combination of Compustat NA and Compustat Global (minus duplicate observations), they are 3.64% and 2.31%. In studies where reassigned firms switch from the treatment to the control group, or vice versa, the effects of reassignment might be twice as large compared to cases where reassigned firms are added to or excluded from a sample. The reassignment rate is smallest when using Compustat NA and assigning tax residence based on incorporation because incorporation is equivalent to tax residence in the United States. In contrast, outside the United States, a variety of rules are used to assign a company's tax residence, leading to higher reassignment rates for Compustat Global.

We also report the reassignment rates for tax haven firms. We use the list of tax havens from Meier et al. (2025). In Compustat NA, an initial assignment of tax residence based only on the location of incorporation results in a reassignment rate of 12.71%, while the corresponding number for an initial assignment based on the location of headquarters is 41.81%. For Compustat Global, these numbers are 34.39% and 16.83%, and for the combination of Compustat NA and Compustat Global, they are 31.64% and 19.99%. These numbers suggest that any paper whose research question or data focuses on tax havens is likely to be particularly sensitive to the accurate measurement of tax residence.

Next, we limit the sample to the year 2023 only (Table 4, Panel B) to examine reas-

signment rates when data quality is highest. The reassignment rate for Compustat NA increases significantly relative to the full sample in Panel A, regardless of whether the initial assignment is based on incorporation (increases from 0.91% to 3.92%) or headquarters (increases from 3.10% to 5.88%). The numbers for Compustat Global are lower for incorporation (4.86% to 4.16%) and higher for headquarters (1.95% to 2.50%). Given our use of Compustat Snapshot and hand-collected data on incorporation and headquarters, historical (pre-2023) data for Compustat NA is of similar quality to data from 2023. In contrast, the gap in data quality is more significant for Compustat Global. Thus, the increase in reassignment rates for Compustat NA indicate that firms in 2023 have a greater propensity to have different locations of headquarters and incorporation, which could reflect greater tax aggressiveness in 2023 relative to the average from 1988 to 2023.

The reassignment rates for haven firms also increase in 2023 relative to the full sample average. However, we are hesitant to attribute this to changes in tax aggressiveness, since being resident in a haven itself reflects a tax-aggressive posture.

Going forward, we focus on the combined sample of Compustat NA and Compustat Global. In Table 5, Panels A and B, we compare summary statistics for reassigned versus non-reassigned firms. Panel A considers reassignment with the algorithm when the initial assignment is based only on the location of incorporation, and shows that reassigned firms have a 3.92 (4.97) percentage point lower mean (median) cash ETR than non-reassigned firms. One driver of this is that reassigned firms are more likely to be tax resident in tax havens. Moreover, firms whose locations of incorporation or headquarters differ from their tax residence are more likely to be tax aggressive than firms for which these locations coincide. In addition, reassigned firms are larger (measured by the log of total book assets), have lower book leverage, are less profitable, hold more cash, have lower capital intensity (PP&E/assets), are less likely to report research and development, and are more likely to be an MNC. The mean (median) cash/assets for reassigned firms is 6.34 (6.17) percentage points higher than for non-reassigned firms.

Panel B considers reassignment using the tax residence algorithm compared with an initial assignment based only on the location of headquarters. At the mean (median), reassigned firms have a 3.33 (3.70) percentage point lower cash ETR. As in Panel A, reassigned firms are larger, have lower book leverage, have lower capital intensity, and are more likely to be an MNC. In addition, the difference in cash holdings for reassigned and correctly assigned firms is again remarkably strong, with reassigned firms having a 7.96 (7.18) percentage point higher mean (median) cash holdings. In contrast to Panel A, in Panel B reassigned firms are not less profitable (the mean is higher and the median is not statistically different) and are significantly more likely to conduct research and development.

Lastly, we compute cash ETR based on reassignment status for large firms (Panels C and D of Table 5), which are those with an inflation-adjusted market capitalization above $1 billion in 2023 USD. We use the GDP price index from the Bureau of Economic Analysis[17] for the inflation adjustment. In this subsample of large firms, the differences in cash ETR between reassigned and non-reassigned firms is even greater than in the overall sample. When the initial assignment is based on incorporation (see Panel C), reassigned firms have 7.91 (8.06) percentage points lower cash ETRs, and when the initial assignment is based on headquarters (see Panel D), reassigned firms have cash ETRs that are 5.89 (5.87) percentage points lower. Thus, reassignment is a stronger predictor of tax aggressiveness for larger firms.

These statistics highlight that reassigned firms are, at least based on univariates, significantly different than correctly assigned firms, highlighting the importance of accurately measuring tax residence.

5.3 Regression Analysis - Reassignment as Dependent Variable

In Table C1, we assess the univariate differences of Table 5 in a multivariate framework using the combined Compustat NA and Compustat Global datasets. We regress a variable that is set to 100 in the case of reassignment (relative to either incorporation-only or headquarters-

[17] "Table 1.1.4. Price Indexes for Gross Domestic Product," *U.S. Bureau of Economic Analysis*, December 19, 2024, https://www.bea.gov/data/prices-inflation/gdp-price-index (accessed January 14, 2025).

only assignments) and 0 otherwise on the set of summary statistics variables and industry fixed effects. Given the importance of cash ETR, we stagger its introduction into the regressions. Regardless of the initial assignment approach and consistent with the summary stats, reassigned firms are larger, have lower book leverage, hold more cash, and have lower cash ETRs. When the initial tax residence assignment is based on incorporation, reassigned firms are less profitable, less likely to report R&D, and more likely to be a multinational corporation. This might reflect a larger weighting on non-US firms given the US-focused tax residence rules (since an assignment based on incorporation classifies US firms correctly, misclassified firms must be non-US firms; simultaneously, US firms are more profitable than non-US firms).[18] Conversely, when the initial assignment is based on headquarters, reassignment is not significantly related to profitability or multinational status, but reassigned firms have lower capital intensity and are more likely to report R&D.

What could be the underlying economic forces behind some of these estimates? Having separate locations of incorporation and headquarters likely raises the fixed costs of running the firm (e.g., the preparation of tax documents, expenses for auditors and consultants), since the organizational structure of a firm is more complex. Larger firms might therefore be more likely to have one or more of the following locations in separate countries: incorporation, headquarters, center of activity, place of shareholder control. Thus, it seems reasonable that larger firms are more likely to be reassigned. High cash holdings of reassigned firms is also consistent with tax aggressiveness in a cross-country context. Firms within a worldwide tax system have an incentive to accumulate cash holdings abroad to avoid repatriation taxes (De Simone et al., 2019). Firms in a territorial tax system also have strong incentives for profit shifting which can result in an accumulation of cash in jurisdictions with low tax rates (Markle, 2016). Moreover, firms in countries with a worldwide taxation system have an incentive to invert out of the country to permanently avoid repatriation taxes (Desai and

[18]The Economist (2016): "Too much of a good thing: Profits are too high. America needs a giant dose of competition," March 31, https://www.economist.com/briefing/2016/03/26/too-much-of-a-good-thing (accessed May 29, 2022).

Hines, 2002; Seida and Wempe, 2004). The decoupling of these locations might facilitate these strategies.

In sum, the regression results suggest that reassigned firms are systematically different from non-reassigned firms, highlighting the importance of accurately measuring tax residence. The low adjusted R^2 values of around 2% also highlight that it is difficult to predict which firms are reassigned by our algorithm, further highlighting the need for our algorithm.

5.4 Regression Analysis - Tax Rates as Dependent Variable

We now focus on the difference in cash ETRs between reassigned firms and non-reassigned firms because this difference is particularly relevant for corporate taxation research. We regress cash ETR on a dummy for reassignment and a number of other firm characteristics, including industry fixed effects. The goal is to more directly measure the cash ETR difference between reassigned and non-reassigned firms, while also accounting for the effect of other economic variables on cash ETRs. Columns 1 and 2 of Table 6 shows that the cash ETRs are 3.39 (4.08) percentage points lower for reassigned firms after conditioning on observables when the initial assignment is only based on a firm's location of incorporation (headquarters). In columns 3 and 4, we interact a dummy that equals one if the firm is large (market capitalization above $1 billion as in Section 5.2) with the reassignment dummies. The main effect of reassignment indicates that small reassigned firms have cash ETRs that are 2.05 (2.09) percentage points lower than comparable small firms that are not reassigned based on incorporation (headquarters). The interaction of large and the reassignment dummies is statistically significant, indicating an even greater difference in cash ETRs between large firms that are reassigned and those that are not. Summing the reassignment main effect and interaction, we find that large reassigned firms have cash ETRs that are 6.78 (5.53) percentage points lower than comparable large firms that are not reassigned based on incorporation (headquarters). The significantly lower cash ETRs for reassigned firms, particularly large ones, illustrates the potential implications if such firms are assigned to the control group instead of the treatment group (and vice versa) in an empirical analysis.

6 Application: Mergers and Acquisitions

In this section, we compare the location assignment of acquirors and targets in M&A using our algorithm versus the location reported in SDC Platinum, the standard data source for M&A (we also provide evidence that this measurement issue is even more severe with Zephyr M&A data). We include an M&A application for three reasons. First, it is an important application. Second, data availability is good. Third, M&A is well suited to tease out that the firms that are reassigned by our algorithm are a non-random subset of all firms–they are, for instance, more aggressive tax avoiders and more acquisitive.

Our tax residence algorithm matters for all M&A research related to corporate taxation, since the tax residence of a firm determines which tax laws and tax rates are applicable for an M&A transaction. Imagine a firm that is the acquirer in a large M&A transaction and SDC considers this firm to be from the United States when the firm is tax resident in Ireland. For example, Actavis PLC, an Irish tax resident, was listed as a US firm according to SDC when it acquired Forest Laboratories Inc for $25 billion in 2014. Research that investigates, for instance, the corporate income tax implications of such an M&A transaction would wrongly apply the US tax laws to this firm, when the Irish tax laws (and tax rates) should apply.

6.1 Algorithm Inputs

There are three important issues regarding the algorithm inputs for research on the taxation of cross-border M&A. First, one needs to understand how SDC, the standard data source for M&A, defines the nationality of acquirers and targets. Second, one needs to obtain additional data on inputs for the tax residence algorithm that are missing in SDC. Third, one also needs to be aware of how one should deal with firms for which it might be difficult or impractical to get information on their algorithm inputs (in particular, unlisted firms), and how one should treat "asset deals"–transactions in which individual assets such as power plants or retail stores are sold, which are not a corporate body by private law and thus neither have a location of headquarters nor incorporation.

Regarding the first issue, SDC defines the nationality of the acquiror and target (henceforth, "SDC nation") as its location of business activities. When the target is not a standalone firm, such as when it's a subsidiary or a collection of assets, the primary location of the target is used. For example, if the target is several oil fields located in Canada that belong to a multinational company, then the target's location would be the physical location of the oil fields, which would be Canada. Thus, we use the SDC nation as a proxy for the acquiror/target's center of activity. SDC also provides the incorporation, though it is frequently missing. We merge SDC with Compustat using the matching methods described in Meier et al. (2025). If a match is made, then we use the incorporation and headquarters from the firm-level dataset described in Section 5.1. Otherwise, we fill in the incorporation and headquarters with the SDC incorporation and the SDC nation, respectively. Since the SDC nation is never missing but the SDC incorporation is often missing, we replace the incorporation with the SDC nation if it is still missing after considering the SDC incorporation. Next, SDC provides the primary stock exchange for acquirors and targets, if applicable. We use this to estimate where shareholder control is exercised, and replace it with the corresponding value from the firm-level dataset if missing. Otherwise, we use the headquarters location if it is still missing after applying these steps.

