

# The Effect of Foreign Operations Located in Tax Havens on Corporate Income Taxes

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## Abstract

This paper investigates the effect of tax haven activities on the effective tax burden of corporate groups in a cross-country setting. Using consolidated accounting data and ownership records from the historical Orbis database between 2007 and 2016, we find that taxes paid at the consolidated firm-level decreases with tax haven activities. Measuring tax haven activities as the percentage of tax haven affiliates to the total amount of foreign affiliates, a one percentage point increase in tax haven activities reduces the ratio of tax liabilities to pre-tax earnings (total assets) by 2.37 (0.07) percentage points. However, after controlling for firm-specific fixed effects the results are no longer significant. These results shed an interesting light on the previous literature that have neglected such unobserved firm characteristics. When using dummy variables to capture the extent of tax haven activities we find that firms benefit from a considerable presence in tax havens.

**Keywords:** Corporate Taxation; Profit shifting; Tax havens; Multinational Firms.

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# 1 Introduction

Tax havens are jurisdictions that offer low or zero tax rates and favorable regulatory policies to foreign investors.<sup>1</sup> Public concern over tax havens have existed almost as long as their emergence after World War I, but have gained considerable attention in the wake of the financial crisis of 2008/09. A number of government inquiries and leaked documents have shed light on the questionable role of tax havens in facilitating tax evasion and avoidance, money laundering and corruption by wealthy individuals, the political elite and multinational companies (MNCs). This paper investigates the role of tax havens in enabling legal tax avoidance, or profit shifting, activities by MNCs. MNCs can use tax havens to reduce or defer tax payments to other non-haven countries, through the strategic use of transfer prices, relocation of debt and various other means (Dharmapala, 2008; Hines, 2010; Palan et al., 2013).

Using firm-level data from Orbis, we find that taxes paid at the consolidated firm-level is significant and negatively associated with tax haven activities. Measuring tax haven activities as the percentage of tax haven affiliates to the total amount of foreign affiliates, a one percentage point increase in tax haven activities reduces the ratio of tax expenses to pre-tax earnings (total assets) by 2.37 (0.07) percentage points. However, after controlling for firm-specific fixed effects the results are no longer significant. These results shed an interesting light on the previous literature that have neglected such unobserved firm characteristics. When using dummy variables to capture the extent of tax haven activities we find that firms benefit from a considerable presence in tax havens. When using the ratio of tax expenses to total assets (Tax-asset ratio), we find that firms which have 1 to 4 tax haven affiliates is not expected to reduce its tax burden compared to firms with no tax haven activities. However, a firm which has 5 to 9 tax haven affiliates has on average a 0.10 percentage points lower Tax-asset ratio. Firms with more than 15 tax haven affiliates has on average a 0.20 percentage points lower Tax-asset ratio. This result is no longer significant when using the ratio of tax expenses to pre-tax earnings (ETR). This latter result appears to be explained by a difference in behavior between firms which at some point incur losses and those who stay profitable over the sample period.

A number of academic studies have pointed to the decreasing effect of tax haven activities on the effective tax burden of MNCs. A subset of these papers, e.g., Markle and Shackelford (2009, 2012a,b, 2014), have utilized cross-country data on the activities of MNCs with static

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<sup>1</sup>For example, tax havens offer secrecy and anonymity that conceal the real beneficial owner of an asset or income; lack of effective supervision and enforcement that deteriorates information exchange agreements; ring-fenced legislation for legal and tax purposes; and special rules for tax domicile (Schjelderup, 2016).

information on ownership of affiliates from Orbis. An identification issue in these papers is the lack of time-variation in tax haven activities, and thus the inability to control for unobserved firm characteristics. Also studies that observe yearly variations in tax haven activities, e.g., Dyreng and Lindsey (2009) and Jaafar and Thornton (2015), seems to neglect such unobserved firm characteristics. As pointed out by Maffini (2009), both the tax burden and demand for tax haven operations are likely correlated with the tax aggressiveness of the firm. Thus, not controlling for such unobserved firm-specific characteristics will cause biased estimates of the relationship between the effective tax burden and tax haven activities. Maffini (2009) controls for firm fixed effects but observes variation in tax haven activities only through M&As, but is unable to establish any significant difference between a cross-sectional and fixed effects specification.

