

Income Shifting Aggressiveness and the Regulatory Environment*

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Abstract

The past decade has witnessed numerous changes to tax regulations aimed at decreasing aggressive income shifting, with a particular focus on income shifting to tax haven jurisdictions. Using a firm-specific, time-varying measure, we study how income-shifting aggressiveness has changed over the period 2002–2022. We find that income-shifting aggressiveness increases from approximately 2005 through 2012 and then decreases significantly from 2013 until around 2018, followed by a modest increase in recent years. Focusing on multinationals with and without tax haven affiliates, we find distinct patterns over time. For multinationals without tax haven affiliates, income-shifting aggressiveness increases until 2012 and then declines until 2018, followed by a renewed increase in recent years. In contrast, income-shifting aggressiveness among multinationals with tax haven affiliates declines over time, with levels converging across the two groups since 2015. Additional results reveal interesting heterogeneities across industries and measures of tax incentives. Our results suggest that coordinated global efforts to reduce income shifting have been effective in reducing income-shifting aggressiveness in multinational firms with tax havens and thus in narrowing differences in income-shifting aggressiveness across types of multinational groups.

Keywords: income shifting, multinational tax, international tax

JEL Classification: H26, F23

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1 Introduction

Accounting research has examined the international tax behavior of multinational corporations for more than three decades. Using large samples of public multinational corporations, scholars have explored the degree to which income reported in lower tax rate countries is higher than expected, and vice versa. This research has revealed dramatic effects of policy evolution, including the rise of income shifting in the late 1990s and early 2000s, at least on average (Klassen and Laplante, 2012a). Research also highlights features of corporations, such as intellectual property (e.g., Harris, 1993; Dischinger and Riedel, 2011), corporate governance (Klassen et al., 2017; McGuire et al., 2018) and financial constraints (Dyreng and Markle, 2016), that lead some corporations to more actively shift income. The research collectively improves our understanding of the factors that influence international tax planning, and the effect of government actions in this setting.

In contrast to the trend of increasingly aggressive income shifting documented in Klassen and Laplante (2012a), the past decade has been characterized by numerous changes to tax regulations aimed at decreasing aggressive income shifting, with a particular focus on income shifting to tax haven jurisdictions. Recent research has explored the effectiveness of a number of these changes (such as country-by-country reporting to revenue authorities or to the public, or other anti-tax avoidance directives in the U.S. or E.U.) on income shifting, investment, and employment (e.g., Joshi et al., 2023; Overesch and Wolff, 2021; De Simone and Olbert, 2022; Laplante et al., 2024; Brühne et al., 2025; De Simone et al., 2025; Fich et al., 2025; etc.). However, the question of whether income shifting has decreased overall or has simply decreased to tax havens remains unanswered.

Using a firm-specific, time-varying measure calculated over two decades (2002-2022), we study how income-shifting aggressiveness has changed. If increased regulation aimed at minimizing income shifting to tax havens has decreased tax-motivated income shifting overall, we expect to observe a decrease in income-shifting aggressiveness over time. However, we do not expect to document a decrease in overall income-shifting aggressiveness if (1) the new regulations are ineffective, or (2) multinationals continue to shift income by replacing tax haven affiliates, that are now more costly recipients of shifted dollars, with

relatively higher-tax jurisdiction recipients of shifted income in response to these regulatory changes.

We test our research question using a Huizinga and Laeven (2008) approach on an expanded sample that aims to address challenges that may affect our ability to identify income shifting over time. Tørsløv et al. (2023), Dyreng and Markle (2016) and Dyreng et al. (2023) identify the previously-available affiliate data from Bureau van Dijk as being concentrated in Europe with limited coverage of tax havens in particular. To address this issue, we use the *Orbis* database (now available from Moody's), which includes about five times as many affiliates as the former database. We follow De Simone et al. (2022) to generate firm-level proxies for income-shifting aggressiveness. We estimate the model using a shorter window of three-years rather than five-years to better identify trends in income-shifting aggressiveness over time.

Additionally, we construct multiple proxies for the tax incentive variable, C , which is the weighted-average tax rate differential across affiliates in a multinational group. We construct multiple measures of this variable in order to explore the effect of incorporating all available affiliate ownership data in our estimation, rather than restricting the estimate to affiliates with financial data. Thus, we are able to incorporate the tax incentive generated by the set of countries that do not require other disclosure of private (subsidiary) entity data to be included in the standard Huizinga and Laeven (2008) model. This innovation allows us to include 60 percent more jurisdictions in the tax incentive proxy than in De Simone et al. (2022) and related work. Thus, our data extends extant work along two dimensions: dramatically expanding the sample of affiliates for the income shifting model and incorporating an even larger set of countries into the tax incentive proxy.

Estimates of income-shifting aggressiveness on this expanded sample with the traditional specification of the tax incentive variable, C , find that income-shifting aggressiveness increases from approximately 2003-05 through 2010-12 and then decreases significantly from 2011-13 through 2018-20. In recent years, we observe a modest uptake again. Estimates of income-shifting aggressiveness using alternative formulations of the tax incentive measure to more completely capture the tax incentives faced by multinationals provide a relatively similar trend.

We next employ a number of cross-sectional tests to further explore the effect of recent tax regulations on income-shifting aggressiveness. First, we examine income-shifting aggressiveness by the country of the multinational's headquarters, as different jurisdictions may adopt and enforce regulations to differing degrees. Results indeed confirm heterogeneity across headquarter countries. For example, multinationals headquartered in the United States and the United Kingdom exhibit pronounced declines in income-shifting aggressiveness over much of the sample period, whereas Japan and Spain show an overall increasing trend. In contrast, multinationals headquartered in countries such as Italy and Luxembourg display non-monotonic patterns, with income-shifting aggressiveness rising in early years, declining in the mid-2010s, and increasing again more recently. These results suggest there is no consistent trend in income-shifting aggressiveness depending on whether headquarter countries have relatively high or low tax rates. However, we do observe an overall increasing trend in income-shifting aggressiveness when we group all tax-haven-headquartered multinationals together.

Second, because many of the regulatory changes specifically target tax planning via tax havens, we examine income-shifting aggressiveness by multinationals based on the extent of their tax haven affiliate operations. We find that income-shifting aggressiveness evolves differently for multinationals with and without tax haven affiliates. Specifically, for multinationals without tax haven affiliates, income-shifting aggressiveness increases in the early part of the sample, declines through the mid- to late 2010s, and increases again in more recent years. In contrast, income-shifting aggressiveness among multinationals with tax haven affiliates declines over our sample period. As a result, differences in income-shifting aggressiveness between these two groups narrow over time, with levels converging from the mid-2010s onwards.

Finally, because scrutiny and regulations could impact industries differently, we also provide an analysis of the trends in income-shifting aggressiveness across industries. Though preliminary and exploratory in nature, these tests validate our income-shifting aggressiveness measure by showing that industries in which the costs of shifting are lower are more aggressive overall. We also observe differences in trends across industries, suggesting that recent tax regulations have been more effective in some industries than in others. Fur-

ther, across many of these cross-sectional tests, inferences can differ depending on which metric of tax incentive is used to measure income-shifting aggressiveness. In future work, we intend to further explore these differences across tax incentive metrics and to provide recommendations for future researchers similarly grappling with differences in observability across jurisdictions.

Our paper contributes to three streams within the income shifting literature. First, we document trends in income-shifting aggressiveness over a recent time period that includes major regulatory changes worldwide. Researchers have attempted to estimate the scope of income shifting, but their estimates vary widely (see for example, Dharmapala, 2014; Dyreng et al., 2023, etc.). Although we document an overall decline in income-shifting aggressiveness over time, these overall trends confound interesting heterogeneities across headquarters country, the extent of tax haven operations, and industry. Further, we find that both the levels and trends can depend significantly on the sample used to estimate the tax incentive, consistent with this variation in estimates across prior work. Second, we contribute to literature on the effects of policy aimed at reducing income shifting. Our results suggest that coordinated global efforts to reduce income shifting have on average been effective. Yet we observe no decline or even an increase in income-shifting aggressiveness on average in some headquarter countries, and across several industries. Finally, our innovation to the income shifting estimation strategy incorporates more complete ownership information without requiring complete financial information on every entity. A more complete sample of affiliates will allow future researchers to mitigate some data limitations inherent to samples that span jurisdictions with different reporting requirements.

2 Background and Hypotheses Development

Large-sample international tax planning research in accounting and public economics began with three papers that were published almost concurrently: Klassen et al. (1993); Harris (1993); and Hines and Rice (1994). Much of this research is based on large sample econometric estimates that model the effects of tax incentives on observable outcomes. A common goal in the literature is to understand firm decision making. These three papers,

and the literature that followed, explicitly or implicitly assert a simplified view of multinationals by identifying one or both of two theoretically interrelated decisions: an operating decision in which global supply chains and related investments are structured, and a tax planning decision in which the location of income from those operations is reported. The two decisions may be made sequentially or simultaneously (Lester and Olbert, 2025).

We define the first decision as tax-optimized investment decisions. Tax-motivated income shifting (or simply, "income shifting") comprises the second decision: reporting more profits than expected from resident operations in countries that tax income more lightly, and less profits than expected from resident operations in countries that tax income more heavily. One of the main challenges in estimating income shift is determining the base, or expected, profit against which "more" or "less" profit is measured. This is, of course, the tax authority's challenge as well.

Empirical Model Alternatives

Employing this conceptual definition of income shifting, the econometric estimates of income shifting are typically based on the following operational definition: income shifting is the degree to which unexpected profits of multinationals' affiliates are correlated with the affiliates' tax incentives.¹ Tax incentives are typically based on differences in statutory tax rates among the jurisdictions in which the firm operates. If, on average, unexpected profits are not correlated with cross-country tax rate differences, then income shifting is assumed not to occur. Stronger negative correlations between tax-rate-based measures and unexpected profits are interpreted as more aggressive or more responsive income shifting.

Because both the conceptual and estimated relations involve unexpected profits, yet only reported profits are observable to firm outsiders, estimates of expected profits are a key element of the research designs. The tax incentive variable is also of obvious import. One of the key models, initially proposed by Huizinga and Laeven (2008) focuses on global samples of multinational corporations, but it has limitations (Lester and Olbert, 2025). We focus on the Huizinga-Laeven model because (1) it uses affiliate-level data to estimate

¹Dyreng and Markle (2016) is an exception to this rule because their model does not incorporate tax incentives.

income shifting among affiliates, rather than a narrower focus on parent-subsidiary income shifting, and (2) it yields estimates for multinationals headquartered in many countries, allowing a global focus rather than a narrower U.S.-centric focus. In the Huizinga-Laeven model, the observed pretax income is regressed on the Cobb-Douglas production function factors of labor, capital, and productivity (collectively a proxy for expected profit), a weighted average tax differential between the affiliate’s statutory tax rate and those of the other affiliates of the multinational (the proxy for tax incentives), and fixed effects along with other covariates.

Other models have also been proposed (e.g., Collins et al. (1998) with extensions by Klassen and Laplante (2012a,b) and Dyreng and Markle (2016); both extended in Drake et al. (2019)). However, the Huizinga-Laeven model has improved substantially over the last thirty years to address many of the concerns previously asserted (e.g., De Simone, 2016; Markle, 2016; De Simone et al., 2017, 2022). Importantly, the model allows for the exploration of a global sample of multinational corporations rather than employing, and thus focusing on, unique U.S. financial reporting requirements (e.g., total non-U.S. sales, pretax income and tax expense).

Initially, this model was only estimable for European affiliates of global multinationals because financial data for private affiliate corporations (i.e., subsidiaries) was only available in Europe. Huizinga and Laeven (2008) estimated the model on a sample that included 2,713 affiliate observations for a single year. More recently, data availability has expanded across more countries globally. For example, De Simone et al. (2022) estimates the aggressiveness of individual multinationals’ income shifting during rolling 5-year windows using more than 150,000 affiliate-year observations, producing estimates at the multinational level for more than 3,000 firm years. Additional control variables have also been included to improve the estimate of expected profits as this model has evolved over time. However, there continue to be notable gaps in, for example, North America and many small tax-haven countries. Our analysis, described below, further increases the sample by an order of magnitude.