We set each incorporation dummy in year t to one in if any of the following conditions hold: (1) the firm was part of an M&A in year t and was incorporated in the country at that time, (2) the firm was not part of an M&A in year t, but was in year t-1, at which point it was incorporated in the country, (3) the firm was not part of an M&A in year t, but was in year t+1, at which point it was incorporated in the country, or (4) the firm was incorporated in the country in year t in the firm-level dataset (see Section 5.1).

Next, to assess whether a firm caries on a business in one of the 11 countries where this factor is considered, we set each business dummy to 1 if the SDC nation coincides with the country. Then, we consider Revere and the headquarters location as in the firm-level analysis. Lastly, as in the firm-level analysis, we apply the same simplifying assumptions to

the algorithm inputs regarding the tax residence rules of Egypt, Uganda, Oman, and Tunisia. To address the third issue (acquiror and/or the target is not a standalone public firm), we use the SDC nation as a proxy for the firm-level location inputs when the necessary data is not available in SDC and no match to Compustat or Revere is made, as described above.

Consequently, if one includes transactions in a sample where one does not have information on the acquiror or target firms' incorporation and headquarters, one is mechanically introducing the possibility of measurement issues. Usually, this issue is more frequent on the target than on the acquiror side, since data availability is better for public than for private firms and targets are more likely to be privately held, while acquirors are more likely to be publicly listed. The reason for the latter is that larger firms are more likely to be acquirors than targets, and larger firms are more likely to be publicly listed than smaller ones.

Unless otherwise stated, in all results in this section, the acquiror refers to what SDC considers the acquiror's ultimate parent, and the target refers to the direct target. For example, if Toyota Motor North America, a subsidiary of Toyota, purchased five car factories from the Volkswagen Group of America, a subsidiary of Volkswagen (a German company), then Toyota would be the acquiror and the five car factories of Volkswagen Group of America the target. Had we instead considered the target to be the target's ultimate parent, then the target in this deal would be Volkswagen. Since Toyota is not buying Volkswagen, but several assets of a subsidiary of Volkswagen, the appropriate target should be the direct target (the five car factories of Volkswagen Group of America). Besides correctly measuring who is the acquiror and who is the target, these differences matter when assigning the acquiror country and target country in a cross-border M&A. Since we consider the acquiror's ultimate parent and the direct target, the aforementioned hypothetical M&A transaction would be assigned to Japan as the acquiror country and the United States as the target country, since a Japanese company buys assets located in the United States.

6.2 M&A Sample Filters

We use M&A data filters similar to Meier and Servaes (2019) and Meier et al. (2025). The sample includes deals announced between 1982 and 2023 and subsequently completed. We drop self-tenders, repurchases, recapitalizations, spin-offs, split-offs, equity issuances, and block purchases. We also exclude deals that involve a mutual company, government entity, or supranational organization (e.g., the United Nations). Moreover, we exclude deals where the buyer or seller nation is listed as "Multi-National." This typically occurs when the acquiror or target company is listed as "Investor Group." We use the GDP price index from the Bureau of Economic Analysis to convert deal value to 2023 USD, and remove observations with missing deal value or deal value below $1 million. The sample includes deals where an entire firm is acquired, as well as deals where assets, a subsidiary, or a division of another firm are acquired. Examples of the latter types include deals where an airline buys several aircraft and landing rights at airports from another airline, or where a utility company buys several power plants from another utility company. For acquisitions of entire firms, we further require that at least 50% of the target's shares are acquired as part of the transaction or as part of several transactions over the sample period. We exclude firms in the utilities (SIC 4900-4999), defense (SIC 3760-3769, 3795, and 3480-3489), and banking (SIC 6000-6199) industries, since many countries have nationality-based ownership rules and other regulatory restrictions for these industries. Lastly, we remove countries with less than $50 million in aggregate deal value on the acquiror or target side. The final dataset has 215,763 deals from 189 countries.

Intra-country deals are only included when discussing statistics on the reclassification of deals from intra-country to cross-border or vice versa. All other analyses only include the 65,551 cross-border deals. In addition, we further require that the source of the incorporation of the acquiror (target) is not the SDC nation when summarizing data at the acquiror (target) level. Recall that the incorporation is obtained by first considering the incorporation from the firm-level data, then the SDC incorporation if missing, and finally the SDC nation if the

previous two measures are missing. Thus, this requirement implies that the incorporation must come from the incorporation in the firm-level data or the incorporation provided by SDC. We make no such requirement for headquarters, where the SDC nation is a reasonable proxy if a match to the firm-level data is not made. Thus, this requirement implies that we are only looking at reassignment rates for firms (acquirors or targets) that have reasonable estimates of the most important inputs for the algorithm. Otherwise, if the incorporation is assigned the SDC nation, then it is possible that all four location variables coincide due to measurement issues. It is likely that such cases will involve private firms or a collection of assets, and a reassignment rate that is mechanically close to 0. We will henceforth refer to deals where this requirement is satisfied as deals where "incorporation is non-missing" or "incorporation is available." There are 49,943 cross-border deals with a non-missing acquiror incorporation, 15,394 with a non-missing target incorporation, and 11,619 with a non-missing incorporation on both sides.

For deals flagged as reverse acquisitions in SDC, we classify the acquiror as the target and the target as the acquiror. In this way, the acquiror is always the economic acquiror (the larger company), as opposed to the legal or accounting acquiror.[19]

6.3 Analysis of M&A Data

Our algorithm is needed anytime at least one of the following locations of a firm are in different countries: headquarters, incorporation, center of activity, and place of shareholder control. Research on the taxation of cross-border M&A usually use the SDC nation of the acquiror and target, which we use to proxy for the center of activity, an input of the algorithm. Only relying on the SDC nation, however, can result in measurement error if this location differs from a firm's headquarters, incorporation, or place of shareholder control.

We provide summary statistics for the overall reassignment rates when the incorporation for both the acquiror and the target are available. 9.7% (8.8%) of deal value (count) involve

[19]If the smaller company in an M&A transaction is listed as the acquiror, then SDC will mark the deal as a reverse acquisition. Reverse acquisitions typically occur when a firm wants the smaller company to be the parent of the combined firm. This is often the case when the smaller firm is in a tax-favored location.

an acquiror whose SDC nation does not equal its tax residence. On the target side, the reassignment rate is 8.9% (10.8%) for deal value (count). Overall, 18.1% (19.7%) of deal value (count) involves an acquiror or target whose tax residence differs from its SDC nation. Accurately classifying tax residence can mean the difference between a deal being intra-country or cross-border. Of the deal value classified by SDC as intra-country, 5.8% is reclassified by our algorithm as cross-border (via a target or acquiror reassignment). Moreover, of the deal value that is cross-border according to SDC, 3.0% is reclassified as intra-country by our algorithm. The corresponding figures for deal count are as follows: 4.2% are reclassified from intra-country to cross-border, and 4.3% are reclassified from cross-border to intra-country. To make matters worse, the rate and type of reassignment rates vary greatly across countries.

6.3.1 Acquiror Reassignment Rates: Deal Value (Panel A1 of Table 7)

We report reassignment rates for the 30 largest countries by deal value in Panel A1 of Table 7 based on the acquiror's location and deals with a non-missing incorporation for the acquiror. Cross-border deal value in billions of dollars is in the first column. The deal value variable is based on the tax residence of the acquiror and includes all M&A deals where the SDC nation coincides with the tax residence of the buyer, the missed transactions, but not the wrongly added transactions. The second column lists the "missed percentage," which is the percentage of deal value where the acquiror is tax resident in the country but the SDC nation differs. The third column lists the "wrongly added percentage," which is the percentage of deal value where the acquiror's SDC nation is in the country but the tax residence differs. The fourth column lists the percentage of deal value where the acquiror's SDC nation and tax residence coincide, but the SDC nation and tax residence of the target differ. The total column sums these three types of reassignment rates.

The United States has the largest amount of deal value, with $4,075 billion in cross-border deal value on the acquiror side. Using the SDC nation would cause the researcher to miss deal value amounting to 3.8% of this, and erroneously add 16.2% in additional deal

value involving firms located (according to SDC) but not resident in the US. In addition, even if the acquiror's SDC nation and tax residence coincide, 8.8% of this deal value involves a target with an SDC nation that differs from its tax residence. The overall reassignment rate for the US is 28.8%. The high wrongly added and missed reassignment rates for the US are driven by three factors. First, it reflects its residency criterion: a firm is resident in the US if and only if it is incorporated in the US. Thus, knowing that a firm has its center of activity in the US is neither necessary nor sufficient for it to be resident in the US. It is only helpful in determining its tax residence to the extent that having a center of activity in the US is positively correlated with being incorporated in the US. Second, it reflects aggressive tax avoidance by "US" firms. Specifically, the high reassignment rate for wrongly added for the US is, to a large extent, driven by firms that were previously headquartered and incorporated in the United States but moved their incorporation abroad as part of an (M&A) inversion, while remaining headquartered in the United States. In addition, when these firms are engaging in cross-border M&A after having shifted their tax residence abroad, SDC continues coding them as US firms. A significant share of such transactions involve very acquisitive "US" pharmaceutical firms that relocated their tax residence to Ireland, such as Actavis PLC and Endo International PLC. Third, many of the firms that contribute to the high reassignment rate of the US have high cash holdings, in particular foreign cash holdings outside the US. These large cash holdings enable these firms to be very acquisitive. Moreover, foreign cash holdings provide an incentive for US tax residents to invert out of the US. For firms that are still US tax residents but that have large unrepatriated foreign cash holdings, these cash holdings also provide a stimulus to engage in acquisitions of non-US firms. Since some of these cash rich firms are US incorporated but headquartered abroad, such cases contribute to the category of missed deals. Many research questions related to these cash holdings are investigated in a large literature on the (foreign) cash holdings of "US" firms, how this cash is used for foreign M&A, and other questions. In Table 2 with the "Topics of Prior Work Affected By Algorithm," these papers fall into the category of

"Worldwide Tax, Territorial Tax, Repatriation Tax," and additionally into the M&A topic in case the paper investigates the issue of foreign cash holdings and M&A.

The United Kingdom (Canada) has the second (third) most deal value on the list, with $2,634 ($1,191) billion in acquiror-side deal value and an overall reassignment rate of 20.6% (13.7%). The fourth and fifth countries on the list, Germany and France, have relatively low reassignment rates, since few companies have different headquarters, incorporation, center of activity, and place of shareholder control when one of these locations is in France or Germany.