In this paper we utilize a comprehensive firm-level data set, the historical Orbis database compiled by Bureau van Dijk (BvD). This database allows us to capture yearly variations in parent-affiliate relations, and therefore, tax haven activities. We apply consolidated accounting figures at the parent level as opposed to unconsolidated figures at the affiliate level. The strength in applying consolidated accounting data is the potential coverage of the firm's group structure. The majority of accounting data found in the historical Orbis database suffers from missing values. In particular, roughly 44% of all firm-year observations covered in our database have no financial data at all. In addition, excluding firm-year observations with no data on key figures such as total assets, sales, current liabilities etc. eliminates around 70% of BvD's coverage of accounting data. As a result, using unconsolidated accounting figures at the affiliate-level will fail to capture important group dynamics over time. Combining consolidated accounting and ownership data from the historical Orbis database allows us to get a more accurate representation of the activities of a multinational firm over time.

A rather similar approach has been taken by studies on tax haven activities among US multinational firms (e.g., Dyreng and Lindsey (2009) and Akamah et al. (2018)). These studies exploit an amendment to the 10-K Form submitted to the Securities and Exchange Commission (SEC) by publicly-traded firms in the US. US public firms are required to report what is known as Exhibit 21 which provides a list of countries in which all its material affiliates are located, but where no accounting items is usually recorded. Thus, Exhibit 21 offers the ability to detect variation in tax haven activities among US public firms. There doesn't seem to be a study who has exploited this feature in Orbis' historical ownership records, and thus we offer a unique sample of multinational firms across the world and their tax haven activities.

An interesting question arising from our results is why having multiple tax haven affiliates should matter for profit shifting among multinational firms. The literature on profit shifting (e.g., Hines and Rice (1994) and Huizinga and Laeven (2008)) suggests that the extent of tax avoidance (or profit shifting) depends merely on corporate tax differentials between countries, and not on the extent of tax haven operations. The results in this paper suggests that there might be substantial benefits from having multiple affiliates in countries associated with being a tax haven. This result is in line with much anecdotal evidence on profit shifting by multinational firms. A number of investigative journalists have illustrated how big companies such as Dole<sup>2</sup>, Ikea<sup>3</sup>, Nike<sup>4</sup> and Apple<sup>5</sup> among many others have used an extensive network of tax haven activities to avoid paying corporate taxes. A key element in these revelations has been the relocation of various forms of intangible assets, such as intellectual property, to tax havens. This is also documented by Dischinger and Riedel (2011).

The paper is organized as follows. Section 2 presents related literature. Section 3 presents the research design, and discusses the role of tax havens in enabling profit shifting. Section 4 describes the data used in the paper. Section 5 presents the empirical results and section 6 provides robustness analysis. Section 7 concludes.

## 2 Related Literature

Our paper is related to a literature that attempts to identify the effect of tax haven activities on the effective tax burden of multinational firms using consolidated accounting data. A number of studies by Markle and Shackelford (2009, 2012a,b, 2014), explores effective tax rates (ETR) combining consolidated accounting data on listed firms from Compustat with static ownership data from Orbis for a wide range of countries worldwide.<sup>6</sup> Closely related to this paper is Markle and Shackelford (2012b) in which the authors explores effective tax rates for MNCs located in 62 countries between 2005 and 2009, and their strategic use of debt, intangible assets and tax havens. As a measure of the ETR, Markle and Shackelford (2012b) use the

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<sup>2</sup>Lawrence and Griffiths (2007): "Revealed: how multinational companies avoid the taxman"

<sup>3</sup>Boffey (2017): EU investigates Ikea after Dutch deals reduce tax bill by €1bn

<sup>4</sup>Bowers (2017a): "How Nike Stays One Step Ahead of the Regulators"

<sup>5</sup>Bowers (2017b): Leaked Documents Expose Secret Tale of Apple's Offshore Island Hop.

<sup>6</sup>An exception here is Markle and Shackelford (2009) which uses accounting data from the Osiris database. Osiris, in addition to Orbis and Amadeus, is also compiled by BvD and provide accounting figures for public firms. Amadeus and Orbis, on the other hand, includes accounting data on both private and public firms.

ratio of tax expenses to pre-tax income.<sup>7</sup> They show that firms with affiliates in tax havens experience lower effective tax rates than firms without tax haven activities.<sup>8</sup> They also find that ETRs are decreasing in the firms' long-term debt-to-asset ratio and the extent to which firms rely on intangible assets.