Main Hypotheses

The aim of this study is to examine changes in overall income-shifting aggressiveness over the past 20 years. Over this period, countries have enacted a number of regulatory changes. Some of these recent changes affect tax calculations themselves, for example through anti-abuse provisions that aim to curb corporate tax arbitrage or through anti-abuse taxes. For example, harmonization of definitions around entity structure aims to minimize "stateless income." Anti-abuse taxes such as digital sales taxes and the Base Erosion Anti-Abuse Tax (BEAT) in the United States aim to replace tax savings due to income shifting with additional taxes. Proposed regulations, such as the global minimum tax, for example, may further increase risks associated with aggressive income shifting.

Others of these new regulations target increased transparency to revenue authorities or to the public. The mechanism for decreasing income shifting in these regulations is not the tax calculation itself, but rather information provided to tax authorities that could be useful in enforcement or to investors and customers that could result in public scrutiny. For example, private country-by-country reporting to tax authorities has become a requirement and tax authorities more commonly exchange private taxpayer information among themselves. Further, certain jurisdictions now require public disclosures of some of this information or discussions of corporate tax strategies and sustainability-related issues. Instead of attempting to isolate and compare the effects of these overlapping changes, we take a comprehensive approach to examining how income shifting has changed over this period.

We assert that, on the one hand, these increased regulations should be effective at curbing corporate tax-motivated income shifting, particularly to tax havens. If the regulations were not effective, per se, the increased information in the hands of tax authorities should at least increase multinational corporate taxpayers' perceived risk of detection by tax authorities, and reduce tax avoidance according to models of crime and tax avoidance (Becker, 1968; Allingham and Sandmo, 1972). Public release of where corporations report profits, assets, and employees on a country-by-country basis could alternatively induce multinationals to reduce their income shifting to low-tax jurisdictions via the concern over

public scrutiny and potential shaming (Hanlon and Slemrod, 2009). Finally, harmonizing transfer pricing rules across countries as a result of EU and OECD/G20 efforts, along with new tax laws that remove tax arbitrage opportunities like hybrid transactions, should reduce the opportunities for, or raise the cost of, aggressive income shifting (Adams, 2025). We predict that the resulting effect of these regulatory changes will *decrease* tax-motivated income-shifting aggressiveness over time.

On the other hand, there are a number of reasons to believe that this relation does not hold. First, it is unclear as of yet whether and how tax authorities are able to use the information provided to them and whether firm management responds to concerns over increased public disclosures. For example, the transfer pricing regulations for how multinationals should allocate profits across jurisdictions for tax purposes do not align merely with the location of tangible assets and employees disclosed in country-by-country reports, but instead consider intangible assets and risks borne by each party to an intercompany transaction. Thus, the new information provided to tax authorities is only a starting point for considering whether the tax authority should pursue further investigation (Hanlon, 2018), making their value to tax authorities unclear and potentially negating the impact of these reports on income shifting behavior. Additionally, prior work generally fails to find significant effects of public scrutiny on tax avoidance (Hanlon and Slemrod, 2009; Gallemore et al., 2014; Joshi, 2020), suggesting it could be rational for management to not adjust tax strategies despite increased public disclosures.

Second, new enforcement tools may simply lead to a change in tax planning with little overall effect (Elemes et al., 2025). Prior work demonstrates that multinationals have strategically responded to the changing regulatory environment by instead increasing operations in relatively low-tax and tax-preferenced jurisdictions to better support their income-shifting behavior (De Simone and Olbert, 2022). Thus, the response to the new regulations may be to alter tax-motivated investment choices rather than income shifting. Further, the primary focus of new regulations is on curbing income shifting to (very) *low* tax-rate countries like tax havens, rather than just *lower* tax-rate countries. It is therefore plausible that multinationals have replaced income shifting to tax haven affiliates with relatively higher-tax jurisdiction recipients of shifted income because the new environment

made tax haven jurisdictions a more costly recipient of shifted income. In this case, the reporting requirements and regulations would be relatively less effective for other potential recipients of shifted income. Taken together, these arguments predict that the resulting effect of these changes will *increase* tax-motivated income-shifting aggressiveness over time, particularly in analyses of income shifting among non-haven countries.

Overall, arguments on the effect of these transparency initiatives and regulations on tax-motivated income shifting suggest that income shifting has, on average, declined, not been affected, or increased. The recent empirical evidence is mixed (e.g., Joshi et al., 2023; Adams, 2025). However, on balance, we follow Adams (2025) and predict that the effect of regulatory changes on tax-motivated income shifting were negative overall, and we state our hypothesis in the alternative form:

H1: *Changes in the regulatory environment have decreased income-shifting aggressiveness over time.*

We wish to reiterate that our aim in this study is to examine the overall trend in income shifting as a result of the changing tax planning environment, rather than estimating the effects of each change. Further, we make no predictions regarding which type or implementation of regulation is effective; rather we intend to let the data document where the most significant changes have occurred.

Cross-sectional Predictions

In addition to time, we employ a number of cross-sectional tests to further explore the effect of these recent regulations on corporate tax-motivated income shifting. First, we examine income-shifting aggressiveness by the country of the multinational's headquarters. Headquarter country is a natural operationalization of these changes because different jurisdictions adopted them to differing degrees. There is also potential heterogeneity in the enforcement across headquarter countries.

Second, we examine income-shifting aggressiveness by countries in which multinationals have operations, focusing on the extent of their tax haven operations. We focus on tax

haven operations because many of the regulatory changes specifically targeted tax planning via tax havens.

Finally, because industries might be subject to different levels of scrutiny or regulations could impact industries differently, we also provide an exploratory analysis of the trends in income-shifting aggressiveness across industries. For example, many regulations appear to target tax plans used by multinational corporations operating in the tech and pharmaceutical industries.

3 Replication

3.1 Data and summary statistics

We first replicate De Simone et al., 2022 to estimate a firm-level measure of income-shifting aggressiveness, ISA_{ft} , similar to that used in prior literature. We use an expanded sample, more recent time period, and shortened rolling window length but otherwise closely follow the research design in De Simone et al., 2022 for this replication.

Moody's *Orbis* contains financial and ownership information on companies worldwide. We primarily use annual unconsolidated affiliate-level financial and historical ownership data² from 2002 to 2022, though we also incorporate consolidated financial data from *Orbis* to complement these affiliate-level data. Our sample includes only affiliates that are owned at least 50 percent by their global ultimate owner. Because we focus on tax-motivated cross-jurisdictional income shifting, we require each firm-year to contain affiliates in at least two different jurisdictions. Additionally, we require financial data for at least one affiliate for each firm-year. We complement these company data with data on GDP from the World Bank and data on corporate income tax rates at the jurisdiction level from the Research School of International Taxation's (RSIT) International Tax Institutions (ITI) database and the Tax Foundation.

We restrict the ISA_{ft} estimation sample to affiliates with complete data for all variables required in the model (return on assets, tangible fixed assets, compensation expense,

²Our historical ownership information starts in 2007. For the period 2002-2006, we assume the same ownership structures as in 2007.

age, changes in GDP, changes in market size, tax incentives C_{it} , industry code, and profits greater than zero after adding one).³ Following De Simone et al. (2017) and De Simone et al. (2022), we exclude affiliates in the banking and insurance sectors, as well as affiliate-year observations of multinational firms with consolidated return on sales below three percent, because these multinationals likely face distinct income-shifting incentives. Applying these criteria yields a final estimation sample of approximately 1.7 million affiliate-year observations. Table 1 summarizes the sample selection process.

[Insert Table 1 about here.]

Table 2 summarizes and defines the variables used for estimating equation (1). Our baseline measure of the tax incentive, C_{it} , follows the widely applied procedure in the literature that requires some of the financial information needed to estimate the model in order to estimate the tax incentives (see, e.g., Huizinga and Laeven, 2008). Specifically, for each multinational group, we compute the weighted difference between the statutory corporate income tax rate in each affiliate country and the group’s average statutory rate.⁴ We use affiliate-level tangible fixed assets as weights such that affiliates with greater capital intensity exert more influence on the group’s overall tax incentive. This approach corresponds to the conventional method employed in prior income-shifting studies.⁵ A drawback of this approach is that we only include those affiliates for which we can collect fixed asset data; affiliates that publicly report financial information represent only a subset of all affiliates whose existence and location within an MNC group are observable in our dataset.

[Insert Table 2 about here.]

We winsorize all continuous variables at one and 99 percent. Affiliates in our sample report earnings before interest and taxes (EBIT) on average 4.80 million USD, and have

³As discussed above, we calculate our tax incentive variables on the full observable sample of affiliates before making these sample selection cuts based on the availability of financial data.

⁴For computational efficiency, we sum all affiliates within a country. Empirical estimates of the tax incentives are not affected by this choice.

⁵Huizinga and Laeven (2008) alternatively weight the tax rate differentials using revenues. Following prior work (De Simone et al., 2022; Dharmapala, 2014; Dharmapala and Riedel, 2013), we use capital instead under the reasonable assumption that it takes more time for a firm’s income shifting decisions to impact real investment than revenues. A drawback of using either revenues or capital is that such weighting schemes require the financial information of observed affiliates to be publicly disclosed.

ROA_{it} of 7.2 percent. 22 percent of sample affiliates report a loss. On average, affiliates have mean total assets of 115 million USD, tangible fixed assets of 20.7 million USD, and compensation expenses of 11.3 million USD. The tax incentive variable, C , is roughly centered around zero by construction.

3.2 Estimation Equation

Following De Simone et al. (2022), we estimate a firm-year proxy for tax-motivated income-shifting aggressiveness (ISA_{ft}). We measure income-shifting aggressiveness as the sensitivity of reported affiliate profits to tax incentives employing the Huizinga-Laeven model. This approach builds on the standard model that estimates a transformed Cobb-Douglas production function, where affiliate-year profits are modeled as a function of capital, labor, productivity (Hines and Rice, 1994), tax incentives (Huizinga and Laeven, 2008), and loss positions (De Simone et al., 2017). Consistent with De Simone et al. (2022), we create firm-year estimates by augmenting the standard model with firm-level indicators, which are interacted with the tax incentive and loss variables. We estimate this specification separately by industry using rolling windows. Industry is defined according to the Fama-French 30 classifications. Unlike De Simone et al. (2022), who rely on five-year windows, we implement three-year rolling industry windows so that we can both extend the analysis to more recent years and study the time-series dynamics with greater precision.

We estimate the following model for affiliate i , in country c , industry sector s , and year t that is an affiliate of firm f . Each industry-window regression, denoted with subscript st , is estimated over a three-year window that includes years k , such that k equals $t - 2$ to t .

$$\begin{aligned}
\ln(ROA_{ik} + 1) = & \beta_{0st} + \beta_{1st} \ln(\text{TangibleAssets}_{ik}) + \beta_{2st} \ln(\text{CompExp}_{ik}) \\
& + \beta_{3st} \text{IndustryROA}_{csk} + \beta_{4st} \text{Age}_{ik} + \beta_{5st} \Delta \text{GDP}_{ck} \\
& + \beta_{6st} \Delta \text{MarketSize}_{csk} + \beta_{7st} C_{ik} + \beta_{8st} \text{Loss}_{ik} + \beta_{9st} (\text{Loss}_{ik} \times C_{ik}) \\
& + \beta_{10ft} \text{Firm}_f + \beta_{11ft} (\text{Firm}_f \times C_{ik}) + \beta_{12ft} (\text{Firm}_f \times \text{Loss}_{ik}) \\
& + \beta_{13ft} (\text{Firm}_f \times \text{Loss}_{ik} \times C_{ik}) + \varepsilon_{ik}
\end{aligned} \tag{1}$$

Consistent with the Cobb–Douglas production function, we model the log of affil-

iate profits ($\ln(ROA_{ik} + 1)$) as a function of capital proxied by tangible fixed assets ($\ln(\text{TangibleAssets}_{ik})$), labor proxied by compensation expense ($\ln(\text{CompExp}_{ik})$), and productivity by country–industry–year return on assets (IndustryROA_{csk}).⁶ To augment the original Huizinga-Laeven model, Huizinga and Laeven (2008), we include controls that capture the changes in jurisdictional GDP (ΔGDP_{ck}), changes in country–industry–year market size ($\Delta \text{MarketSize}_{csk}$), affiliate age (Age_{ik}), and an indicator for loss status (Loss_{ik}). The key variables of interest are the tax incentive, C_{it} , and its interactions with the firm fixed-effects vector, $Firm_f$. These interactions identify firm-specific deviations from industry-average sensitivity to tax incentives. More negative coefficients on C_{it} (β_{7st}) and on its interaction with $Firm_f$ (β_{11ft}) indicate more aggressive income shifting at the industry–year and firm–year levels, respectively. Following De Simone et al. (2022), we define firm-level income-shifting aggressiveness as

$$ISA_{ft} = -\beta_{7st} - \beta_{11ft}. \quad (2)$$

Because we multiply these coefficients by negative one, ISA_{ft} increases with income-shifting aggressiveness.