Many of the countries with particularly high reassignment rates are tax havens. Examples are the Netherlands ($734 bn deal value, eighth country by acquiror deal value, total reassignment rate of 39.8%), Ireland ($469 bn deal value, 10^{th} country by acquiror deal value, total reassignment rate of 50.8%), Bermuda ($315 bn deal value, 13^{th} country by acquiror deal value, total reassignment rate of 40.9%), Singapore ($327 bn deal value, 15^{th} country by acquiror deal value, total reassignment rate of 65.9%), and the Cayman Islands ($139 bn deal value, 22^{nd} country by acquiror deal value, total reassignment rate of 92.8%). As documented by Meier et al. (2025), tax havens attract an abnormally high amount of M&A activity, which, on the acquiror side, is driven by firms that reap tax savings by increasing the asset base exposed to the low tax rates in these havens. Many of these firms have moved their headquarters and/or their incorporation to establish a tax residence in havens. After the relocation, SDC often continues to define each firm's nationality as being from the original country, thus resulting in high overall reassignment rates that are driven by a high missed percentage. Given that haven firms are disproportionately likely to be headquartered and incorporated in different countries, relying solely on any one measure of location (Center of Activity, HQ, incorporation) would also result in high overall reassignment rates.

One of the biggest outliers regarding the total reassignment rate is China ($223 bn deal value, 16^{th} country by acquiror deal value, total reassignment rate of 105.8%). What makes China unique is that tax avoidance is not the primary motivator for having a split location of

headquarters and incorporation. Rather, firms are using a so called "variable interest entity" (thereafter VIE) to circumvent restrictions in many industries on raising equity financing outside mainland China. One important side effect of VIEs is that the tax residence of the global legal parent company is outside China. For more detail on VIEs, see Appendix A.

6.3.2 Target Reassignment Rates: Deal Value (Panel A1 of Table C2)

Next, we report reassignment rates by the top target countries by deal value in Panel A1 of Table C2. What are some countries with large differences in reassignment rates between Panels A1 of Table C2 (target side) and A1 of Table 7 (acquiror side)? The reassignment rate for the Netherlands has changed from 39.8% on the acquiror side to 15.3% on the target side, while the rate for Switzerland increased from 13.7% to 23.4%. Some further noteworthy changes are China (105.8% to 318.9%, the latter of which is driven by a wrongly added rate of 253.4%) and Singapore (65.9% to 14.4%). While the sum of the missed and target reassignment rates is bounded above at 100%, since these measures only consider deals that are a subset of the deal value reported in column A, the wrongly added reassignment rate includes additional deals where the SDC nation is in the country but the tax residence is not, allowing the total reassignment rate to be above 100%. Many tax havens continue to have high reassignment rates in both panels. There are also some non-haven countries that have interesting differences: Australia (32.9% to 11.6%) and Japan (2.5% to 12.5%).

6.3.3 Acquiror Reassignment Rates: Deal Count (Panel A2 of Table 7)

Panel A2 of Table 7 considers deal count instead of deal value. The reassignment rates remain large. While the United States has a slightly lower reassignment rate, the reassignment rates of the United Kingdom and Canada, countries two and three by deal count, are higher. Many tax havens have again particularly large reassignment rates. Due to the aforementioned VIE structures, China has the highest reassignment rate among any country by acquiror deal count.

6.3.4 Target Reassignment Rates: Deal Count (Panel A2 of Table C2)

Data availability on the target side is worse than on the acquiror side, and the difference is more significant for deal count than for deal value.[20] This implies that for smaller transactions, the incorporation on the target side is more likely to be missing. The reassignment rates are generally much larger than in prior tables, whether on the acquiror or target side. Among the top 10 countries by deal count, all have double-digit reassignment rates. Even a jurisdiction like Japan that previously had low reassignment rates now has one of 25.2%. Tax havens are again among the countries with the highest reassignment rates.

6.3.5 Acquiror Reassignment Rates: Deal Value (Both Incorporations Available) (Panel B1 of Table 7)

Going forward, we condition on the availability of incorporation on both the acquiror and target sides. The previously reported reassignment rates consequently represent lower bounds of the true reassignment rates since if the incorporation is missing on one side of a transaction, the reassignment rate for that side of the transaction is mechanically close to 0. Unlike us econometricians, practitioners will have access to information about the locations firms without a match to Compustat or hand-collected data from SEC filings, such as privately held firms.

Relative to Panel A1, the reassignment rate for the US increases from 28.8% to 42.5% and China's reassignment rate above 100increases from 105.8% to 130.0%. Tax havens with large changes include Hong Kong (46.5% to 70.2%) and Singapore (65.9% to 85.4%). Non-havens with considerable differences are Mexico (6.1% to 9.2%), South Africa (31.5% to 58.4%), South Korea (6.3% to 1.8%), and India (13.1% to 31.3%).

[20] Canada is an outlier in this regard, as SDC provides good availability of incorporation for Canadian-incorporated firms.

6.3.6 Target Reassignment Rates: Deal Value (Both Gvkeys Available) (Panel B1 of Table C2).

If the target is a standalone public firm, then it turns out empirically that it is likely that the acquiror is also a standalone public firm, too. This might be because publicly listed firms are large and to acquire a large firm one needs to be even larger, which points to a publicly listed acquiror. Thus, given that Panel A1 requires a non-missing gvkey for the target, the additional requirement that the acquiror have a non-missing gvkey does not significantly reduce the overall sample of deals in Panel B1 relative to Panel A1 of Table C2. As such, the reassignment rates for the largest countries do not change much. One outlier is China, with $67 billion in deal value. China's reassignment rate falls from 318.9% in Panel A1 to 222.9% in Panel B1, which is driven by a drop in the wrongly added rate from 253.4% and 153.2%, respectively.

6.3.7 Acquiror Reassignment Rates: Deal Count (Both Incorporations Available) (Panel B2 of Table 7)

Again, the reassignment rates remain very high when considering the deal count on the acquiror side, conditioning on the availability of both incorporations. The top four countries all have reassignment rates above 20%. All of the top 10 countries have reassignment rates above 10%. Countries with particularly high reassignment rates include Canada, Hong Kong, China, and the Cayman Islands.

6.3.8 Target Reassignment Rates: Deal Count (Both Incorporations Available) (Panel B2 of Table C2)

Lastly, we focus on the reassignment rate for deal count on the target side when both incorporations are available. Only two countries in the table have a reassignment rate below 10%. Countries with particularly high reassignment rates include Hong Kong, China, the British Virgin Islands, Japan, and the Cayman Islands.

6.3.9 Discussion of M&A Reassignment Rates

In general, the reassignment rates for deal counts are higher than for deal value. This implies that the reassignment rate for smaller transactions is higher than for larger ones. One of the economic forces limiting tax avoidance through havens (the reassignment rates are driven by cross-border M&A that have a haven acquiror or target; reassignment rates for haven firms are very high) is the heightened scrutiny from tax authorities that typically follows such activities, which affects large firms to a greater extant than small firms. This has implications for the reassignment rates of transactions where we cannot observe the incorporation on one or both sides of the transaction (in which case the reassignment rate is mechanically close to 0). Transactions without incorporation include asset deals (no target incorporation) and deals involving private firms. Consequently, it seems likely that transactions where we cannot apply our algorithm because of a lack of publicly available data have higher reassignment rates than those with observable inputs.

The generally very high M&A reassignment rates highlight that when studying questions of the taxation of cross-border M&A, the use of our tax residence algorithm (together with data on the on the inputs) is important for empirical inferences.

6.4 M&A Data Comparison: SDC vs. Zephyr

While the majority of papers on tax and international cross-border M&A use M&A data from SDC Platinum, a significant minority of papers (e.g., Bradley et al. 2021; Todtenhaupt and Voget 2021; Feld et al. 2016) use M&A data from Bureau van Dijk's (BvD's) Zephyr database. This raises the question of how Zephyr and other BvD datasets such as Amadeus and Orbis (which are usually used in combination with Zephyr) measure a firm's location, and whether this results in a different reassignment rate relative to SDC when using our tax residence algorithm. To summarize, we have strong reasons to believe that the reassignment rate when using Zephyr data is even higher than with SDC data, making SDC the preferred choice for M&A data.

To start, BvD data generally uses the location of incorporation to assign the location of a firm or the parties involved in an M&A transaction. 8.3% of deal value involves an acquiror or target whose tax residence differs from its incorporation. Thus, at first it appears that using Zephyr instead of SDC will result in lower higher reassignment rates.[21]

However, the general data quality of SDC M&A data is superior to that of Zephyr as indicated by the detailed comparison of the two databases in Bollaert and Delanghe (2015). According to Bollaert and Delanghe (2015), the most severe issues with Zephyr are the continuous overwriting of firm-level data and inaccuracies in announcement dates. Regarding the former issue, many variables on acquiror and target characteristics in Zephyr are current (measured as of the time the data is accessed) instead of historical (measured as of the time of the transaction), as is the case with SDC. One example is the public status of acquirors and targets, which SDC reports as of the time of the transaction, while Zephyr provides as of the date accessed. This is a particular problem for targets, which Zephyr generally classifies as de-listed, independently of whether they were publicly listed at the time of the transaction or not. The most important issue with Zephyr M&A data regarding the measurement of tax residence is that the location (country) information is current instead of at the time of the transaction. Thus, if a firm changes its tax residence after a cross-border M&A, the location data for the firm's entire M&A history would be overwritten. This implies that using the incorporation from Zephyr will likely result in a higher reassignment rate than the 8.3% figure we report, since our data is historical. According to Bollaert and Delanghe (2015), it is also difficult to apply data filters on some variables in Zephyr because the presentation of data is not systematic.

In addition, based on unreported results in which we compare summary statistics on the number of transactions and deal volumes on a country-year basis using SDC data to the summary statistics in some papers that use Zephyr data (taking different sample filters

[21]Recall that the SDC nation is never missing, while the incorporation provided by SDC is often missing. Thus, while it is still useful as one of the inputs to our algorithm, solely relying on the SDC incorporation as a proxy is not feasible.

into account), SDC Platinum appears to have much more comprehensive coverage of M&A transactions. This observation holds even for Europe, the supposed strength of Zephyr data (and BvD data in general). This evidence is in line with Bollaert and Delanghe (2015), who also document that SDC has a greater coverage of M&A transactions than Zephyr.

Based on a further unreported analysis of Orbis and Amadeus (which are often used in combination with Zephyr), there are additional important data coverage issues with these databases–importantly, even for large multinational firms such as firms listed in the S&P 500 or in the top stock market indexes of large European countries. In general, the coverage in Orbis and Amadeus of large multinational firms that changed their incorporation is inconsistent and not comprehensive. In a sample of S&P 500 firms that moved their incorporation and thus tax residence to Europe–and thus should be covered by Amadeus–some showed up in Amadeus after the relocation, while others did not. Both Amadeus and Orbis overwrite past location data after a move. We also found that both Amadeus and Orbis are not consistent in how they treat the past data for firms that moved locations. Sometimes the "old" firm data is recorded under one identifier and the "new" firm under a new identifier, with no easy or clean way to combine these time series data for the firm. On other occasions, the "old" firm data is linked to the "new" firm data under the same identifier, with the location data of the "old" firm overwritten by the location data of the "new" firm. For yet other cases, we found that the "old" firm data can be linked to the "new" firm data under the same identifier, with the location data of the "old" firm overwritten by the location data of the "new" firm ***and*** the time series data for the "old" firm is ***also*** showing up under a separate identifier with no clean and easy way to match to the other set of data on the firm, resulting in duplicate observations for the "old" firm. Since we only discovered these issues when manually looking up individual firms in BvD datasets, we believe that in many papers using these datasets, these data issues are not properly resolved.