Furthermore, Markle and Shackelford (2009) exploits Osiris data on firms from 85 countries between 1988-2007; Markle and Shackelford (2012a) exploits Compustat data on firms from 82 countries between 1988-2009; and Markle and Shackelford (2014) exploits Compustat data on firms from 87 countries between 2006-2011. Overall, these papers find that the country in which the parent of a multinational firm is resident, and to a lesser extent where its affiliates are resident, substantially affects its effective tax rate. Among the findings are that Japanese firms always face the highest ETRs; US firms are among the highest taxed; ETRs for tax havens and countries from the Middle East and Asia (excluding Japan) were always lower than those for the US and European countries; and firms based in tax havens faces the lowest ETRs. They also find that ETRs have been falling over the period from late 1980s, but that ETRs remained unchanged in the period from 2006 to 2011. Furthermore, they find that MNCs with tax haven affiliates face a lower ETR than firms without tax haven activities. For instance, according to Markle and Shackelford (2012a) locating an affiliate in a tax haven lowers US MNC' ETR by 1.2 percentage points.

A caveat in the analysis by Markle and Shackelford (2009, 2012a,b, 2014) is the reliance on static ownership data, and therefore no time-variation to capture changes in tax haven activities. As a result, they cannot control for firm-specific fixed effects, and thus their estimates most likely suffers from omitted variable bias. In a discussion paper, Maffini (2009) corrects for the lack of time-variation in tax haven activities by exploiting the Zephyr database, a global data set on merger and acquisitions (M&A) provided by BvD. Maffini utilizes consolidated accounting data with static ownership data from Orbis on firms from 15 countries between 2003 and 2007, and is able to capture time-variation in tax haven activities by merging these with Zephyr.<sup>9</sup> As

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<sup>7</sup>Specifically, they use the current income tax expense as the numerator in the calculation of ETR. When this variable is missing, they calculate the current income tax expense as total income tax expense minus deferred income tax expense. The Amadeus and Orbis databases report only total income tax expense, and not current or deferred income tax expenses. In the paper I will use the term tax expense, referring to the total income tax expense in the firms' financial statement.

<sup>8</sup>More specifically, they report that an interquartile increase in the ratio of tax haven affiliates to total affiliates results in a 0.54 percentage point drop in the ETR. Reading from their regression table, a one percentage increase in the use of tax haven affiliates to total foreign affiliates reduces the ETR by 0.15 percentage points.

<sup>9</sup>The countries includes: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

a measure of the effective tax burden, Maffini uses the ratio of tax expenses to total assets (Tax-asset ratio). The motivation behind the use of total assets as the denominator is the potential selection bias that occurs in using pre-tax income in the calculation of ETRs. With the ETR, the researcher needs to eliminate firm-year observations with either negative tax expenses or pre-tax income.<sup>10</sup> As Maffini points out, this selection is of importance as profitable firms and unprofitable firms might have different incentives from utilizing tax havens.<sup>11</sup> Maffini controls for firm fixed effects, and shows that the Tax-asset ratio of MNCs with tax haven activities is one percentage point lower than that of groups without tax haven activities. Maffini also shows that the Tax-asset ratio of MNCs headquartered in countries with a territorial tax system is lower than that of companies headquartered in countries with a worldwide tax system.

Jaafar and Thornton (2015) analyses tax haven activities and ETRs of publicly listed and privately held firms resident in 14 European countries Europe between 2001 and 2008 using the Amadeus database.<sup>12</sup> To capture time-variation in tax haven activities, they utilize the historical Amadeus database.<sup>13</sup> Jaafar and Thornton (2015) construct effective tax rates as the ratio of tax expenses to pre-tax income.<sup>14</sup> Jaafar and Thornton (2015) show that tax haven activities reduces the ETRs of both private and listed firms relative to firms without tax haven activities, and that the impact of tax haven activity in lowering ETRs is more pronounced in private firms than in listed firms. Although they capture time-variation in the use of tax haven activities, their empirical approach is based on OLS, including country, industry and year fixed effects, where they don't control for firm fixed effects.

There is also a number of studies exploiting data on the activities of multinational firms in a unilateral setting. Dyreng and Lindsey (2009) uses consolidated accounting data on public US multinational firms, and their tax haven activities. The authors exploit Exhibit 21 in the Form 10-K reported to the SEC. No financial data are usually recorded, however, Exhibit 21 offers the ability to identify tax haven activities over time. Akamah et al. (2018) shows that US

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<sup>10</sup>An alternative is to keep observations with negative pre-tax income and replace negative ETRs by zero (See e.g., Henry and Sansing (2018)(?) for a discussion.)

<sup>11</sup>An alternative is to use sales as the denominator, as Desai et al. (2006). However, sales figures is scarce in Orbis.

<sup>12</sup>The countries include: Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

<sup>13</sup>BvD began gathering annual historical ownership records from 2005; prior to 2005, ownership was recorded on an bi-annual basis. Thus, their study also suffers from minor mis-specified parent-affiliate relations prior to 2005.