3.3 Replication Results

Table A1 in the appendix presents our results for estimating ISA_{ft} with our sample. We follow De Simone et al. (2022) and present results in Column (1) for a baseline analysis that more closely follows the empirical model in Huizinga and Laeven (2008), before adding an indicator for loss-making affiliates Loss_{it} and its interaction with C_{it} in Columns (2) and (3), respectively. In columns (4) we estimate the regressions at the industry level and column (5) we include firm fixed effects. While we use more than ten times more observations, our results are closely aligned with those reported by De Simone et al. (2022). For original profit prediction variables with firm fixed effects, reported in column (5), we observe a negative and significant coefficient on $\ln(\text{TangibleAssets})$ of approximately -0.0015, a coefficient of zero on $\ln(\text{CompExp})$, and a significant coefficients on

⁶In calculating affiliate profits, we deflate by assets and add one to retain loss observations.

IndustryROA of 0.50, consistent with De Simone et al. (2022), though their coefficient on *IndustryROA* is somewhat smaller at 0.34. Also consistent with De Simone et al. (2022), our other control variables are also positive and statistically significant.

Income shifting predicts a negative expected association between tax incentives and reported affiliate-level profits, and we observe a negative and significant coefficient on the tax incentive variable C_{it} of -0.11, statistically significant at the 1 percent level. Consistent with De Simone et al. (2022), we estimate a negative coefficient on $Loss_{it}$ and a positive coefficient on its interaction with C_{it} .

[Insert Figure 1 about here.]

4 Research Design

4.1 Measuring Tax Incentive C_{it}

The Huizinga-Laeven model has been criticized along a variety of dimensions. For example, those that use data from the U.S. Bureau of Economic Analysis (e.g., Clausing, 2020a,b; Blouin and Robinson, 2020) or from U.S. GAAP reporting (e.g., Dyreng and Markle, 2016; Dyreng et al., 2023) argue that the data on U.S. multinationals are complete in the sense that the data include all jurisdictions.⁷ Because our research question relates to reporting and regulatory pressures around tax havens, it is especially important that our proxies include the incentives that tax havens create. Additionally, one of our goals in this paper is to explore the degree to which the measurement of tax incentives affects the reported income shifting estimates.

To gauge the sensitivity of estimates to the lack of financial data for some affiliates, particularly those in tax havens, we use four different approaches to measure the tax incentive C_{it} . The baseline measure that is capital weighted, and we defined earlier to replicate De Simone et al. (2022), we now refer to as C_{it}^{CW} .

We next use alternative tax incentive measures to address different data reporting

⁷Although these data may be complete in this sense, we note that the data are necessarily focused on U.S. multinational corporations and they are aggregated for all non-U.S. jurisdictions in the case of GAAP data or suffer from other data issues as noted by Blouin and Robinson (2020) in the case of BEA data.

requirements across countries and thus data availability issues within our sample of MNC affiliates. Importantly, we conduct these calculations on the broadest sample of affiliates available in our data *prior to* sample selection steps. Doing so ensures that we use all available information on the existence and location of MNC affiliates to calculate an MNC’s tax incentives. Thus, we maintain the assumption that including the broadest set of affiliates to measure the tax incentive will lead to the closest reflection of management’s choice set. The need for alternative metrics arises because financial information is not publicly available for all affiliates for which we are able to observe their existence and location. Throughout the alternative measures, we consolidate the subsidiary information used for that alternative measure within a jurisdiction-year so that each jurisdiction is only represented once per annual C_{it} calculation per MNC, following the original Huizinga and Laeven (2008).

The first alternative measure we construct is C_{it}^{EW} , in which each country within a multinational group receives an equal weight regardless of the distribution of tangible fixed assets. This specification only requires knowledge of a subsidiary’s existence and location, rather than also requiring tangible fixed-asset data on a subsidiary. This measure assumes that income-shifting costs and incentives arise proportional to the tax rate differences across all countries in which the group operates. The measure is then calculated as the equally-weighted sum of tax rate differentials within the group. The advantage of this measure is that it does not rely on the availability of capital information, which is missing for some affiliates and thus exclude them from the calculation of C_{it}^{CW} . To the extent that jurisdictions with attractive tax attributes such as low rates or fewer information sharing agreements are less likely to require financial reporting for private companies, this approach allows the inclusion of the tax incentives they create within the group. However, a drawback of this approach is that it does not account for the relative size of MNCs’ operations in different jurisdictions, which can influence an MNC’s incentives and ability to shift income.

We construct an additional alternative measure, $C_{it}^{GDPWeight}$, which weights tax rate differentials by the relative economic size of the jurisdictions in which a multinational operates. Specifically, for each multinational group, we weight the statutory tax rate differential of each jurisdiction by that country’s share of aggregate GDP across all jurisdictions in

which the group has affiliates in a given year. Similar to C_{it}^{EW} , this measure only requires information on the existence and location of affiliates and does not rely on the availability of affiliate-level financial data. By assigning greater weight to economically larger jurisdictions, $C_{it}^{GDPWeight}$ captures the idea that income-shifting incentives and opportunities may be more closely related to the scale of economic activity in a jurisdiction rather than to the distribution of reported affiliate assets.

Lastly, we construct an additional measure, C_{it}^{AdjCW} , which exploits information on both unconsolidated assets at the affiliate level and consolidated capital at the MNC level. This alternative measure includes the same sample of jurisdictions as C_{it}^{EW} but differs in how the tax differential of each jurisdiction is weighted. Specifically, the estimation of this measure follows two steps. In cases where consolidated tangible fixed assets exceed the sum of affiliate-level fixed assets, we treat the residual as non-attributed capital that belongs to the affiliates in jurisdictions without reported assets.⁸ We then allocate the non-attributed capital across countries with affiliates without financial information proportional to the GDP of the jurisdictions without financial information. The resulting weights combine reported affiliate capital and imputed capital, ensuring that the group's entire consolidated capital stock is reflected in the calculation. The tax incentive, C_{it}^{AdjCW} , is then obtained as the weighted sum of tax rate differentials within each group using either actual or imputed capital. We use this adjustment to include jurisdictions whether or not we can observe the financial information of affiliates located there. The use of relative country size weighting in is also consistent with the Hines and Rice (1994) assertion that the size of operations can impact an MNC's incentive and ability to shift income.

Figure 2 details the significant increase in information used to calculate the tax incentive C_{it} under the original and alternative specifications. Figure 2b shows that the original specifications included approximately only 11 to 25 percent of the affiliates and 51 to 61 percent of the jurisdictions included in the alternative specifications.

[Insert Figure 2 about here.]

⁸This approach implicitly assumes that the unreported assets are primarily from jurisdictions without publicly reported financial data. Said another way, we assume that in a jurisdiction with any affiliate-level financial data, either all affiliates are captured or missing affiliates are de minimis.

In spite of the expanded sample used to compute the alternative proxies C_{it}^{EW} , $C_{it}^{GDPWeight}$, and C_{it}^{AdjCW} , only affiliate observations with all required data can be used to estimate equation (1). Summary statistics for the four tax incentive proxies over the equation (1) estimation sample are provided in Table 3.

[Insert Table 3 about here.]

As reported in Table 2, the original estimate C_{it}^{CW} has a mean value of -0.004, compared to the value reported in De Simone et al. (2022) of 0.002. With the weighted difference in tax rates, a positive value occurs when there is greater weight on lower tax rate jurisdictions with an MNC. The quartiles are also consistently lower in our sample than in De Simone et al. (2022). Thus, our expanded and more recent sample, relative to De Simone et al. (2022), has more fixed asset weight in higher tax-rate jurisdictions.

Turning to the effect of expanding the sample to more jurisdictions and adjusting the weighting, we observe a more positive mean value for C_{it}^{EW} , at 0.015. We consider this value to be notably larger. The interquartile range is also much larger (at 0.079 versus for C_{it}^{CW} of 0.031). Using GDP-based weights in $C_{it}^{GDPWeight}$ yields a mean value of -0.025 and an interquartile range of 0.080. Compared to C_{it}^{CW} and C_{it}^{EW} , $C_{it}^{GDPWeight}$ places relatively more weight on larger, higher-tax jurisdictions, resulting in a more negative mean while maintaining a level of dispersion comparable to C_{it}^{EW} . Using the inferred capital weights within the C_{it}^{AdjCW} proxy, the mean returns to -0.004, similar to the traditional proxy, and the interquartile range continues to be large at 0.070. This analysis suggests that the use of the full sample of affiliate years with ownership data allows for greater variability within the incentive proxy, presumably improving its informativeness.

In the appendix Table A2, Table A3 and Table A4, we report the regression results of estimating the income shifting model, equation (1), using the alternative C measures. In spite of the differences observed above, the coefficient estimates on C are very similar across the specifications. These regressions, with the addition of the interactions of the firm fixed effects with C and estimated in 3-year rolling windows create the estimates of ISA_{ft} .

5 Empirical Results

Overall Trends

With the approximately 283,300 firm-year estimates of income-shifting aggressiveness, we are able to explore the trends that have occurred during our sample period. We focus on trends over time because there have been many tax policy changes during our sample period and much emphasis on reducing income shifting through efforts such as the OECD project on base erosion and profit shifting (BEPS). Our estimating technique uses three year rolling-windows such that values of *ISA* labelled 2004 reflect estimations over the period 2002-2004.

[Insert Figure 3 about here.]

Figure 3 plots the median annual values of our *ISA* estimates. *ISA* calculated using all four tax incentive measures show comparable annual fluctuations in the median value. Using the traditional tax incentive variable C_{it}^{CW} , we observe a generally flat trend in income-shifting aggressiveness with some moderate fluctuations between 2003-05 (labelled as 2005) and 2013-15 (labelled as 2015). After approximately 2013-15, the trend in median estimates shows a decline in income-shifting aggressiveness. Thus, there is evidence consistent with Adams (2025) that the overall level of income-shifting aggressiveness has declined following the implementation of several of the BEPS action items designed to curb this behavior. Starting in 2018-20, income-shifting aggressiveness seems to moderately increase again.

The inclusion of additional affiliates and jurisdictions through C_{it}^{EW} , C_{it}^{AdjCW} , and $C_{it}^{GDPWeight}$ in the estimate of income-shifting aggressiveness shows a slightly different pattern: income-shifting aggressiveness seems to increase between 2009-05 and 2008-10 followed by a decrease until 2016-18. The moderate increase in income-shifting aggressiveness is visible from 2016-18 onwards. Taken together, these differences suggest that inferences about time trends in income-shifting aggressiveness are sensitive to how tax incentives are measured, and that relying on incomplete affiliate information may mask important dynamics in multinationals' income-shifting behavior.

Because the results based on C_{it}^{EW} , C_{it}^{AdjCW} , and $C_{it}^{GDPWeight}$ are very similar, we henceforth present results using only the traditional capital-weighted measure C_{it}^{CW} and the equally weighted measure C_{it}^{EW} , which is the most straightforward and intuitive of the alternative specifications.