In conclusion, SDC M&A data is the superior choice for M&A data compared to Zephyr, regardless of whether one wants to study questions of corporate taxation or other issues.

7 Conclusion

The empirical analysis of corporate and shareholder taxation touches upon accounting, economics, and finance. Much of this research exploits geographic variation in tax regimes, and thus, assigning the correct tax residence to firms is key for reliable inference. However, no database exists that directly provides firms' tax residence, and only a small subset of firms disclose their own tax residence. Consequently, the existing literature uses various proxies for firms' tax residence in cross-country settings. We use a novel algorithm that incorporates tax residence laws for 179 countries to accurately assign tax residence. This paper is therefore the first paper to actually measure firms' tax residence instead of proxying for it. The tax residence of a meaningful fraction of firms is reassigned using this algorithm relative to the standard assignments employed by the literature. The underlying reason for the reassignment is the different weights that countries place on a firm's locations of incorporation, headquarters, center of activity, and place of shareholder control when determining tax residence.

Underscoring the importance of accurate tax resident measurement, reassigned firms are systematically different from other firms—in particular, they have significantly lower effective tax rates. Thus, reassignment of firms can reduce bias and variance of estimated regression coefficients when, for instance, the dependent variable is a firm's effective tax rate and the variable of interest varies with a firm's tax residence. Based on an analysis of firm-level data from Compustat North America and Compustat Global, and cross-border M&A from SDC, we believe that accurate tax residence measurement bears serious consideration when one conducts corporate taxation research.

Ideally, as Hribar and Collins (2002) do with measurement of accruals and Coppola et al. (2021) do with measurement of bilateral investment positions, this paper will update best practices in its domain. We plan to make the algorithm and associated data publicly available.

A Tax Residence Algorithm for Individuals. A research question related to the

one studied in this paper is whether one needs a tax residence algorithm for individuals. Dual citizenship is quite frequent, especially at the bottom and top of the (within-country) income and wealth distribution. Moreover, having more than one residence is surprisingly common at the top of the wealth distribution (for example, see Alstadsæter et al. (2022) for evidence on foreign real estate ownership in Dubai). On the extreme right tail of the wealth distribution–people on the Forbes Billionaire list–having more than one citizenship and residence (country) is nothing extraordinary but rather the norm. Similarly, at the top of the income and wealth distribution it is also common that the residence of an individual is different than their citizenship.[22,23]

The issue of assigning tax residence to such wealthy individuals is important for questions of taxation due to the high concentration of income and wealth. While it is likely that some similarities exist between a tax residence algorithm for individuals and that for corporate entities, there are some obvious and major differences. For corporate entities, the inputs for the tax residence algorithm include the locations of headquarters, incorporation, center of activity, and place of shareholder control. For individuals, the inputs for a tax residence algorithm likely are citizenship and residence (and in the case of a significant managerial positions in companies (part-)owned by these individuals, potentially also the inputs of the tax residence algorithm for these firms). Gaining a better understanding of how to assign and measure tax residence of these individuals is a task for future research.

[22]According to Transparency International and Global Witness (2018), in the 10 years up to 2018, various member states of the European Union sold in aggregate more than 6,000 citizenships and close to 100,000 new resident rights, generating around 25 billion euros in foreign direct investment through these so called "Golden Visas." Henley & Partners, the self-ascribed "global leader in residence and citizenship by investment," on its homepage offers the citizenship of 11 countries and the residence rights in 23 countries more or less for "sale," including the minimum capital required for a particular scheme (henleyglobal.com/countries) (accessed June 2, 2022). Langenmayr and Zyska (2021) provide evidence that citizenship-by-investment programs are used for tax evasion.

[23]Examples are Roman Abramovich (residences in the UK and Israel and citizenships of Russia, Israel, and Portugal) and the commodity trader and founder of Glencore March Rich (at the time of death with residences in Switzerland and the US, while citizen of Belgium, Bolivia, the US, Israel, and Spain). An example of the residence being different than the citizenship is Jim Ratcliffe, the richest British Citizen in 2019, who moved to Monaco in 2020 to save up to GBP 4 billion in tax (The Guardian, 2019): UK's richest man moves to Monaco to 'save £4bn in tax'" February 17, (theguardian.com/business/2019/feb/17/brexiter-jim-ratcliffe-uk-richest-man-plans-save-4bn-pounds-tax-monaco-move) (accessed May 26, 2022).

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Table 1: Prior Work Affected by Tax Residence Algorithm

This table reports the number of papers in 18 accounting, finance, and economics journals with results that are likely affected by the tax residence algorithm. The literature search covers papers published from 2001 to 2023, except for AEJ: Applied Economics and AEJ: Economic Policy, which began publication in 2009. We first identify papers that (1) contain one of the following words in the title or abstract: tax, taxes, taxation; (2) contain one of the following words anywhere in the paper, including the appendix: domicile, domiciled, incorporation, repatriate, repatriated, repatriating, repatriation, reside, residence, residency, resident, resides, residing; (3) are partly or entirely empirical; and (4) use firm-level data. From this set, we retain papers focused on corporate or shareholder taxation and then subjectively assess each paper's potential to benefit from a more accurate measure of tax residence. In doing so, we consider whether the research question depends on the firm's country-level location or exploits cross-country variation in tax rules, including tax rates.

Journal	Number of Affected Papers
Contemporary Accounting Research	10
Journal of Accounting and Economics	11
Journal of Accounting Research	7
Review of Accounting Studies	4
The Accounting Review	18
Accounting Total	*50*
Journal of Finance	3
Journal of Financial Economics	11
Review of Financial Studies	8
Finance Total	*22*
AEJ: Applied Economics	0
AEJ: Economic Policy	6
American Economic Review	0
Econometrica	0
Journal of International Economics	5
Journal of Political Economy	0
Journal of Public Economics	23
Quarterly Journal of Economics	1
Review of Economics and Statistics	6
Review of Economic Studies	0
Economics Total	*41*
Grand Total	113

Table 2: Topics of Prior Work Affected By Algorithm

This table provide a breakdown of the papers in Table 1 by topic. A paper can be assigned to more than one topic. We distinguish between 12 topics, four of which are related to corporate tax avoidance. If a paper is assigned to one of the three subtopics on corporate tax avoidance (Corporate Tax Avoidance – Financing and Capital Structure, Corporate Tax Avoidance – Intellectual Property, or Corporate Tax Avoidance – Supply Chain), the paper is *not* automatically assigned the topic "General Corporate Tax Avoidance," too.

Topic	Share of Affected Papers
Regulations, Laws, Transparency	41%
General Corporate Tax Avoidance	40%
Worldwide Tax, Territorial Tax, Repatriation Tax	30%
Corporate Tax Avoidance – Financing and Capital Structure	18%
Governance, Valuation	17%
Investment, Employment, Productivity	16%
Tax Havens	15%
Mergers & Acquisitions (including Inversions)	13%
Corporate Tax Avoidance – Intellectual Property	9%
Financial Services, Foreign Direct Investment, Capital Flows	9%
Corporate Tax Avoidance – Supply Chain	7%
Shareholder or Creditor Taxation	7%
Total	221%
Average Topics per Paper	2.21

Table 3: Variable Definitions

This table defines variables, all of which are observed at the firm-year level. Firm and year subscripts are omitted for brevity. To be included in the sample, firms must have at least $1 million in inflation-adjusted (2023 USD) assets and sales, positive cumulative pre-tax income over the current and prior year, and not be in the utilities (SIC 4900-4999), defense (SIC 3760-3769, 3795, and 3480-3489) or banking (SIC 6000-6199) industries, since many countries have nationality-based ownership rules and other regulatory restrictions for these industries.

Variable	Definition
ln(Assets)	ln(total book assets) at time t.
Book Leverage	Total liabilities over total book assets at time t.
Cash/Assets	Cash divided by total book assets at time t.
Cash ETR	Taxes paid from $t-1$ to t divided by pre-tax income from $t-1$ to t.
EBITDA/Assets	EBITDA divided by total book assets at time t.
$\mathbb{1}$(Large)	Dummy that equals 1 if the firm has market capitalization of at least $1 billion at time t and 0 otherwise.
$\mathbb{1}$(MNC)	Dummy that equals 1 if the firm's income at time t has been affected by exchange rate fluctuations.
PP&E/Assets	Property, plant, and equipment divided by total book assets at time t.
$\mathbb{1}$(Reassignment HQ)	Dummy that equals 1 if the tax residence algorithm reassigned the tax residence of the firm relative to an initial assignment using headquarters at time t and 0 if the tax residence equals headquarters at time t.
$\mathbb{1}$(Reassignment Inc.)	Dummy that equals 1 if the tax residence algorithm reassigned the tax residence of the firm relative to an initial assignment using incorporation at time t and 0 if the tax residence equals incorporation at time t.
$\mathbb{1}$(R&D > 0)	Dummy that equals 1 if the firm has positive and non-missing research and development expenses at time t and 0 otherwise.

Table 4: Fraction of Reassigned Firms

This table reports the fraction of reassigned firms for the full sample from 1988 to 2023 (Panel A) and 2023 only (Panel B). Each panel further subdivides firms cross-sectionally based on dataset inclusion (Compustat Global, Compustat North America, and the combination of the two) and tax residence (all firms and only firms tax resident in tax havens). The reassignment rate is computed as the percentage of firms that are reassigned by the tax residence algorithm. The initial assignment is only based on a firm's location of incorporation or headquarters. Data filters are described in Table 3.

Panel A: 1988-2023 (Full Sample)

	Reassignment Rate Based on Incorporation		Reassignment Rate Based on Headquarters	
	All Firms	Haven Firms	All Firms	Haven Firms
Compustat NA	0.91%	12.71%	3.10%	41.81%
Compustat Global	4.86%	34.39%	1.95%	16.83%
Compustat NA + Global	3.64%	31.64%	2.31%	19.99%

Panel B: 2023

	Reassignment Rate Based on Incorporation		Reassignment Rate Based on Headquarters	
	All Firms	Haven Firms	All Firms	Haven Firms
Compustat NA	3.92%	22.87%	5.88%	41.70%
Compustat Global	4.16%	33.12%	2.50%	24.09%
Compustat NA + Global	4.12%	31.72%	2.97%	26.50%

Table 5: Summary Statistics

This table compares summary statistics by reassignment status for firms from Compustat North America and Compustat Global from 1988 to 2023. Panels A and B use the full sample of firm-years and include summary statistics of all variables, while Panels C and D report cash ETRs for the subset of firm-years where market capitalizations is above $1 billion (2023 USD). Variable definitions and data filters are described in Table 3. Reassignment is based on applying the tax residence algorithm to an initial assignment of incorporation (Panels A and C) and headquarters (B and D). The statistical significance of the difference in means (medians) is tested using a t-test (nonparametric equality-of-medians test). ***, ** and * denote significance at the 1%, 5% and 10% levels.