<sup>14</sup>They also construct the ETR as the ratio of tax expenses to cash-flow from operation. The results remain qualitatively the same.

multinational firms with tax haven activities tend to aggregate their geographic disclosures in their Exhibit 21 to a greater extent than multinationals without such activities. As they point out, managers have incentives to make the firm's income shifting practices less transparent to the public, thereby hiding their activities as much as possible. As a result, companies report minimal information from their tax haven activity.

Dyreng and Lindsey (2009) show how US multinational firms that disclosed material operations in at least one tax haven country have a worldwide tax burden that is approximately 1.5 percentage points lower than firms without material operations in tax havens. They also find that US firms with operations in some tax havens have higher federal tax rates on foreign income than other firms. This result suggests that in some cases, tax haven operations may increase US tax collections at the expense of foreign countries. The main reason for this is the worldwide tax system in the US which gives a tax credit for foreign taxes. When US firms shift profits to tax havens from high-tax countries this reduces the tax credit when that income is subsequently repatriated to the US, thereby increasing the tax collections in the US.

Dyreng et al. (2013) studies the role of Delaware as a "domestic" tax haven in the US. Delaware offers a preferential tax regime for revenues generated by intangible assets. The authors show that firms likely to have a Delaware-based tax strategy are able to reduce their state income tax burden between 15% and 24% when compared to other firms. Harris et al. (1991) analyzes ETRs, measured as tax expenses divided by either US total assets or US sales, of 200 US manufacturing firms between 1984 and 1988. They show that ETRs are lower for firms with operations in tax havens. Janský and Prats (2015) shows how multinational firms operating in India in 2010 with links to tax havens reported lower profits and paid less in taxes per unit of total asset than MNCs with no such links.

Using affiliate-level data on US multinational firms, Desai et al. (2006) provide a quantification of the extent to which tax haven activities reduce the tax burden of affiliates of US multinational firms. Unlike the majority of the paper cited above, the authors exploit confidential affiliate-level data offered by the US Bureau of Economic Analysis. The authors find that US firms with tax haven activities systematically reduce their tax burden. Their results suggests a difference between tax havens in terms of economic size (measured by GDP). The use of affiliates in larger tax haven countries ("Big 7") is to reallocate taxable income among its foreign affiliates, whereas the use of affiliates in smaller tax haven countries ("Dots") is to facilitate deferral of US taxation of foreign income. They also find a regional effect, in the sense that the tax burden is lower among foreign affiliates in regions where the firm has a tax

haven affiliate in that same region.

Related studies involving the use of tax haven activities include Bennedsen and Zeume (2018), Durnev et al. (2017) and Rusina (2020). Bennedsen and Zeume focuses on a cross-country sample of public MNCs and the relationship between tax haven activities and the expropriation on firm value. They find evidence for some companies switching to new tax havens once a tax information exchange agreement (TIEA) is established. They also find that tax haven activities are more prominent among firms headquartered in countries with high corporate tax rates. Durnev et al. (2017) find that multinational firms with affiliates in tax havens exhibit lower financial reporting quality than comparable firms without tax haven activities. Finally, Rusina (2020) exploits the European Union (EU) tax haven blacklist published in 2017, to examine whether and how the use of tax havens affects firm value. The results shows that tax haven naming and shaming by the EU was associated with a negative stock price reaction of firms with tax haven activities. Overall, publication of the blacklist erased \$56 billion in market capitalization among the affected firms.

### 3 Research Design

In this section, we describe our research design. We begin by specifying the empirical strategy, and then describe how multinational firms can use tax havens for profit shifting purposes. Finally, we discuss identification and endogeneity concerns.

#### 3.1 Empirical Strategy

We are interested in the causal effects of tax haven activities on the effective tax burden of multinational firms. This relationship can be captured by a linear regression of the form

$$Y_{pt} = \beta_0 + \beta_1 Haven_{pt} + \gamma X_{pt} + \lambda_t + \alpha_p + \lambda_t \times \psi_C + \lambda_t \times \phi_I + \epsilon_{pt} \quad (1)$$

where  $Y_{pt}$  is the effective tax burden for (parent) firm  $p$  in year  $t$ . We consider two definitions of  $Y_{pt}$ . The first one is measured as tax expenses divided by pre-tax earnings (ETR), and the second is tax expenses divided by total assets (Tax-asset ratio). The variable of main interest is  $Haven_{pt}$ , capturing the extent of tax haven activities. In the first specification we define  $Haven_{pt}$  as the ratio of tax haven affiliates to foreign affiliates. In this specification,  $\beta_1$  will capture the average effect on the effective tax burden from a percentage point increase in tax haven affiliates relative to total foreign affiliates.