Country of Headquarters Analysis

Our detailed data also allows us to explore differences across the country of the multinationals' headquarters. We examine differences across headquarter country because jurisdictions likely differ in the degree to which they adopt and enforce the increased tax regulations over time. We first focus on the three largest countries by number of affiliate observations represented in our sample: France, Germany, and the United States. We present median *ISA* by country over time for C^{CW} and C^{EW} in Figure 4.

[Insert Figure 4 about here.]

Of the countries shown, Germany has the highest median *ISA* values over time, equaling 0.064 for *ISA* calculated using C^{CW} and 0.062 calculated using C^{EW} . The U.S. has relatively low median *ISA* values, averaging 0.036 and 0.043, respectively. The low values for U.S. affiliates may result from a lack of data for the U.S. affiliates such that *ISA* does not capture shifting to and from the main domestic operations. France falls in the middle of these two countries with average median *ISA* values over time of 0.049 and 0.057. In Figure A1 of the Appendix, we examine the ten headquarters countries with the largest number of observations and find that Luxembourg and Sweden also have relatively high average values of median *ISA* over time (0.063 and 0.043 for Luxembourg, and 0.051 and 0.027 for Sweden, calculated using C^{CW} and C^{EW} , respectively). Switzerland and Japan-headquartered multinationals have the lowest median *ISA*, with average values of 0.020 and 0.017 for Switzerland and -0.003 and 0.004 for Japan for *ISA* calculated using C^{CW} and C^{EW} , respectively.

Turning to the trends observed in Figure 4, multinationals headquartered in Germany shows an increasing trend in median *ISA* until 2008-10 followed by a declining trend until 2020-22 calculated using both C^{CW} and C^{EW} . For multinationals headquartered in the

United States, we observe a declining trend in median *ISA* until 2009-11 and a relatively flat trend since then. The trend for multinationals headquartered in France shows some fluctuations until 2010-12 and a moderate decline since then.

Figure A1 in the appendix documents trends across an expanded sample of headquarter countries consisting of the ten headquarter countries with the largest number of observations. Among these countries, income-shifting aggressiveness exhibits substantial heterogeneity and non-monotonic dynamics. For example, Italy and the United Kingdom show increases in income-shifting aggressiveness in the early part of the sample, followed by pronounced declines through the late 2010s and modest increases in more recent years, while Spain displays a slight upward trend accompanied by considerable volatility. In contrast, income-shifting aggressiveness for multinationals headquartered in Japan follows an overall increasing trend over time. A more detailed look at the individual countries, suggests that it is not the case that multinationals headquartered in low tax-rate countries are, on balance, either more or less aggressive than countries headquartered in higher tax-rate countries.

Tax Havens Analysis

Because the public policy concern is that multinationals headquartered in *non-haven countries* use tax haven affiliates to engage in more aggressive tax planning, we next explore the differences in income-shifting aggressiveness between multinationals that use tax haven countries extensively relative to multinationals that do not.⁹ We define tax havens following Alstadsæter et al. (2018).

We begin by plotting the median *ISA*, measured using tax incentive variables C^{CW} and C^{EW} , over time for multinationals with and without tax haven affiliates, classifying multinationals by tax haven presence separately in each year. We present these results in 5.

[Insert Figure 5 about here.]

⁹We also explored other specific affiliate countries but did not observe striking patterns.

We find distinct but converging patterns in income-shifting aggressiveness for multinationals with and without tax haven affiliates both when we use C^{CW} and C^{EW} as tax incentive variable. For multinationals with tax haven affiliates, income-shifting aggressiveness declines consistently over the sample period. In contrast, for multinationals without tax haven affiliates, income-shifting aggressiveness increases until approximately 2010-12 and then decreases thereafter. Despite these different dynamics, the levels of income-shifting aggressiveness for the two groups move closer together over time, indicating convergence in income-shifting behavior in the later years of the sample.

These patterns suggest that regulatory and institutional changes over the sample period differentially affected multinationals depending on their affiliate structures, while ultimately leading to more similar levels of income-shifting aggressiveness across groups. The convergence in income-shifting aggressiveness may reflect reduced advantages of tax haven-based structures, increased scrutiny across jurisdictions, or broader changes in the costs of income shifting that affect multinationals more uniformly over time.

However, we observe that the decline in income-shifting aggressiveness for multinationals with tax haven affiliates begins well before the introduction of major coordinated anti-tax avoidance initiatives, such as the OECD's BEPS project in 2013. This early decline suggests that changes in income-shifting behavior were already underway prior to large, internationally coordinated policy interventions. Possible explanations include earlier unilateral regulatory actions by individual countries, increased enforcement intensity by tax authorities, or growing compliance and documentation requirements. The continued decline and convergence observed after 2013 are consistent with these earlier developments being reinforced and extended by subsequent coordinated international efforts to curb income shifting.

To further explore the role of tax haven affiliates in income-shifting aggressiveness, we next bifurcate our sample by tax haven intensity. Across the full sample of approximately 1.7 million MNC-years in our most inclusive dataset, we compute the annual distribution of the share of tax haven affiliates relative to all firm affiliates. Based on this distribution, we classify multinationals in the top quantile of the tax haven affiliate share in a given year as having a high haven share, and multinationals in the bottom quantile as having a low

haven share, with quantile cutoffs defined separately for each year. Using this classification, we plot the two groups of multinationals — those with a high haven share (labeled "high haven share") and multinationals with a low haven share (labeled "low haven share") — across the sample period in Figure 6. Panel A shows the two groups for the C^{CW} metric and Panel B shows the two groups for the C^{EW} metric.

[Insert Figure 6 about here.]

Two observations arise from these plots. First, the income-shifting aggressiveness of multinationals with a high share of tax haven affiliates declines over the sample period, with the decrease being more pronounced when *ISA* is calculated using the traditional capital-weighted tax incentive measure C^{CW} . When using the equally weighted measure C^{EW} , income-shifting aggressiveness among high-haven-share multinationals is relatively stable from approximately 2009–11 onward.

Second, for multinationals with a low share of tax haven affiliates, income-shifting aggressiveness increases until around 2010–12 and then remains relatively stable with some fluctuations thereafter, with a tendency toward a moderate decline in later years. Despite these differing early dynamics, the levels of income-shifting aggressiveness for the high- and low-haven-share groups converge markedly over time, particularly from approximately 2013–2015 onward when *ISA* is calculated using C^{CW} .

Overall, these results indicate that income-shifting aggressiveness among multinationals with a high share of tax haven affiliates has declined over time, particularly when measured using the traditional capital-weighted tax incentive. The earlier increase and subsequent stabilization among multinationals with a low share of tax haven affiliates are consistent with income-shifting activity shifting toward non-haven jurisdictions in the period preceding more coordinated anti-tax avoidance efforts. The pronounced convergence in income-shifting aggressiveness across high- and low-haven-share multinationals from the mid-2010s onward suggests that differences in income-shifting opportunities associated with tax haven intensity have narrowed over time.

Industry Analysis

Finally, because prior research demonstrates heterogeneity in income shifting across industries and the implementation and enforcement of tax regulations intended to curb income shifting may also vary across industries, we also explore median values of *ISA* within industry over time, as well as across industries. Throughout this analysis, we use the Fama-French 30 industry classifications. We begin by exploring the time trends for the most common industries in our sample based on number of observations. The most common industries are Wholesale (FF30 26), Personal and Business Services (FF30 22), and Construction and Construction Materials (FF30 11). Figure 7 plots the trends in median *ISA* for these three industries, using the tax incentive metric C^{CW} to estimate *ISA* in Panel A, and C^{EW} in Panel B.

[Insert Figure 7 about here.]

Cutting our full sample by industry results in smaller subsamples with more extreme fluctuations in median *ISA* year to year relative to the full sample with all industries combined. The Personal and Business Services (“Services”) industry exhibits the highest levels of income-shifting aggressiveness throughout the sample period, accompanied by a relatively modest decline over time. Wholesale begins the sample with relatively high income-shifting aggressiveness but shows a consistent decline over time, resulting in substantially lower levels than Personal and Business Services from approximately 2005–2007 onward. In contrast, income-shifting aggressiveness in Construction and Construction Materials displays no clear time trend. The high level in income-shifting aggressiveness in the Personal and Business Services industry is in line with prior work suggesting there may be more income shifting opportunities in the Personal and Business Services industry than in other industries (e.g., (Hebous and Johannesen, 2021)).

In Figure A2 of the appendix, we also examine the industries with the highest and lowest median *ISA* estimates (measured over our pooled sample period). The most aggressive industries using C^{CW} as the tax incentive metric are FF30 24 Business Supplies and Shipping Containers, FF30 7 Apparel, and FF30 22 Personal and Business Services. The least aggressive industries are FF30 14 Electrical Equipment, FF30 21 Communication and

FF30 4 Recreation. These industry classifications are in line with expectations drawn from prior studies of income shifting. For example, global supply chains involved in manufacturing allow for significant opportunities to shift income (Huizinga and Laeven, 2008; Cristea and Nguyen, 2016). Further, services involve greater flexibility in the location of profits due to the mobility of the labor input in these industries and have been shown to facilitate income shifting (Hebous and Johannesen, 2021). Conversely, the least aggressive industries typically involve a more locally-supplied good or service (e.g., recreation), leading to fewer opportunities (higher cost) to shift income.¹⁰

Overall, although annual estimates are more volatile when aggregated at the industry level, consistent with smaller samples, there are observable differences in the level and trend of income-shifting aggressiveness across industries. Industries in which the costs of shifting are lower due to supply chain design or due to more mobile types of income, shift more, overall. Using the example of two industries that have been aggressive during the sample period, we see a stable but moderately declining trend in the Personal and Business Services industry. In contrast, we observe an increasing trend in income-shifting aggressiveness over time in the Business Supplies industry. These trends suggest that regulatory efforts to curb income shifting are likely to have been less effective in some industries, depending on the source of the income-shifting aggressiveness.

6 Conclusion

Given the unprecedented level of tax regulations introduced recently, we examine trends in income-shifting aggressiveness over the last two decades. In particular, we examine whether income shifting has decreased overall or has simply decreased to tax havens, with multinationals replacing tax haven affiliates with other low-tax affiliates as recipients of shifted income. We find that income-shifting aggressiveness follows non-monotonic dynamics over time, increasing in the early part of the sample, declining through the mid-to-late 2010s, and modestly increasing again in recent years. While income-shifting aggressiveness declines consistently for multinationals with tax haven affiliates, multina-

¹⁰We cannot estimate a reliable median for five industries due to low sample sizes: petroleum and natural gas; aircraft, ships and railroad equipment; tobacco; beer and liquor; and metals and mining.

tionals without tax haven affiliates exhibit an earlier increase followed by a subsequent decline, with levels converging across groups over time. Additional analyses reveal meaningful heterogeneity across industries and demonstrate that inferred trends depend on how tax incentives are measured, underscoring the importance of measurement choices when assessing changes in income shifting.

Our study contributes to the income shifting literature by documenting trends in income-shifting aggressiveness over a recent time period that includes major regulatory changes worldwide. In doing so, we contribute to literature on the effectiveness of policies aimed at curbing multinational corporate income shifting behavior. Our results suggest that coordinated global efforts to reduce income shifting have been effective on average, but that some subsets of multinationals continue to increase their income-shifting aggressiveness even in the face of these regulations. Finally, we continue to improve upon the income shifting estimation strategy by incorporating more complete ownership information without requiring complete financial information on every affiliate. In future work, we aim to explore differences in measurement approach to inform future researchers how to mitigate data limitations inherent to samples that span jurisdictions with different reporting requirements.