Panel A: Full Sample and Reassignment Based on Incorporation

	Reassigned N=12,558		Non-Reassigned N=332,471		Difference	
	Mean	Median	Mean	Median	Mean	Median
ln(Assets)	5.60	5.45	5.52	5.40	0.08***	0.05***
Book Leverage in %	43.15	42.21	47.29	47.10	-4.15***	-4.89***
Cash/Assets in %	19.09	14.57	12.75	8.40	6.34***	6.17***
Cash ETR in %	22.13	16.83	26.05	21.81	-3.92***	-4.97***
EBITDA/Assets in %	11.35	9.91	12.67	11.34	-1.32***	-1.43***
$\mathbb{1}$(MNC) in %	68.49		55.52		12.97***	
PP&E/Assets in %	25.12	19.71	28.47	23.97	-3.35***	-4.26***
$\mathbb{1}$(R&D > 0) in %	34.05		40.81		-6.76***	

Panel B: Full Sample and Reassignment Based on Headquarters

	Reassigned N=7,956		Non-Reassigned N=337,073		Difference	
	Mean	Median	Mean	Median	Mean	Median
ln(Assets)	5.86	5.75	5.51	5.39	0.35***	0.36***
Book Leverage in %	42.20	40.46	47.26	47.06	-5.06***	-6.61***
Cash/Assets in %	20.76	15.66	12.79	8.48	7.96***	7.18***
Cash ETR in %	22.66	17.99	25.98	21.69	-3.33***	-3.70***
EBITDA/Assets in %	13.07	11.32	12.61	11.29	0.46***	0.03
$\mathbb{1}$(MNC) in %	62.15		55.84		6.31***	
PP&E/Assets in %	23.76	18.11	28.46	23.94	-4.70***	-5.83***
$\mathbb{1}$(R&D > 0) in %	58.31		40.14		18.17***	

Table 5: Summary Statistics (Continued)

Panel C: Large Firms and Reassignment Based on Incorporation

	Reassigned Firms N=2,391		Non-Reassigned Firms N=86,605		Difference	
	Mean	Median	Mean	Median	Mean	Median
Cash ETR in %	19.95	16.16	27.86	24.22	-7.91***	-8.06***

Panel D: Large Firms and Reassignment Based on Headquarters

	Reassigned Firms N=2,078		Non-Reassigned Firms N=86,918		Difference	
	Mean	Median	Mean	Median	Mean	Median
Cash ETR in %	21.89	18.27	27.78	24.14	-5.89***	-5.87***

Table 6: Cash Effective Tax Rates as Dependent Variable

The dependent variable is the cash effective tax rate. Reassignment Inc. (HQ) is a dummy that is 1 if a firm's tax residence differs from its location of incorporation (headquarters). The sample used is the combination of Compustat North America and Compustat Global (minus duplicate observations). Variable definitions and data filters are described in Table 3. All non-dummy variables are in percentage points. All models include two-digit SIC industry fixed effects. Standard errors are robust to heteroskedasticity and are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

	Cash ETR in %			
	(1)	(2)	(3)	(4)
𝟙(Reassignment Inc.)	-3.39***		-2.05***	
	(0.36)		(0.44)	
𝟙(Reassignment HQ)		-4.08***		-2.09***
		(0.42)		(0.55)
𝟙(Large) × 𝟙(Reassignment Inc.)			-4.72***	
			(0.86)	
𝟙(Large) × 𝟙(Reassignment HQ)				-3.43***
				(0.89)
𝟙(Large)			1.58***	1.57***
			(0.24)	(0.24)
ln(Assets)	0.25***	0.26***	-0.13**	-0.14**
	(0.04)	(0.04)	(0.06)	(0.06)
Book Leverage in %	0.05***	0.05***	0.06***	0.06***
	(0.00)	(0.00)	(0.00)	(0.00)
EBITDA/Assets in %	-0.28***	-0.27***	-0.31***	-0.31***
	(0.01)	(0.01)	(0.01)	(0.01)
Cash/Assets in %	-0.12***	-0.12***	-0.12***	-0.12***
	(0.01)	(0.01)	(0.01)	(0.01)
PP&E/Assets in %	-0.08***	-0.08***	-0.08***	-0.08***
	(0.00)	(0.00)	(0.00)	(0.00)
𝟙(R&D > 0)	7.10***	7.22***	6.99***	7.09***
	(0.23)	(0.23)	(0.24)	(0.24)
𝟙(MNC)	-1.17***	-1.23***	-1.56***	-1.60***
	(0.15)	(0.15)	(0.16)	(0.16)
FE	SIC 2D	SIC 2D	SIC 2D	SIC 2D
N	345,029	345,029	288,558	288,558
Adjusted R^2	0.052	0.052	0.053	0.052

Table 7: M&A Reassignment Rates for Acquiror

This table reports reassignment rates for cross-border M&A at the acquiror level using the SDC nation relative to our algorithm. We exclude deals with a missing incorporation for the acquiror in Panel A. In Panel B, we further restrict the sample to deals where incorporation is available on both sides. *Deal Value* reports total deal value in billions of inflation-adjusted 2023 dollars based on the tax residence of the acquiror. *Deal Count* reports the deal count based on the tax residence of the acquiror. *Missed* indicates the percentage of *Deal Value* (Panels A1 and B1) or *Deal Count* (Panels A2 and B2) where the acquiror's SDC nation differs from its tax residence and it is resident in the country. *Wrongly Added* indicates the percentage of *Deal Value* (Panels A1 and B1) or *Deal Count* (Panels A2 and B2) where the acquiror's SDC nation differs from its tax residence and its SDC nation is in the country. *Target* indicates the percentage of *Deal Value* (Panels A1 and B1) or *Deal Count* (Panels A2 and B2) where the target's SDC nation differs from its tax residence and the acquiror's SDC nation equals its tax residence. *Total* reports the sum of the three reassignment rates. *Neth Antilles* refers to the Netherlands Antilles, which includes Curaçao and Sint Maarten after it was dissolved in 2010.

Table 7: M&A Reassignment Rates (Continued)

Panel A1: Deal Value: Acquiror-Level with Non-Missing Incorporation for Acquiror

	Deal Value (bn $)	Missed (%)	Wrongly Added (%)	Target (%)	Total (%)
1. United States	4,075	3.8	16.2	8.8	28.8
2. United Kingdom	2,634	6.6	13.5	0.5	20.6
3. Canada	1,191	7.8	2.6	3.4	13.7
4. Germany	1,157	0.3	0.8	1.7	2.7
5. France	1,147	0.3	1.0	1.8	3.1
6. Japan	943	0.7	0.5	1.4	2.5
7. Switzerland	771	3.9	7.2	2.6	13.7
8. Netherlands	734	34.0	5.4	0.4	39.8
9. Ireland	469	42.0	7.5	1.3	50.8
10. Australia	421	9.2	22.6	1.1	32.9
11. Sweden	356	3.3	6.6	3.7	13.6
12. Belgium	345	3.3	0.3	0.3	3.8
13. Singapore	327	50.9	0.9	14.1	65.9
14. Bermuda	315	36.6	4.2	0.1	40.9
15. Spain	271	4.8	0.6	0.5	6.0
16. Hong Kong	249	25.2	8.2	13.1	46.5
17. China	223	1.2	91.5	13.2	105.8
18. Luxembourg	205	18.7	7.1	0.0	25.9
19. Italy	161	5.5	0.9	0.1	6.6
20. Israel	154	1.5	2.2	2.6	6.3
21. India	143	6.8	0.3	6.1	13.1
22. Cayman Islands	139	92.1	0.7	0.0	92.8
23. Finland	124	1.7	0.0	0.1	1.8
24. Mexico	117	0.8	0.0	5.2	6.1
25. South Africa	112	7.1	13.4	11.0	31.5
26. Norway	102	1.2	3.0	0.9	5.0
27. Brazil	99	0.1	14.0	2.2	16.3
28. Denmark	92	1.3	0.0	3.3	4.6
29. South Korea	78	0.2	5.7	0.4	6.3
30. Neth Antilles	64	98.6	0.3	0.0	98.9

Table 7: M&A Reassignment Rates (Continued)

Panel A2: Deal Count: Acquiror-Level with Non-Missing Incorporation for Acquiror

	Deal Count	Missed (%)	Wrongly Added (%)	Target (%)	Total (%)
1. United States	10,694	7.5	8.3	2.0	17.8
2. United Kingdom	8,038	5.9	5.5	0.7	12.1
3. Canada	5,602	9.1	4.9	1.5	15.5
4. Japan	2,211	0.4	0.9	1.5	2.7
5. Australia	2,035	4.8	10.1	0.8	15.8
6. Hong Kong	1,844	12.0	8.8	15.8	36.6
7. Sweden	1,620	1.1	3.8	0.9	5.8
8. France	1,576	2.2	2.7	1.1	6.0
9. Germany	1,234	1.5	1.5	0.7	3.8
10. Singapore	1,046	6.8	5.2	2.7	14.6
11. Netherlands	1,037	14.9	6.5	0.4	21.8
12. China	899	1.3	133.3	8.8	143.4
13. Ireland	878	12.1	10.3	0.6	22.9
14. Switzerland	870	3.9	9.2	1.1	14.3
15. India	774	1.4	1.4	1.0	3.9
16. Cayman Islands	749	93.6	1.1	0.0	94.7
17. Bermuda	613	44.2	10.4	0.2	54.8
18. Malaysia	564	5.0	3.7	2.5	11.2
19. Norway	529	2.8	3.6	0.4	6.8
20. Israel	517	6.2	4.4	1.0	11.6
21. South Africa	505	9.7	9.5	1.0	20.2
22. Spain	485	0.8	2.3	1.2	4.3
23. Finland	463	1.1	0.0	0.4	1.5
24. Italy	438	2.3	4.8	0.2	7.3
25. Belgium	418	2.6	2.4	0.7	5.7
26. Denmark	418	4.5	0.5	0.5	5.5
27. South Korea	417	1.9	5.0	0.7	7.7
28. British Virgin Is.	383	75.2	2.1	1.3	78.6
29. Taiwan	374	5.1	3.2	2.1	10.4
30. Luxembourg	221	30.8	15.4	0.5	46.6

Table 7: M&A Reassignment Rates (Continued)

Panel B1: Deal Value: Acquiror-Level with Non-Missing Incorporation for Acquiror and Target

	Deal Value (bn $)	Missed (%)	Wrongly Added (%)	Target (%)	Total (%)
1. United States	2,225	3.3	23.1	16.1	42.5
2. United Kingdom	1,535	5.9	15.7	0.9	22.5
3. Germany	770	0.1	0.5	2.5	3.1
4. France	688	0.4	0.8	3.0	4.1
5. Canada	585	7.0	3.6	6.9	17.5
6. Japan	524	1.2	0.8	2.5	4.5
7. Netherlands	469	43.2	4.4	0.6	48.3
8. Switzerland	438	3.4	6.1	4.6	14.0
9. Ireland	347	50.1	3.3	1.7	55.1
10. Belgium	270	1.0	0.2	0.3	1.5
11. Singapore	244	66.1	0.5	18.8	85.4
12. Australia	190	10.6	38.3	2.5	51.4
13. Bermuda	171	26.6	1.1	0.2	27.8
14. Spain	139	0.0	0.1	1.0	1.1
15. Sweden	130	7.4	8.2	10.1	25.7
16. Hong Kong	128	35.1	9.6	25.5	70.2
17. China	116	0.7	103.9	25.4	130.0
18. Luxembourg	107	23.9	10.6	0.1	34.5
19. Italy	87	8.8	1.5	0.3	10.6
20. Cayman Islands	71	91.3	0.6	0.0	91.9
21. Brazil	70	0.0	0.0	3.2	3.2
22. Mexico	66	0.0	0.0	9.2	9.2
23. Finland	60	2.1	0.0	0.3	2.4
24. Israel	58	0.5	3.8	6.8	11.1
25. Neth Antilles	58	99.7	0.0	0.0	99.7
26. India	56	15.7	0.0	15.6	31.3
27. South Africa	43	11.6	18.1	28.7	58.4
28. British Virgin Is.	34	85.8	0.9	0.8	87.5
29. South Korea	32	0.2	0.7	1.0	1.8
30. Russia	30	22.7	48.0	11.3	82.0

Table 7: M&A Reassignment Rates (Continued)

Panel B2: Deal Count: Acquiror-Level with Non-Missing Incorporation for Acquiror and Target

	Deal Count	Missed (%)	Wrongly Added (%)	Target (%)	Total (%)
1. United States	3,299	9.1	6.2	6.4	21.7
2. United Kingdom	1,157	7.5	7.7	4.8	20.1
3. Canada	841	10.7	23.7	10.1	44.5
4. Hong Kong	792	8.5	9.5	36.7	54.7
5. Japan	527	0.8	2.1	6.3	9.1
6. France	392	2.6	4.1	4.6	11.2
7. Australia	383	5.7	9.4	4.4	19.6
8. China	358	1.7	130.2	22.1	153.9
9. Germany	304	1.0	1.3	3.0	5.3
10. Cayman Islands	301	93.4	1.0	0.0	94.4
11. Sweden	279	0.7	4.3	5.4	10.4
12. Switzerland	263	3.0	5.7	3.8	12.5
13. Singapore	262	9.9	5.0	10.7	25.6
14. Netherlands	236	16.9	5.5	1.7	24.2
15. British Virgin Is.	199	71.4	2.0	2.5	75.9
16. Malaysia	190	2.1	2.6	7.4	12.1
17. Ireland	152	23.0	11.8	3.3	38.2
18. India	143	4.2	0.0	5.6	9.8
19. Bermuda	139	44.6	10.1	0.7	55.4
20. Israel	105	2.9	3.8	4.8	11.4
21. South Africa	94	8.5	12.8	5.3	26.6
22. Taiwan	92	4.3	1.1	8.7	14.1
23. South Korea	86	3.5	1.2	3.5	8.1
24. Italy	83	8.4	4.8	1.2	14.5
25. Belgium	76	2.6	2.6	3.9	9.2
26. Spain	74	0.0	1.4	8.1	9.5
27. Finland	70	2.9	0.0	2.9	5.7
28. Denmark	69	5.8	0.0	2.9	8.7
29. Norway	62	3.2	8.1	3.2	14.5
30. Luxembourg	58	34.5	22.4	1.7	58.6

Figure 1: Tax Residence Algorithm Example

This figure reports the tax residence of a UK-headquartered firm given two possible locations of incorporation.

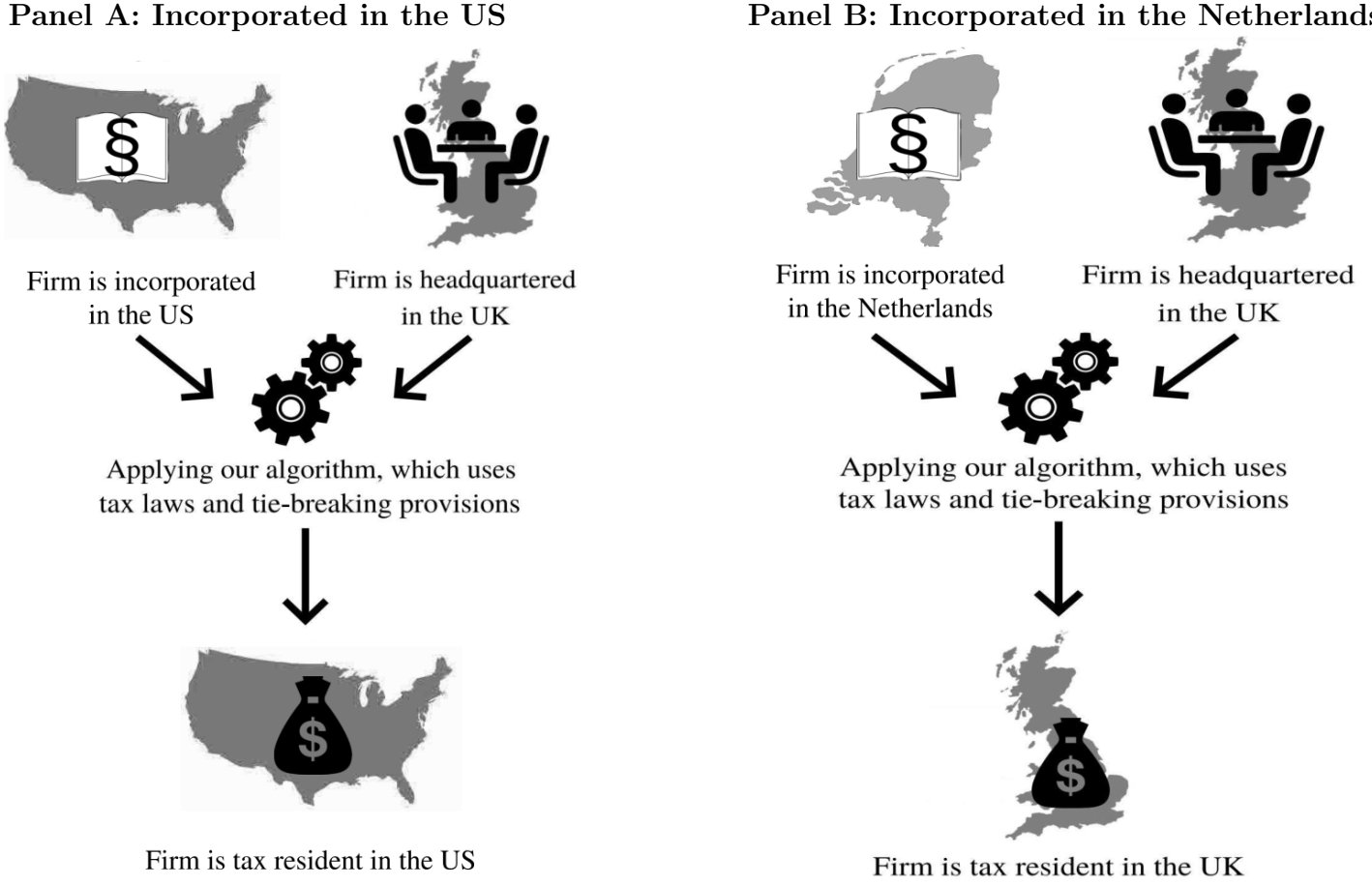


Figure 2: Tax Guides - Examples

This figure uses examples to illustrate the nature of the tax guides that form the starting point for our tax residence algorithm. Panel A reports a part of one out of four pages of contact details of EY staff for Ireland EY's 2015 tax guide. Panel B reports part of a by-country list of transfer pricing experts in PwC's 2013 tax guide.

Panel A: Example for Contact Details in EY Tax Guide

International Tax Services – Operating Model Effectiveness

★ Joe Bollard	+353 (1) 221-2457 Mobile: +353 (86) 600-9253 Email: joe.bollard@ie.ey.com

International Tax Services – Transfer Pricing

★ Dan McSwiney	+353 (1) 221-2094 Mobile: +353 (87) 963-9103 Email: dan.mcswiney@ie.ey.com
Noel Maher	+353 (1) 221-2401 Mobile: +353 (87) 982-4356 Email: noel.maher@ie.ey.com

Business Tax Advisory

★ Kevin McLoughlin	+353 (1) 221-2478 Mobile: +353 (86) 380-6603 Email: kevin.mcloughlin@ie.ey.com

Panel B: Example for Contact Details in PwC Tax Guide

Transfer Pricing

Argentina	Juan Carlos Ferreiro	+54 11 4850 6720	juan.carlos.ferreiro@ar.pwc.com
Australia	Pete Calleja	+61 2 8266 8837	pete.calleja@au.pwc.com
Austria	Herbert Greinecker	+43 1 501 88 3301	herbert.greinecker@at.pwc.com
Belgium	Isabel Verlinden	+32 2 710 7295	isabel.verlinden@be.pwc.com
Brazil	Cristina Medeiros	+55 11 3674 2582	cristina.medeiros@br.pwc.com
Bulgaria	Irina Tsvetkova	+359 2 9355 100	irina.tsvetkova @bg.landwellglobal.com
Canada	Charles Theriault	+1 514 205 5144	charles.theriault@ca.pwc.com
Chile	Roberto Carlos Rivas	+56 2 940 0151	roberto.carlos.rivas@cl.pwc.com
China, People's Republic of	Spencer Chong	+86 21 2323 1135	spencer.chong@cn.pwc.com
Colombia	Carlos Mario Lafaurie	+57 1 634 0492	carlos_mario.lafaurie@co.pwc.com
Croatia	Lana Brlek	+385 1 6328 892	lbrlek@hr.pwc.com
Cyprus	Nicos Chimarides	+357 22 555 270	nicos.chimarides@cy.pwc.com
Czech Republic	David Borkovec	+420 251 152 549	david.borkovec@cz.pwc.com
Denmark	Jørgen Juul Andersen	+45 3945 9434	jju@pwc.dk

Figure 2: Tax Guides - Examples (continued)

Panel C reports the tax residence section of the PwC 2013 tax guide for France. Panel D contains the changes in tax laws and regulations for Uzbekistan in the 2013 PwC tax guide.

Panel C: Tax Residence in EY Tax Guide

Corporate residence

France is defined as metropolitan France (excluding Monaco, but including the continental shelf), Corsica, and the overseas departments (French Guyana, Guadeloupe, Martinique, Reunion).

As a general rule, a resident company is a company that is incorporated under French commercial laws.

Panel D: Changes in Tax Law in PwC Tax Guide

Significant developments

Tax reporting periods, and thus frequency of tax reports submission, for value-added tax (VAT), excise tax, unified social payment (USP), turnover taxes, and subsurface use tax returns, and reports on individual pension fund contributions, have been reduced from monthly to quarterly. The frequency of the water use tax report changed from monthly to annually, and the frequency of the property tax return changed from quarterly to annually.

For the purposes of property tax, intangible assets are now excluded from the list of taxable property.

Microfirms and small enterprises paying taxes under the standard tax regime (except enterprises producing excisable goods and extracting mineral products subject to subsurface use tax) are no longer subject to obligatory contributions to pension fund and road fund.