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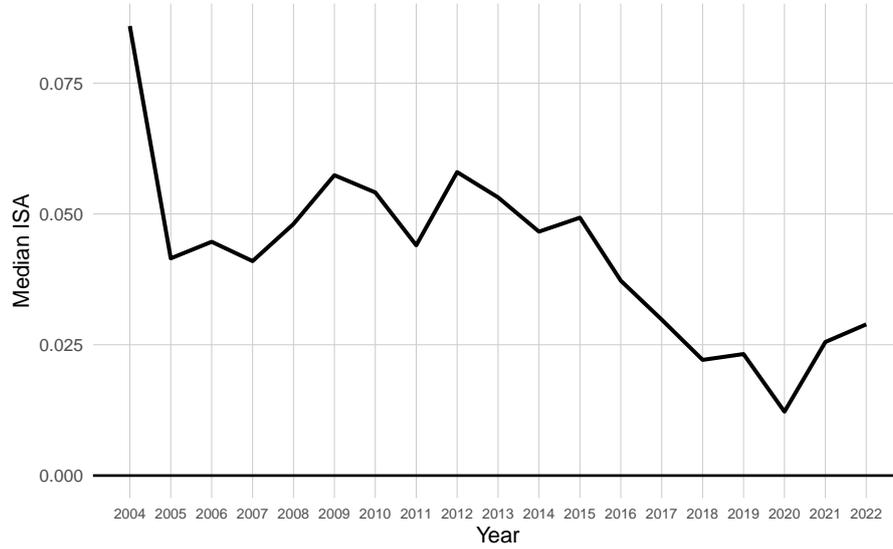
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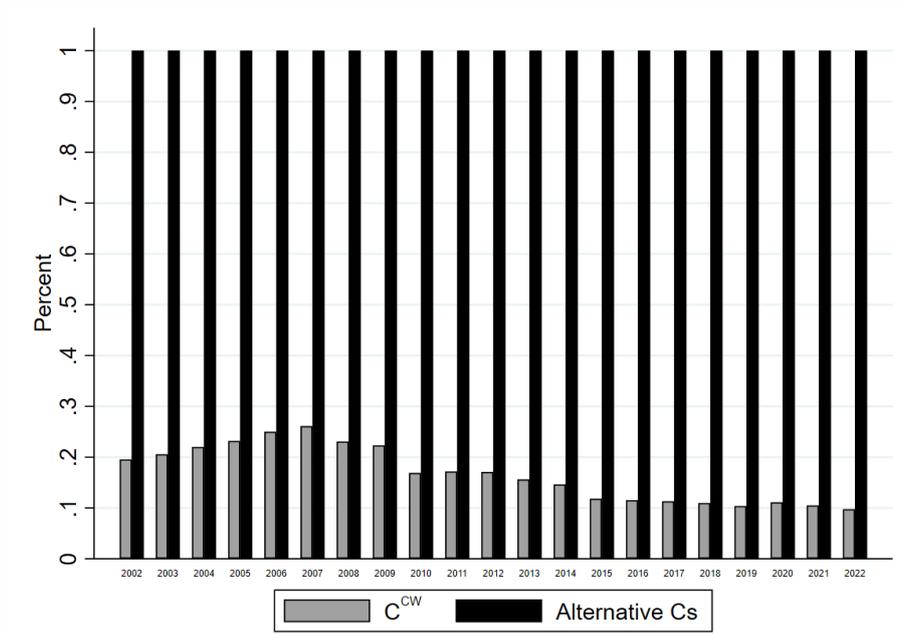
Figures & Tables

FIGURE 1: Median ISA calculated using C^{CW}

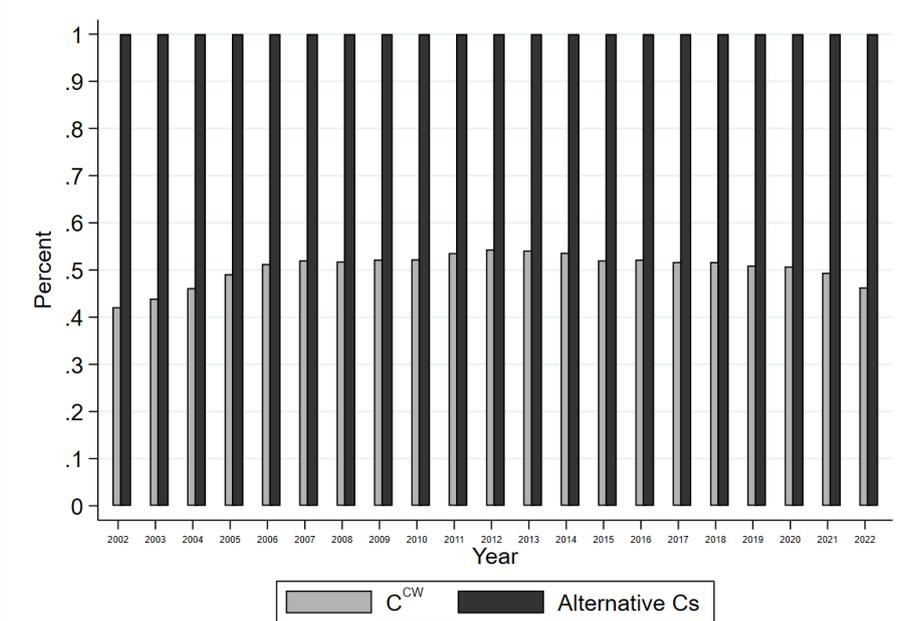


Median of Income Shifting Aggressiveness (estimated according to Equation (1)) using C^{CW} as the tax incentive variable. C^{CW} is the traditional capital-weighted tax incentive measure, calculated using affiliates' tangible fixed assets to weight statutory tax rate differentials within the multinational group. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

FIGURE 2: Affiliates and countries entering C calculations



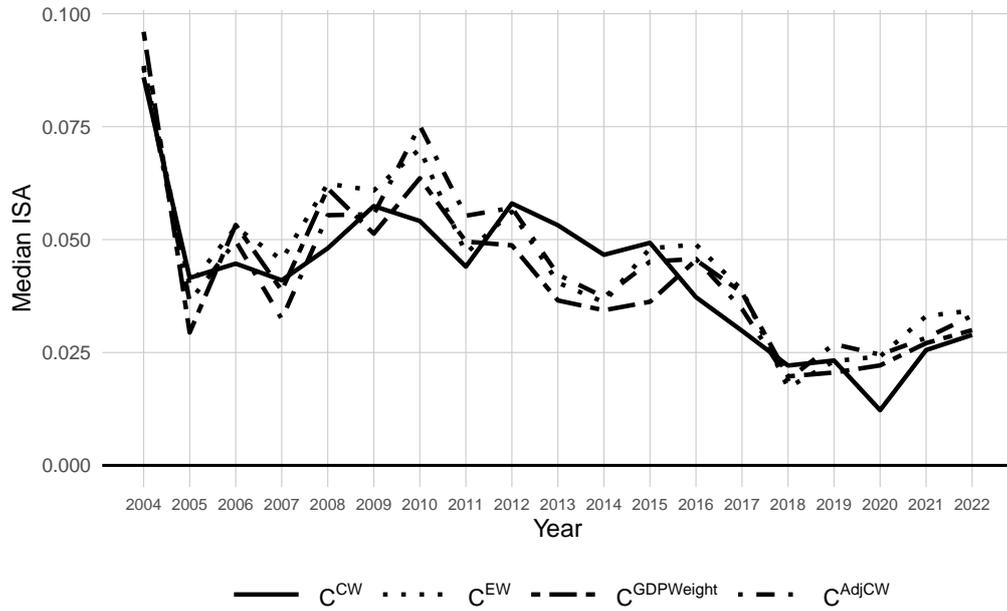
(A) Number of affiliates



(B) Number of jurisdictions

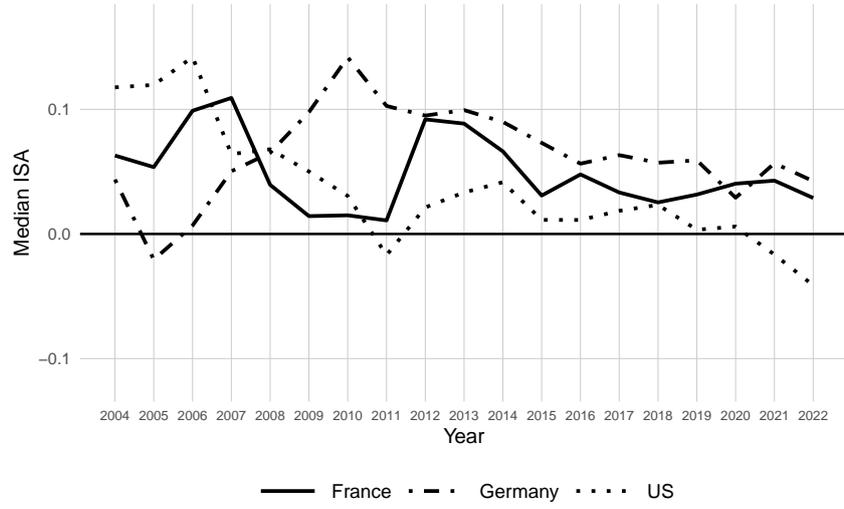
Number of affiliates (Panel A) and jurisdictions (Panel B) entering the different tax incentive measures. C^{CW} is the traditional capital-weighted tax incentive measure, calculated using affiliates' tangible fixed assets to weight statutory tax rate differentials within the multinational group. Alternative tax incentive measures include C^{EW} (equal-weighted across affiliates), $C^{GDPweight}$ (weighted by country GDP), and C^{AdjCW} (capital-weighted, with missing affiliate capital imputed using GDP). Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

FIGURE 3: Median ISA calculated using different C s

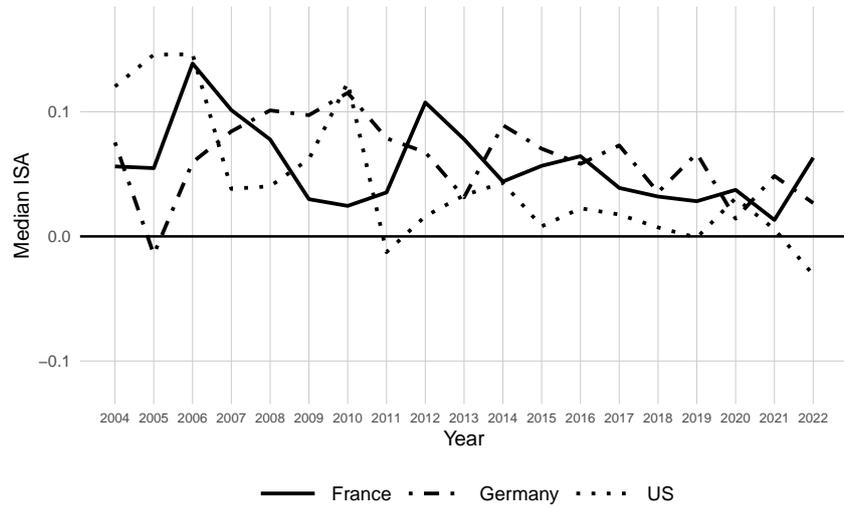


Median of Income Shifting Aggressiveness (estimated according to Equation (1)) using the four tax incentive measures C^{CW} (traditional capital-weighted), C^{EW} (equal-weighted across affiliates), $C^{GDPWeight}$ (weighted by country GDP), and C^{AdjCW} (capital-weighted, with missing affiliate capital imputed using GDP). Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

FIGURE 4: Median ISA by multinational headquarter country



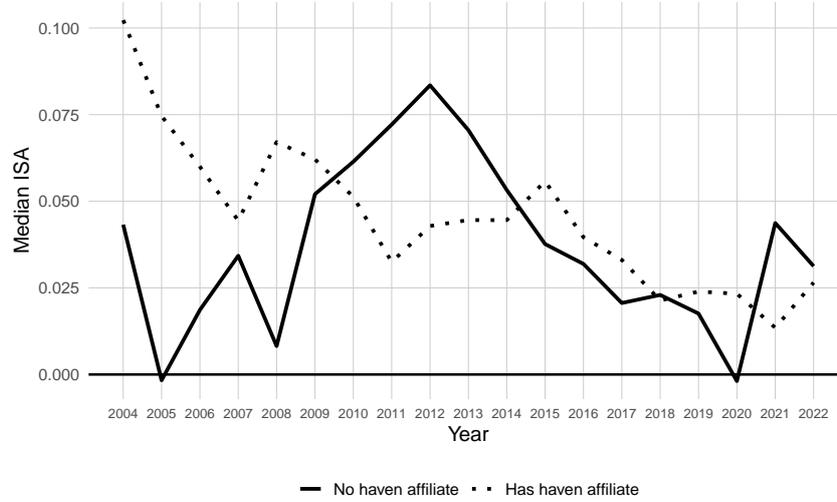
(A) C^{CW}



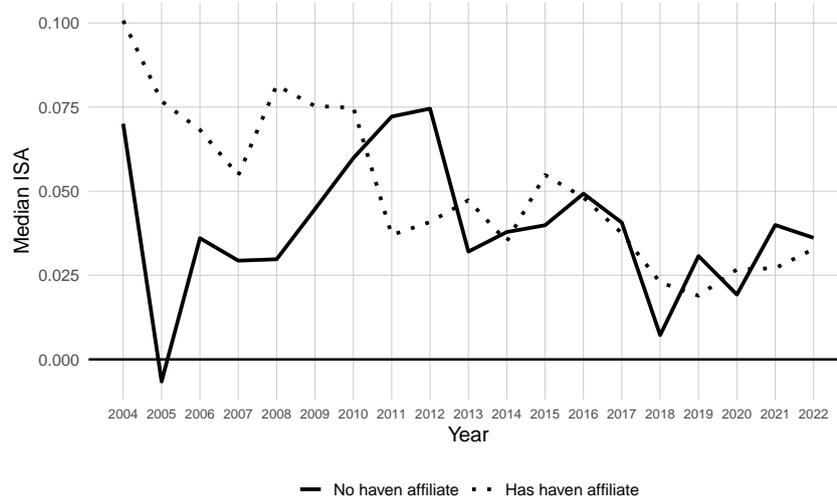
(B) C^{EW}

Median of Income Shifting Aggressiveness (estimated according to Equation (1)) for the three headquarter countries with the highest number of affiliate-years, France, Germany, and the US. Panel (A) uses C^{CW} , the traditional capital-weighted specification, as the tax incentive variable, Panel (B) uses C^{EW} , which equal-weights the tax incentive across affiliates. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

FIGURE 5: Median ISA for MNEs with and without tax haven affiliates



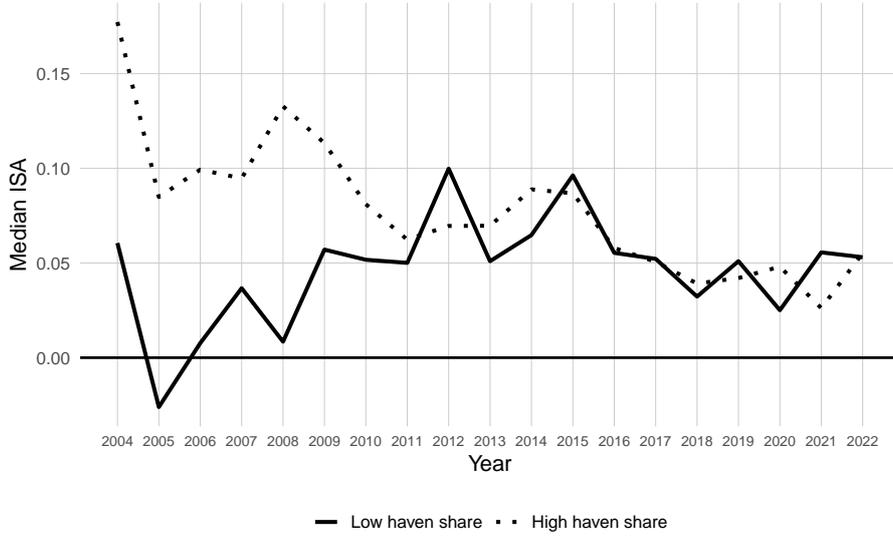
(A) C^{CW}



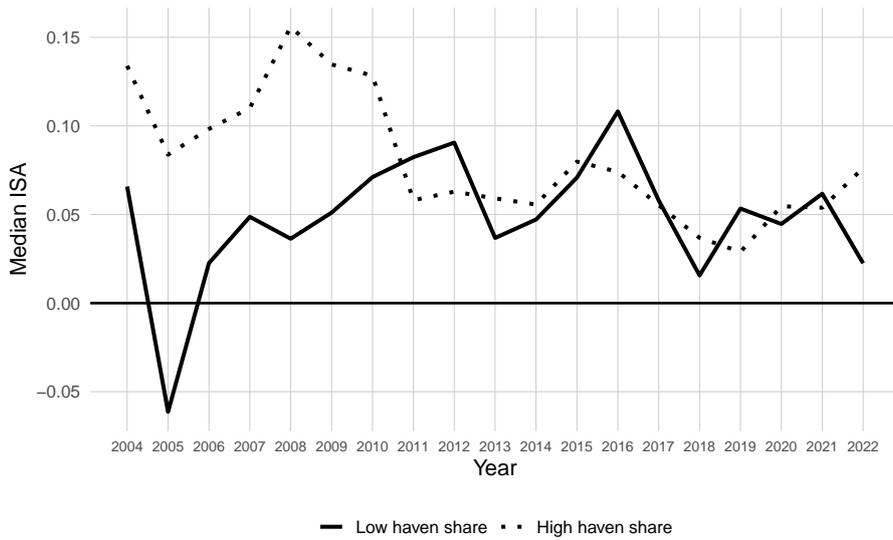
(B) C^{EW}

Median of Income Shifting Aggressiveness (estimated according to Equation (1)) for MNEs with and without tax haven affiliates. The graph defines affiliates as tax haven affiliates if they are located in Austria, Bahamas, Belgium, Bermuda, Cayman Islands, Cyprus, Hong Kong, Luxembourg, Malaysia, Panama, Singapore, Switzerland and the United Kingdom. Panel (A) uses C^{CW} , the traditional capital-weighted specification, as the tax incentive variable, Panel (B) uses C^{EW} , which equal-weights the tax incentive across affiliates. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

FIGURE 6: Median ISA by multinational's share of tax haven affiliates to total affiliates



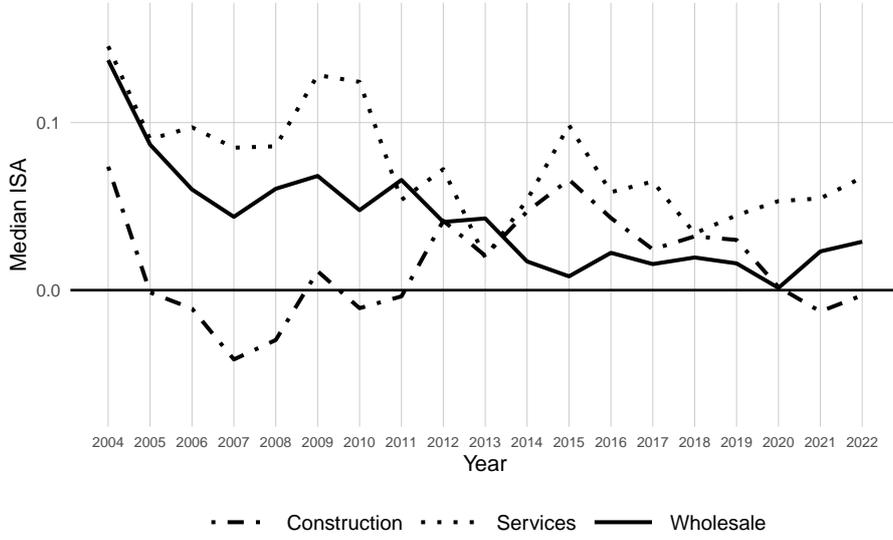
(A) C^{CW}



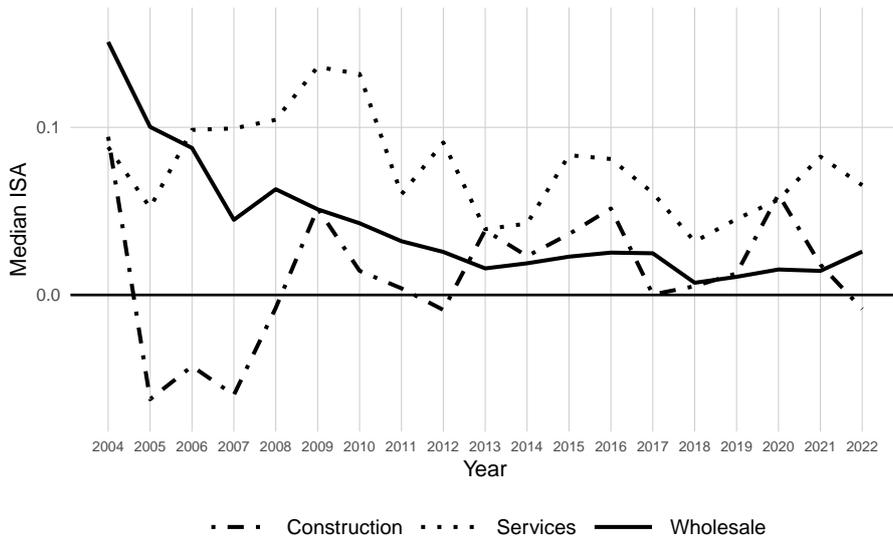
(B) C^{EW}

Median of Income Shifting Aggressiveness (estimated according to Equation (1)) for affiliates where the respective MNC has a high share of tax haven affiliates (75th percentile or higher) and for affiliates where the respective MNC has a low share of tax haven affiliates (up to the 25th percentile). Panel (A) uses C^{CW} , the traditional capital-weighted specification, as the tax incentive variable, Panel (B) uses C^{EW} , which equal-weights the tax incentive across affiliates. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

FIGURE 7: Median ISA for multinationals in the most frequent industries



(A) C^{CW}



(B) C^{EW}

Median of Income Shifting Aggressiveness (estimated according to Equation (1)) for the three industries with the highest number of affiliate-years, FF30 26 Wholesale, FF30 22 Personal and Business Services, FF30 11 Construction and Construction Materials. Panel (A) uses C^{CW} , the traditional capital-weighted specification, as the tax incentive variable, Panel (B) uses C^{EW} , which equal-weights the tax incentive across affiliates. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

TABLE 1: Sample selection to estimate ISA_{ft}

| | |
|---|------------------|
| Affiliate-years in Orbis with at least one foreign affiliate and non-missing EBIT 2009-2022 | 7,264,643 |
| Less: missing NACE Code | (3,334,048) |
| Less: banks and insurance companies | (248,085) |
| Less: assets less than or equal to zero, or missing | (386,662) |
| Less: compensation expense less than or equal to zero | (814,493) |
| Less: missing age, Δ GDP or Δ MarketSize | (325,247) |
| Less: ROA less than or equal to zero | (11,133) |
| Less: consolidated return on sales less than 3 percent | (381,200) |
| Less: industries with less than 100 firms in any year | (32,860) |
| Affiliate-years in sample | 1,730,915 |

Table 1 presents sample selection criteria. The affiliate-year sample includes 1,730,915 affiliate-years from Moody's Orbis database from 2002 to 2022 with non-missing EBIT from multinational groups with at least two affiliates in different jurisdictions in a year. Variables are obtained from Moody's Orbis database unless otherwise noted. *Age* is the natural log of one plus year t minus the year the affiliate first appears in the database. Δ GDP is GDP in year t minus GDP in year $t - 1$, scaled by GDP in year t_1 ; we obtain GDP data from the World Bank. Δ MarketSize is the country-industry-year sum of all affiliate and standalone firm sales in year t less the sum in year $t - 1$, scaled by 1,000,000. ROA is the sum of EBIT scaled by total assets.