A new Special Industrial Zone (*Djizzak*) is to be created in Djizzak region for a preliminary term of 30 years with potential prolongation. During that period, special customs and tax regimes and benefits will be in force within its territory.

The protocol to the double tax treaty (DTT) with India was enforced. The protocol decreases maximum rates applicable for interest, dividend, royalty, and technical payments from 15% to 10% and introduces articles on mutual assistance in collection of taxes and on limitation of benefits.

Online Appendix

"Improving the Measurement of Tax Residence: Implications for Research on Corporate and Shareholder Taxation"

A The Chinese Variable Interest Entity

For most firms, taxation is the key driver for splitting the locations of incorporation and headquarters across two countries. However, for firms that are Chinese from an economic nationality perspective, the key reason for such a complicated legal structure is usually not tax related. Chinese firms in a number of strategically important industries (in particular, high-tech industries such as internet and communication services) that wanted to open their equity to foreign investors in the past could use a complicated legal structure called "variable interest entity" (henceforth VIE) which, while not officially endorsed, was long tolerated by Chinese policymakers and regulators and widely used by Chinese firms.[24] These VIEs involve issuing equity in non-mainland-China stock exchanges (usually in New York but also in Hong Kong) through a shell company that is usually incorporated in the Cayman Islands or the British Virgin Islands. One implication of the complicated legal structure of VIEs is that the tax residence of the global legal parent company is outside China. The reason for this is that while the operating company in a VIE structure is headquartered and incorporated in China, it is owned by a global legal parent company that is incorporated outside of China. Importantly, this global legal parent company is the legal entity that is listed on foreign stock exchanges such as the Nasdaq or NYSE. As long as the legal parent is incorporated in a NO country or a country such that (1) the country considers incorporation when determining

[24]Regulatory changes initiated around the turn of the year 2021/2022, whose outcomes are still not fully clear, are likely to close down the creation of new VIEs while not touching upon existing ones. Financial Times (2022): "China to tighten rules for tech companies seeking foreign funding," December 7, https://www.ft.com/content/7689489c-cdad-4596-a7c6-0774ed68bf5a (accessed May 27, 2022).

residency, and (2) all conditions for the firm to be resident in the country of incorporation are satisfied, then it will be tax resident in the country of incorporation (see Section 2).

The Chinese Variable Interest Entity and Firm-Level Data. An important question is whether this VIE structure is tax efficient for these firms. In our data, "Chinese" firms that are tax resident in the Cayman Islands or the British Virgin Islands have lower mean cash effective tax rates than "Chinese" firms not using the VIE structure, suggesting that this setup allows for quantitatively meaningful tax savings. In particular, those using a VIE structure have 6.7% lower mean cash ETRs compared to those that do not.

However, the work by Dienst (2012) and Whitehill (2017) suggests that there are many plausible scenarios under which VIEs could result in much higher rates of taxation in the future than had these firms remained tax resident in China. Dienst (2012) and Whitehill (2017) suggest a quite tenuous position of the tax practices used by firms using VIE structures. The SEC filings of these Nasdaq and NYSE listed firms have substantial cross-sectional variation in their discussion of the tax implications raised by the VIE structures. Moreover, many of these firms seem to be postponing these tax issues by reinvesting past profits rather than paying them out to shareholders, which would trigger many of these issues. Changes in payout policies by the affected firms or minor changes in the interpretation of the tax code might yield drastically different tax implications of these VIE structures.

The Chinese Variable Interest Entity and Mergers and Acquisitions. Since the SDC nation often coincides with the headquarters, these firms are considered Chinese by SDC most of the time. Thus, even an M&A deal between two companies with Chinese economic nationalities can, from a tax perspective, be a cross-border M&A transaction if one of the two parties involved is using a VIE structure. Consequently, if one is examining the tax implications of Chinese cross-border M&A, then it is important to accurately measure the tax residence of Chinese firms, since relying on SDC data would assign the M&A transactions involving VIE firms to the wrong country.

For more detail on the economic implications of these VIE structures, see Coppola et al.,

2021. For more detail on the tax and legal implications of VIEs, see Dienst (2012) and Whitehill (2017).

B The Concept of Permanent Establishment/Nexus

This appendix will explain the concept of a permanent establishment/nexus. Imagine a firm that is a US tax resident and doing business in Germany. There are two extremes. On one extreme, the firm has significant business activities in Germany, such as factories, thousands of employees, and billions in sales (e.g., the Ford Motor Company). Such a firm clearly has a permanent establishment in Germany and has to pay corporate income tax on the part of its corporate income that arises due to its German business activities. On the other extreme, the firm has no local operations or employees in Germany–it only exports some of its output from the US to Germany. In this case, the firm does not have to pay corporate income tax in Germany since it has no nexus to Germany (it might have to pay import duties or sales tax/value added tax). Between these extremes can be situations where the firm is utilizing the services of an independent sales agent, renting storage space in a logistics center in Germany without employing any staff, or employing a hundred local sales staff in an office building rented by the firm. The laws and rules on permanent establishment (which differ from country to country) determine the cutoff for a firm to have a permanent establishment in a country–which in the above example will be between the two extremes. If a firm has a nexus to a particular country, then it must pay corporate income taxes on the profits attributable to the local operations in the country. How much or high little of a firm's profits are attributable to the operations in different permanent establishments across the world is then a natural question that arises from having permanent establishments in more than one country, with obvious tax avoidance incentives as documented by a large literature on profit-shifting within firms (for a recent survey see Dyreng and Hanlon, 2021).

C Additional Results

Table C1: Reassignment as Dependent Variable

The dependent variable equals 100 if the firm's tax residence is reassigned relative to the tax residence algorithm and 0 otherwise. In columns 1 and 2 (3 and 4), tax residence is assigned based only on a firm's location of incorporation (headquarters). The sample used is the combination of Compustat North America and Compustat Global (minus duplicate observations). Variable definitions and data filters are described in Table 3. All independent variables that are not dummies are in percentage points. All models include two-digit SIC industry fixed effects. Standard errors are robust to heteroskedasticity and are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

	$100 \times \mathbb{1}$(Reassignment Inc.)		$100 \times \mathbb{1}$(Reassignment HQ)	
	(1)	(2)	(3)	(4)
ln(Assets)	0.26***	0.27***	0.25***	0.26***
	(0.05)	(0.05)	(0.04)	(0.04)
Book Leverage in %	-0.01***	-0.01***	-0.01***	-0.01**
	(0.00)	(0.00)	(0.00)	(0.00)
EBITDA/Assets in %	-0.06***	-0.07***	0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Cash/Assets in %	0.12***	0.12***	0.09***	0.08***
	(0.01)	(0.01)	(0.01)	(0.01)
PP&E/Assets in %	-0.01	-0.01	-0.01**	-0.01***
	(0.01)	(0.01)	(0.00)	(0.00)
$\mathbb{1}$(R&D > 0)	-1.59***	-1.44***	1.71***	1.82***
	(0.23)	(0.23)	(0.17)	(0.18)
$\mathbb{1}$(MNC)	1.76***	1.73***	0.14	0.12
	(0.17)	(0.17)	(0.13)	(0.13)
Cash ETR in %		-0.02***		-0.02***
		(0.00)		(0.00)
FE	SIC 2D	SIC 2D	SIC 2D	SIC 2D
N	345,029	345,029	345,029	345,029
Adjusted R^2	0.024	0.025	0.020	0.021

Table C2: M&A Reassignment Rates for Target

This table is equivalent to Table 7, except that it is at the target side. We exclude deals with a missing incorporation for the target in Panel A. In Panel B, we further restrict the sample to deals where incorporation is available on both sides. *Deal Value* reports total deal value in billions of inflation-adjusted 2023 dollars based on the tax residence of the target. *Deal Count* reports the deal count based on the tax residence of the target. *Missed* indicates the percentage of *Deal Value* (Panels A1 and B1) or *Deal Count* (Panels A2 and B2) where the target's SDC nation differs from its tax residence and it is resident in the country. *Wrongly Added* indicates the percentage of *Deal Value* (Panels A1 and B1) or *Deal Count* (Panels A2 and B2) where the target's SDC nation differs from its tax residence and its SDC nation is in the country. *Acquiror* indicates the percentage of *Deal Value* (Panels A1 and B1) or *Deal Count* (Panels A2 and B2) where the acquiror's SDC nation differs from its tax residence and the target's SDC nation equals its tax residence. *Total* reports the sum of the three reassignment rates. *Neth Antilles* refers to the Netherlands Antilles, which includes Curaçao and Sint Maarten after it was dissolved in 2010.

Table C2: M&A Reassignment Rates (Continued)

Panel A1: Deal Value: Target-Level with Non-Missing Incorporation for Target

	Deal Value (bn $)	Missed (%)	Wrongly Added (%)	Acquiror (%)	Total (%)
1. United States	4,081	1.4	13.9	15.2	30.5
2. United Kingdom	1,846	6.3	2.5	6.9	15.8
3. Canada	1,107	9.2	3.9	10.3	23.4
4. Germany	645	1.4	1.8	1.3	4.5
5. Australia	339	5.7	1.3	4.7	11.6
6. Netherlands	322	8.3	4.9	2.1	15.3
7. Ireland	308	36.7	2.1	0.1	38.9
8. France	277	4.8	1.9	3.0	9.8
9. Cayman Islands	239	98.5	0.9	0.0	99.4
10. Bermuda	224	37.5	1.4	1.6	40.4
11. Switzerland	216	21.4	2.0	0.0	23.4
12. Sweden	216	1.9	1.1	11.0	14.1
13. Hong Kong	130	25.4	10.3	11.8	47.6
14. Italy	125	0.3	0.4	1.7	2.4
15. Spain	121	0.0	5.0	1.2	6.2
16. Japan	99	5.5	1.6	5.5	12.5
17. Israel	98	7.3	3.2	0.9	11.4
18. Norway	95	8.9	1.5	3.1	13.5
19. Singapore	82	4.1	7.9	2.3	14.4
20. India	79	3.7	0.3	0.8	4.8
21. British Virgin Is.	76	96.4	0.5	0.5	97.4
22. China	72	1.7	253.4	63.8	318.9
23. Luxembourg	53	28.6	0.2	3.2	32.0
24. Brazil	52	0.0	6.2	3.2	9.4
25. Belgium	50	0.5	15.7	0.1	16.4
26. Denmark	49	0.1	7.9	4.3	12.4
27. Finland	43	0.0	0.0	6.5	6.5
28. Argentina	40	1.2	1.9	1.0	4.1
29. South Africa	36	0.5	17.2	9.4	27.0
30. South Korea	32	0.3	0.9	0.2	1.4

Table C2: M&A Reassignment Rates (Continued)