TABLE 2: Summary Statistics

| Variable | N | Mean | Std Dev | p25 | Median | p75 |
|--------------------------|-----------|---------|-----------|--------|--------|--------|
| EBIT (mio USD) | 1,730,915 | 4.799 | 95.203 | 0.023 | 0.391 | 1.883 |
| TotalAssets (mio USD) | 1,730,915 | 115.039 | 1657.197 | 2.842 | 9.686 | 34.595 |
| TangibleAssets (mio USD) | 1,730,915 | 20.670 | 341.682 | 0.089 | 0.674 | 4.426 |
| CompExp (mio USD) | 1,730,915 | 11.323 | 173.989 | 0.644 | 1.986 | 6.228 |
| ROA | 1,730,915 | 0.072 | 1.454 | 0.006 | 0.057 | 0.132 |
| ln(TangibleAssets) | 1,730,915 | 13.321 | 2.764 | 11.392 | 13.421 | 15.303 |
| ln(CompExp) | 1,730,915 | 14.502 | 1.792 | 13.375 | 14.502 | 15.645 |
| ln(ROA + 1) | 1,730,915 | 0.050 | 0.210 | 0.006 | 0.055 | 0.124 |
| IndustryROA | 1,730,915 | 0.043 | 16.122 | 0.030 | 0.049 | 0.073 |
| Age | 1,730,915 | 1.908 | 0.695 | 1.386 | 1.946 | 2.485 |
| ΔGDP | 1,730,915 | 0.039 | 0.095 | -0.022 | 0.036 | 0.100 |
| $\Delta MarketSize$ | 1,730,915 | 65.155 | 77199.155 | -0.020 | 0.065 | 0.166 |
| Loss | 1,730,915 | 0.221 | 0.415 | 0.000 | 0.000 | 0.000 |
| C^{CW} | 1,730,915 | -0.004 | 0.053 | -0.016 | 0.000 | 0.015 |

Table 2 presents descriptive statistics for the sample. The sample selection process and construction of the estimation sample are described in Table 1. The affiliate-year sample includes 1,730,915 affiliate-years from Moody’s Orbis database from 2002 to 2022 with non-missing EBIT from multinational groups with at least two affiliates in different jurisdictions in a year. Variables are obtained from the Moody’s Orbis database unless otherwise noted. Dollar values are reported in USD millions unless logged. *EBIT* is earnings before interest and taxes (EBIT). *TotalAssets* is total assets. *TangibleAssets* is tangible fixed assets. *CompExpense* is compensation expense. *ROA* is *EBIT* scaled by *TotalAssets*. $\ln(TangibleAssets)$ is the natural log of *TangibleAssets*. $\ln(CompExpense)$ is the natural log of *CompExpense*. $\ln(ROA + 1)$ is the natural log of the sum of *ROA* and one. *IndustryROA* is country-industry-year median *ROA* for all observable affiliates. *Age* is the natural log of one plus year t minus the year the affiliate first appears in the database. *GDP* is a country’s *GDP* in year t obtained from the World Bank. ΔGDP is GDP_t minus GDP_{t-1} , scaled by GDP_{t-1} . $\Delta MarketSize$ is the country-industry-year sum of all affiliate and standalone firm sales in year t less the sum in year $t - 1$, scaled by 1,000,000. C^{CW} is the capital-weighted average differential statutory tax rate between the affiliate and all related affiliates in the same firm-year; we compile statutory tax rate data from the Research School of International Taxation (RSIT) and the Tax Foundation. *Loss* is an indicator variable equal to one if the affiliate reports *EBIT* less than zero. All variables are winsorized at 1 and 99 percent.

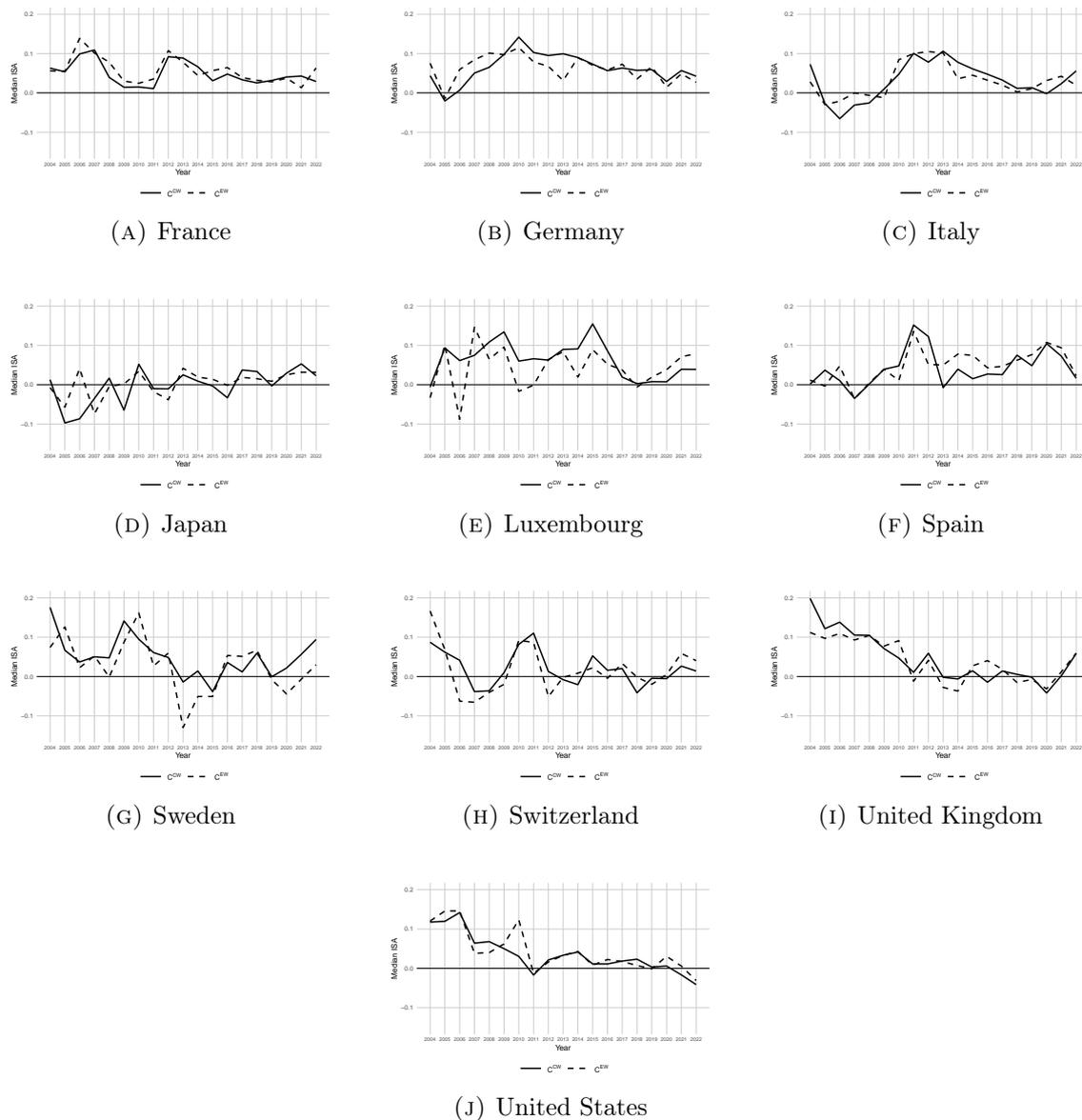
TABLE 3: Summary Statistics for Different C Measures

| Variable | N | Mean | Std Dev | p25 | Median | p75 |
|-----------------|-----------|--------|---------|--------|--------|-------|
| C^{CW} | 1,730,915 | -0.004 | 0.053 | -0.016 | 0.000 | 0.015 |
| C^{EW} | 1,730,915 | 0.015 | 0.058 | -0.024 | 0.016 | 0.055 |
| $C^{GDPWeight}$ | 1,730,915 | -0.025 | 0.062 | -0.064 | -0.011 | 0.016 |
| C^{AdjCW} | 1,730,915 | -0.004 | 0.061 | -0.038 | 0.000 | 0.032 |

Table 3 presents descriptive statistics the four different tax incentive variables. C^{CW} is the capital-weighted average differential statutory tax rate between the affiliate and all related affiliates in the same firm-year. C^{EW} is an equally weighted measure of tax rate differentials across all countries in which a multinational group operates, assigning each country equal weight regardless of the distribution of tangible fixed assets. $C^{GDPWeight}$ is a GDP-weighted measure of statutory tax rate differentials across all countries in which a multinational group operates, assigning greater weight to countries with higher GDP. C^{AdjCW} is a capital-weighted measure of tax rate differentials that adjusts for missing affiliate asset data by imputing unreported capital across jurisdictions based on GDP, ensuring the group’s full consolidated capital is represented. Data from Moody’s Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

Appendix

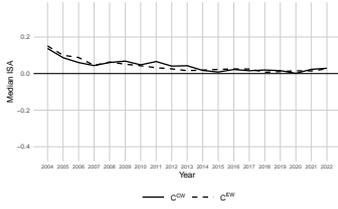
FIGURE A1: Median ISA by multinational headquarter country



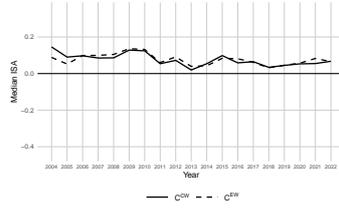
Median of Income Shifting Aggressiveness (estimated according to Equation (1)) for the ten headquarter countries with the highest number of affiliate-years, France, Germany, Italy, Japan, Luxembourg, Spain, Sweden, Switzerland, United Kingdom, and the U.S. In each graph, the tax incentive variable is measured using two specifications: C^{CW} , the traditional capital-weighted measure, and C^{EW} , which equal-weights the tax incentive across affiliates. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

FIGURE A2: Median ISA by industry

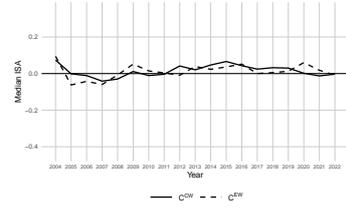
Industries with most observations



(A) 26: Wholesale

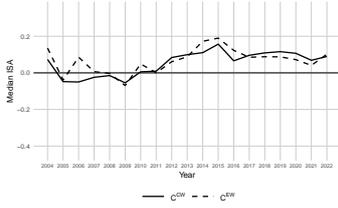


(B) 22: Services

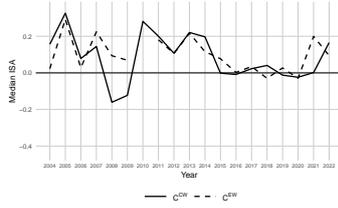


(C) 11: Construction

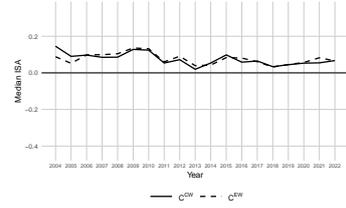
Most aggressive industries



(D) 24: Business Supplies

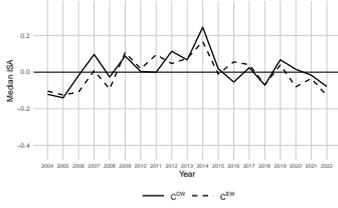


(E) 7: Apparel

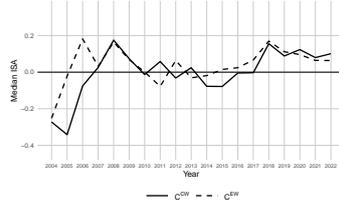


(F) 22: Services

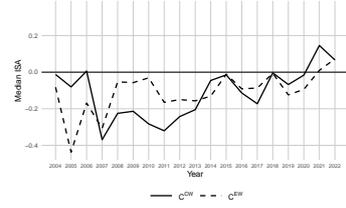
Least aggressive industries



(G) 14: Electrical Equipment

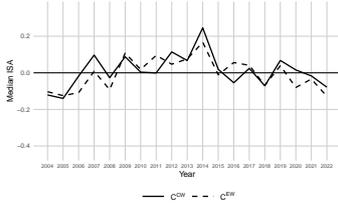


(H) 21: Communication

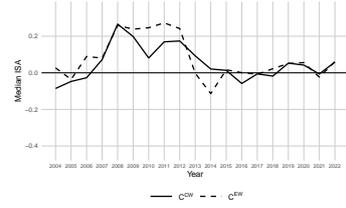


(I) 4: Recreation

Tech industries



(J) 14: Electrical Equipment



(K) 23: Business Equipment

Median of Income Shifting Aggressiveness (estimated according to Equation (1)) for the three industries with the highest number of affiliate-years (FF30 26 Wholesale, FF30 22 Personal and Business Services, FF30 11 Construction and Construction Materials), the three most aggressive industries (FF24 Business Supplies, FF7 Apparel, FF22 Personal and Business Services), the three least aggressive industries (FF14 Electrical Equipment, FF21 Communication, FF4 Recreation), and two industries that can be attributed to the tech industry (FF14 Electrical Equipment, FF23 Business Equipment). In each graph, the tax incentive variable is measured using two specifications: C^{CW} , the traditional capital-weighted measure, and C^{EW} , which equal-weights the tax incentive across affiliates. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

TABLE A1: Regression results of estimating ISA_{ft}

| | <i>Dependent variable:</i> | | | | |
|-------------------------|----------------------------|-------------------------|-------------------------|-------------------------|------------------------|
| | $\ln(ROA_{it} + 1)$ | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| $\ln(TangibleAssets)$ | -0.0016*** (-27.54) | -0.0023*** (-47.56) | -0.0023*** (-47.54) | -0.0017*** (-36.18) | -0.0015*** (-19.14) |
| $\ln(CompExp)$ | 0.0031*** (33.37) | 0.0012*** (15.52) | 0.0012*** (15.62) | 0.0007*** (10.48) | -0.0001 (-0.00) |
| $IndustryROA$ | 1.0456*** (285.18) | 0.5327*** (178.33) | 0.5294*** (176.85) | 0.5312*** (229.89) | 0.4958*** (19.65) |
| Age | 0.0061*** (28.23) | 0.0012*** (7.31) | 0.0011*** (6.85) | 0.0055*** (27.53) | 0.0043*** (15.71) |
| ΔGDP | 0.0175*** (10.32) | 0.0119*** (9.00) | 0.0118*** (8.95) | 0.0093*** (6.96) | 0.0107*** (8.37) |
| $\Delta MarketSize$ | 0.0031*** (6.22) | 0.0021*** (5.51) | 0.0022*** (5.57) | 0.0016*** (5.16) | 0.0016*** (5.01) |
| C_{it}^{CW} | -0.0180*** (-6.14) | -0.0159*** (-7.09) | -0.0468*** (-19.16) | -0.0449*** (-22.31) | -0.1062*** (-4.21) |
| $Loss$ | | -0.2259*** (-566.93) | -0.2258*** (-567.26) | -0.2177*** (-743.08) | -0.2401*** (-9.52) |
| $Loss * C_{it}^{CW}$ | | | 0.1492*** (21.68) | 0.1297*** (22.24) | 0.2725*** (10.80) |
| Estimation | Pooled | Pooled | Pooled | By industry | By industry |
| Adjusted R ² | 0.0889 | 0.4425 | 0.4429 | 0.4484 | 0.5388 |
| Period k | t | t | t | $t - 2 - t$ | $t - 2 - t$ |
| Firm Fixed Effects | No | No | No | No | Yes |

Table A1 presents results of estimating variations of equation (1) using C^{CW} (traditional capital-weighted) as the tax incentive variable. Columns (1) to (3) replicate De Simone et al. (2017) Table 5B using our sample. Column (4) presents results of estimating equation (1) using affiliate-level data by industry using the Fama-French 30 industry classifications in rolling three-year windows that includes years k such that k equals $t-2$ to t . Column (5) also includes firm indicator variables for firms with at least ten sample affiliate-years and the interactions of these indicator variables with C , $Loss$, and $C * Loss$. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors are clustered at the firm level. T-stats in parentheses. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

TABLE A2: Regression results of estimating ISA_{ft} using C^{EW}

| | <i>Dependent variable:</i> | | | | |
|-------------------------|----------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
| | $\ln(ROA_{it} + 1)$ | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| $\ln(TangibleAssets)$ | -0.0017*** (-28.00) | -0.0023*** (-48.08) | -0.0023*** (-48.03) | -0.0018*** (-37.15) | -0.0015*** (-18.83) |
| $\ln(CompExp)$ | 0.0033*** (34.48) | 0.0013*** (16.96) | 0.0013*** (17.20) | 0.0009*** (12.38) | 0.0000 (-0.07) |
| $IndustryROA$ | 1.0416*** (281.18) | 0.5292*** (174.52) | 0.5228*** (172.17) | 0.5253*** (226.24) | 0.4927*** (151.32) |
| Age | 0.0060*** (27.76) | 0.0011*** (6.81) | 0.0010*** (5.80) | 0.0054*** (27.14) | 0.0042*** (15.39) |
| ΔGDP | 0.0169*** (9.97) | 0.0114*** (8.62) | 0.0114*** (8.60) | 0.0077*** (5.71) | 0.0099*** (7.57) |
| $\Delta MarketSize$ | 0.0029*** (5.96) | 0.0020*** (5.23) | 0.0021*** (5.34) | 0.0015*** (5.03) | 0.0016*** (4.73) |
| C_{it}^{EW} | -0.0314*** (-11.61) | -0.0274*** (-13.22) | -0.0714*** (-29.84) | -0.0609*** (-35.60) | -0.1193*** (-128.14) |
| $Loss$ | | -0.2259*** (-567.03) | -0.2295*** (-580.44) | -0.2202*** (-726.47) | -0.2404*** (-2501.84) |
| $Loss * C_{it}^{EW}$ | | | 0.1998*** (30.11) | 0.1466*** (29.88) | 0.1914*** (233.37) |
| Estimation | Pooled | Pooled | Pooled | By industry | By industry |
| Adjusted R ² | 0.0890 | 0.4426 | 0.4435 | 0.4489 | 0.5362 |
| Period k | t | t | t | $t - 2 - t$ | $t - 2 - t$ |
| Firm Fixed Effects | No | No | No | No | Yes |

Table A2 presents results of estimating variations of equation (1) using C^{EW} (equal-weighted across affiliates) as the tax incentive variable. Columns (1) to (3) replicate De Simone et al. (2017) Table 5B using our sample. Column (4) presents results of estimating equation (1) using affiliate-level data by industry using the Fama-French 30 industry classifications in rolling three-year windows that includes years k such that k equals $t-2$ to t . Column (5) also includes firm indicator variables for firms with at least ten sample affiliate-years and the interactions of these indicator variables with C , $Loss$, and $C * Loss$. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors are clustered at the firm level. T-stats in parentheses. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

TABLE A3: Regression results of estimating ISA_{ft} using $C^{GDPWeight}$

| | <i>Dependent variable:</i> | | | | |
|-----------------------------|----------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
| | $\ln(ROA_{it} + 1)$ | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| $\ln(TangibleAssets)$ | -0.0017*** (-28.13) | -0.0023*** (-48.62) | -0.0023*** (-48.61) | -0.0018*** (-37.71) | -0.0015*** (-18.96) |
| $\ln(CompExp)$ | 0.0032*** (34.39) | 0.0013*** (17.09) | 0.0013*** (17.32) | 0.0009*** (12.79) | 0.0000 (-0.16) |
| $IndustryROA$ | 1.0412*** (282.51) | 0.5270*** (174.80) | 0.5210*** (172.19) | 0.5226*** (225.05) | 0.4942*** (150.13) |
| Age | 0.0061*** (28.05) | 0.0012*** (6.98) | 0.0010*** (6.13) | 0.0052*** (26.33) | 0.0043*** (15.36) |
| ΔGDP | 0.0166*** (9.82) | 0.0108*** (8.19) | 0.0107*** (8.14) | 0.0068*** (5.05) | 0.0110*** (8.27) |
| $\Delta MarketSize$ | 0.0028*** (5.76) | 0.0018*** (4.78) | 0.0019*** (4.96) | 0.0013*** (4.37) | 0.0015*** (4.52) |
| $C_{it}^{GDPWeight}$ | -0.0337*** (-13.49) | -0.0379*** (-19.80) | -0.0768*** (-36.00) | -0.0693*** (-43.55) | -0.0921*** (21.35) |
| $Loss$ | | -0.2259*** (-567.24) | -0.2220*** (-519.77) | -0.2141*** (-685.64) | -0.2358*** (-2609.55) |
| $Loss * C_{it}^{GDPWeight}$ | | | 0.1811*** (29.95) | 0.1469*** (31.82) | 0.1541*** (220.50) |
| Estimation | Pooled | Pooled | Pooled | By industry | By industry |
| Adjusted R ² | 0.0891 | 0.4427 | 0.4435 | 0.4490 | 0.5342 |
| Period k | t | t | t | $t - 2 - t$ | $t - 2 - t$ |
| Firm Fixed Effects | No | No | No | No | Yes |

Table A4 presents results of estimating variations of equation (1) using $C^{GDPWeight}$ (weighted by country GDP) as the tax incentive variable. Columns (1) to (3) replicate De Simone et al. (2017) Table 5B using our sample. Column (4) presents results of estimating equation (1) using affiliate-level data by industry using the Fama-French 30 industry classifications in rolling three-year windows that includes years k such that k equals $t-2$ to t . Column (5) also includes firm indicator variables for firms with at least ten sample affiliate-years and the interactions of these indicator variables with C , $Loss$, and $C * Loss$. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors are clustered at the firm level. T-stats in parentheses. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.

TABLE A4: Regression results of estimating ISA_{ft} using C^{AdjCW}

| | <i>Dependent variable:</i> | | | | |
|-------------------------|----------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
| | $\ln(ROA_{it} + 1)$ | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| $\ln(TangibleAssets)$ | -0.0017*** (-28.09) | -0.0023*** (-48.00) | -0.0023*** (-47.97) | -0.0018*** (-37.60) | -0.0015*** (-18.74) |
| $\ln(CompExp)$ | 0.0032*** (34.57) | 0.0012*** (16.38) | 0.0012*** (16.47) | 0.0008*** (12.31) | 0.0000 (-0.16) |
| $IndustryROA$ | 1.0374*** (279.85) | 0.5273*** (174.21) | 0.5225*** (172.03) | 0.5242*** (225.79) | 0.4934*** (151.25) |
| Age | 0.0059*** (27.22) | 0.0011*** (6.48) | 0.0010*** (5.73) | 0.0052*** (26.23) | 0.0042*** (15.32) |
| ΔGDP | 0.0163*** (9.62) | 0.0111*** (8.42) | 0.0112*** (8.44) | 0.0072*** (5.33) | 0.0097*** (7.33) |
| $\Delta MarketSize$ | 0.0028*** (5.62) | 0.0019*** (5.00) | 0.0020*** (5.10) | 0.0014*** (4.57) | 0.0015*** (4.54) |
| C_{it}^{AdjCW} | -0.0488*** (-19.11) | -0.0352*** (-17.83) | -0.0709*** (-32.27) | -0.0689*** (-41.83) | -0.1228*** (21.35) |
| $Loss$ | | -0.2258*** (-566.81) | -0.2259*** (-566.98) | -0.2177*** (-745.79) | -0.2396*** (-2524.98) |
| $Loss * C_{it}^{AdjCW}$ | | | 0.1648*** (26.75) | 0.1386*** (28.71) | 0.1847*** (231.85) |
| Estimation | Pooled | Pooled | Pooled | By industry | By industry |
| Adjusted R ² | 0.0892 | 0.4427 | 0.4433 | 0.4490 | 0.5356 |
| Period k | t | t | t | $t - 2 - t$ | $t - 2 - t$ |
| Firm Fixed Effects | No | No | No | No | Yes |

Table A4 presents results of estimating variations of equation (1) using C^{AdjCW} (capital-weighted, with missing affiliate capital imputed using GDP) as the tax incentive variable. Columns (1) to (3) replicate De Simone et al. (2017) Table 5B using our sample. Column (4) presents results of estimating equation (1) using affiliate-level data by industry using the Fama-French 30 industry classifications in rolling three-year windows that includes years k such that k equals $t-2$ to t . Column (5) also includes firm indicator variables for firms with at least ten sample affiliate-years and the interactions of these indicator variables with C , $Loss$, and $C * Loss$. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. Standard errors are clustered at the firm level. T-stats in parentheses. Data from Moody's Orbis, the World Bank, RSIT, and the Tax Foundation from 2002-2022. The sample selection process and construction of the estimation sample are described in Table 1.