Panel A2: Deal Count: Target-Level with Non-Missing Incorporation for Target

	Deal Count	Missed (%)	Wrongly Added (%)	Acquiror (%)	Total (%)
1. Canada	3,710	3.6	2.5	7.1	13.2
2. United States	2,658	6.5	12.1	8.0	26.7
3. United Kingdom	1,373	6.7	5.5	3.9	16.1
4. Hong Kong	726	12.5	7.7	20.1	40.4
5. Australia	634	6.8	3.6	7.9	18.3
6. China	584	1.2	129.6	32.9	163.7
7. British Virgin Is.	505	95.8	0.6	0.6	97.0
8. France	367	4.1	4.6	4.4	13.1
9. Singapore	347	6.3	7.2	4.9	18.4
10. Germany	341	1.8	4.1	4.1	10.0
11. Japan	266	9.0	8.3	7.9	25.2
12. Cayman Islands	250	96.0	1.2	0.0	97.2
13. India	223	4.9	2.2	4.0	11.2
14. Sweden	205	2.0	5.9	2.9	10.7
15. Netherlands	200	10.0	4.5	3.0	17.5
16. Norway	168	14.3	3.0	4.8	22.0
17. Malaysia	166	4.2	5.4	6.0	15.7
18. Italy	160	1.9	2.5	5.6	10.0
19. Indonesia	146	0.7	0.7	1.4	2.7
20. Israel	141	9.2	1.4	3.5	14.2
21. Switzerland	119	13.4	4.2	0.0	17.6
22. Poland	115	7.0	0.9	1.7	9.6
23. Bermuda	111	55.9	6.3	3.6	65.8
24. New Zealand	103	6.8	6.8	1.0	14.6
25. South Korea	103	8.7	6.8	1.9	17.5
26. Spain	99	1.0	9.1	2.0	12.1
27. Brazil	92	0.0	4.3	4.3	8.7
28. Ireland	88	15.9	21.6	2.3	39.8
29. Taiwan	87	10.3	5.7	3.4	19.5
30. Finland	77	0.0	0.0	1.3	1.3

Table C2: M&A Reassignment Rates (Continued)

Panel B1: Deal Value: Target-Level with Non-Missing Incorporation for Acquiror and Target

	Deal Value (bn $)	Missed (%)	Wrongly Added (%)	Acquiror (%)	Total (%)
1. United States	3,725	1.0	12.1	16.7	29.8
2. United Kingdom	1,604	5.8	2.2	8.0	16.0
3. Canada	930	8.8	3.2	12.3	24.4
4. Germany	571	1.6	1.8	1.5	4.9
5. Australia	306	3.8	1.3	5.2	10.3
6. Ireland	291	38.6	0.3	0.1	39.0
7. Netherlands	261	7.3	6.0	2.5	15.8
8. France	210	6.0	0.8	4.0	10.8
9. Sweden	188	2.2	0.6	12.6	15.4
10. Switzerland	180	19.5	1.0	0.0	20.5
11. Bermuda	154	33.7	0.6	2.3	36.6
12. Cayman Islands	130	98.9	0.3	0.0	99.1
13. Spain	105	0.0	5.7	1.4	7.1
14. Italy	100	0.2	0.2	2.1	2.5
15. Hong Kong	96	30.8	12.1	16.2	59.0
16. Israel	87	7.0	3.5	1.0	11.5
17. India	68	4.2	0.3	1.0	5.4
18. China	67	1.6	153.2	68.1	222.9
19. Japan	66	2.6	2.4	8.1	13.1
20. Norway	62	9.1	0.3	4.8	14.2
21. British Virgin Is.	60	98.6	0.6	0.6	99.8
22. Singapore	60	4.7	9.4	3.2	17.3
23. Brazil	48	0.0	1.2	3.5	4.7
24. Belgium	46	0.6	17.1	0.1	17.8
25. Denmark	43	0.2	4.4	4.9	9.5
26. Argentina	39	1.3	0.2	1.1	2.6
27. Luxembourg	35	6.4	0.3	4.8	11.5
28. South Africa	31	0.5	5.2	11.0	16.8
29. Finland	30	0.0	0.0	9.2	9.2
30. Czech Republic	27	0.0	20.4	0.7	21.1

Table C2: M&A Reassignment Rates (Continued)

Panel B2: Deal Count: Target-Level with Non-Missing Incorporation for Acquiror and Target

	Deal Count	Missed (%)	Wrongly Added (%)	Acquiror (%)	Total (%)
1. Canada	2,751	3.2	2.7	9.6	15.6
2. United States	2,224	5.0	9.7	9.6	24.3
3. United Kingdom	996	5.7	4.8	5.3	15.9
4. Hong Kong	529	12.9	6.4	27.6	46.9
5. China	506	1.0	107.9	37.9	146.8
6. Australia	486	7.0	3.5	10.3	20.8
7. British Virgin Is.	398	95.2	0.8	0.8	96.7
8. Germany	259	2.3	4.2	5.4	12.0
9. Singapore	257	5.4	6.6	6.6	18.7
10. France	252	4.8	3.2	6.3	14.3
11. India	180	4.4	2.2	5.0	11.7
12. Japan	180	8.3	11.1	11.7	31.1
13. Netherlands	147	9.5	5.4	4.1	19.0
14. Cayman Islands	143	96.5	0.7	0.0	97.2
15. Sweden	137	2.9	6.6	4.4	13.9
16. Norway	129	13.2	2.3	6.2	21.7
17. Malaysia	120	4.2	5.8	8.3	18.3
18. Indonesia	116	0.0	0.0	1.7	1.7
19. Italy	110	1.8	1.8	8.2	11.8
20. Israel	109	9.2	0.9	4.6	14.7
21. Brazil	80	0.0	2.5	5.0	7.5
22. Switzerland	77	14.3	5.2	0.0	19.5
23. South Korea	76	11.8	3.9	2.6	18.4
24. Bermuda	74	48.6	2.7	5.4	56.8
25. New Zealand	74	6.8	9.5	1.4	17.6
26. Spain	70	1.4	8.6	2.9	12.9
27. Taiwan	69	5.8	5.8	4.3	15.9
28. South Africa	64	9.4	9.4	15.6	34.4
29. Ireland	62	14.5	17.7	3.2	35.5
30. Poland	62	8.1	1.6	3.2	12.9

D Examples of Firms with Different Locations of Headquarters and Incorporation

Table D1: Examples of Firms with Different Locations of Headquarters and Incorporation

This table lists examples of firms whose locations of headquarters and incorporation differ. Firms are selected based on size (book assets or sales) or membership in a major stock index such as the S&P 500. We also extend the selection procedure to include some interesting country-pairs. If firms were selected purely based on size, the selection would feature many more firms from China and the United States. Data is for the year 2017. Companies are listed in alphabetical order.

Firm	Headquarters	Incorporation	Tax Residence
Alibaba Group	China	Cayman Islands	Cayman Islands
An internet giant specializing in e-commerce, retail, internet, and technology.			
Autoliv	Sweden	United States	United States
A large automotive supplier with a focus on car safety products.			
Baidu	China	Cayman Islands	Cayman Islands
An internet giant with a large number of internet-related services, especially internet search.			
Brookfield Asset Management	United States	Canada	Canada
One of the world's largest alternative investment management companies.			
Bunge	United States	Bermuda	Bermuda
An agricultural commodity firm that trades, processes, stores, and transports basic foods.			
Carnival	United States	Panama	Panama
A multinational operator of passenger cruise ships.			
CK Hutchison Holdings	Hong Kong	Cayman Islands	Hong Kong
A conglomerate controlled by Li Ka-shing, one of Hong Kong's richest billionaires, with four core businesses–ports, retail, infrastructure, and telecommunications.			
CNH Industrial	United Kingdom	Netherlands	United Kingdom
A manufacturer of agricultural machinery and construction equipment.			
Cosan	Brazil	Bermuda	Brazil
A conglomerate that specializes in energy production and distribution.			

Table D1: Examples of Firms with Different Locations of Headquarters and Incorporation (Continued)

Firm	Headquarters	Incorporation	Tax Residence
Del Monte Pacific	Singapore	British Virgin Islands	Singapore
A food company focused on packaged fruits and vegetables, juices, sauces, and condiments.			
Evraz	Russia	United Kingdom	Russia
A steel maker and mining company.			
Ferrari	Italy	Netherlands	Italy
A luxury sports car manufacturer.			
Wolseley	Switzerland	Jersey	Switzerland
A plumbing and heating products distributor.			
Fiat Chrysler	United Kingdom	Netherlands	United Kingdom
A manufacturer of automobiles and commercial vehicles.			
Genting Singapore	Singapore	United Kingdom	Singapore
A gaming and integrated resort developer; especially of Resorts World Sentosa in Singapore.			
General Interface Solutions	Taiwan	Cayman Islands	Taiwan
A manufacturer of touch displays.			
Glencore	Switzerland	Jersey	Switzerland
One of the world's largest integrated producers and marketers of commodities.			
Global Telecom Holding	Netherlands	Egypt	Netherlands
A mobile phone network operator in several countries, particularly Algeria.			
Golden Agri Resources	Singapore	Mauritius	Singapore
A palm oil company.			
Hanwha Q Cells	South Korea	Cayman Islands	South Korea
A manufacturer of photovoltaic solar cells.			
Hunter Douglas	Netherlands	Netherlands Antilles	Netherlands
A manufacturer of window blinds and coverings.			
IHS Markit	United Kingdom	Bermuda	United Kingdom
An information services provider.			

Table D1: Examples of Firms with Different Locations of Headquarters and Incorporation (Continued)

Firm	Headquarters	Incorporation	Tax Residence
Invesco	United States	Bermuda	Bermuda
An independent investment management company.			
L'Occitane International	France	Luxembourg	Luxembourg
A luxury retailer of body, face, hair, fragrances, and home products.			
MMG Ltd	Australia	Hong Kong	Australia
A mining company focusing on base metals such as zinc, copper, and lead.			
Sands China	Macau	Cayman Islands	Macau
An integrated resort and casino developer in Macau.			
Seadrill Partners	United Kingdom	Marshall Islands	United Kingdom
A deepwater drilling contractor for the petroleum industry.			
SolarEdge Technologies	Israel	United States	United States
A designer, developer, and provider of solar power equipment.			
Subsea 7	United Kingdom	Luxembourg	United Kingdom
A subsea engineering, construction, and services company serving the offshore energy industry.			
Tencent Holdings	China	Cayman Islands	Cayman Islands
One of the largest internet, technology, and entertainment conglomerates.			
Ternium	Argentina	Luxembourg	Argentina
A steel company with large operations in Latin America.			
Trinseo	United States	Luxembourg	Luxembourg
A materials company focusing on plastics, latex, and synthetic rubber.			
United Co Rusal	Russia	Jersey	Russia
One of the world's largest aluminum producers.			
Viatris	United Kingdom	Netherlands	United Kingdom
A healthcare company focused on generics, branded medicines, and consumer healthcare.			
Viohalco	Greece	Belgium	Greece
A heavy industry conglomerate focusing on metal production and trade.			

Table D1: Examples of Firms with Different Locations of Headquarters and Incorporation (Continued)

Firm	Headquarters	Incorporation	Tax Residence
Willis Towers Watson	United Kingdom	Ireland	United Kingdom
A multinational offering risk management, insurance, brokerage, and advisory services.			
WPP	United Kingdom	Jersey	United Kingdom
A multinational communications, advertising, and public relations holding company.			
Zhen Ding Technology	Taiwan	Cayman Islands	Taiwan
A manufacturer of printed circuit boards.			

References Appendix

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