In a second specification,  $Haven_{pt}$  is captured by dummy variables denoting whether firm  $p$  have affiliates in tax havens in year  $t$ . In this specification  $\beta_1$  can be interpreted as the average difference between firms with tax haven activities and firms without tax haven activities on the effective tax burden. To be more specific, we compare across three groups: (i) MNCs with affiliates in tax havens; (ii) MNCs; and (iii) domestic firms.<sup>15</sup> For both measures of  $Haven_{pt}$ , we predict a negative relation with respect to the effective tax burden ( $\beta_1 < 0$ ).

$X_{pt}$  is our set of control variables, and  $\lambda_t$ ,  $\alpha_p$ ,  $\lambda_t \times \psi_C$ ,  $\lambda_t \times \phi_I$  and  $\epsilon_{pt}$  are error components. In particular,  $\lambda_t$  captures time effects common to all firms;  $\alpha_p$  captures unobserved firm-specific effects;  $\lambda_t \times \psi_C$  captures country-year effects common to all firms in the same country-year pair; and  $\lambda_t \times \phi_I$  captures industry-year effects common to all firms in the same industry-year pair. Finally,  $\epsilon_{pt}$  is an idiosyncratic error term assumed to be uncorrelated with  $Haven_{pt}$ . Whether this is a valid assumption will be discussed in Section 3.3. We estimate the model by ordinary least squares (OLS) using a within-group transformation to control for firm effects, and dummy variables to control for time, country-year and industry-year effects.

### 3.1.1 Control Variables

Our vector of firm-level control variables include key characteristics likely to be correlated with both the tax burden and tax haven activities. *Fixed asset ratio* is measured as the ratio of fixed assets to total assets. Fixed assets carry tax deductible allowances that will reduce tax expenses. Whether the amount of fixed assets relates to tax haven activities is ambiguous. Prior literature have established a causal link between the location of intangible assets in tax havens. If firms with tax havens are more tax aggressive than other firms, we can expect these firms to rely more on depreciable assets.

*Profitability* is measured as the ratio of operating pre-tax earnings (EBIT) to total assets. One could expect profitable firms are more likely to engage in profit shifting, and thus have a greater incentive to engage in tax haven activities. A change in profitability will also affect the tax expenses, however, the firm can through other strategies of tax avoidance, such as the use of debt and intangible assets, reduce the tax expense. Thus, whether more profitable firms face a greater or lower tax burden is ambiguous.

*Leverage* is measured as the ratio of total debt to total assets. Debt carry tax deductible in-

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<sup>15</sup>The previous literature have not been consistent here. Markle and Shackelford (2012b) controls for MNCs in robustness tests but only in interactions with  $Haven_{pt}$ ; Dyreng and Lindsey (2009) instead controls for the average tax rate in tax havens; and Jaafar and Thornton (2015) controls for MNCs but only those with no tax haven affiliates.

terest expenses which reduces taxable income. The strategic shifting of debt within a corporate group is a well-known method to shift profits from high-tax countries and into low-tax countries (e.g., Huizinga et al. (2008)). The use of debt for profit shifting purposes could reduce the incentive to engage in tax haven activities.

*Loss carryforward* is a dummy variable that equals one if the company has losses to be carried forward that can reduce their future tax expenses. The idea is that the demand for tax havens may be lower if the firm has no profits to shift. Hopland et al. (2018) show that parent firms with loss-making affiliates utilize losses for tax planning purposes. Thus, the expected sign on Loss carryforward is ambiguous.

Following Harris et al. (1991), we also control for *Log(Employees)* which is defined as the natural logarithm of the number of employees. Employees carry tax deductible expenses which affect the tax burden. Ideally, we would like to control for the costs of employees but this variable is scarce in the Orbis database. Whether the number of employees affects the demand for tax haven activities is however ambiguous. If one were to view the number of employees as a proxy for firm size, one could expect larger firms to have more foreign affiliates than smaller firms.

We control for the size of the firm using the logarithm of total assets, *Log(Total assets)*. Firms of larger sizes is expected to have more economic activity and therefore more foreign and also tax haven affiliates than smaller firms. Prior literature have also found a causal link between firm size and effective tax rates (e.g., Rego (2003)).

*MNC* is a dummy variable equal to one if a firm has at least one foreign affiliate. As pointed out by Markle and Shackelford (2012a), the location of foreign affiliates affects the group's tax burden. A firms' status as a multinational rather than purely domestic is likely to affect the demand for tax haven activities. A natural question is also whether tax haven activities contribute to lower tax burden, in the sense that only tax differential matters for multinational firms. Thus, what might appear as the causal effect between the tax burden and tax havens is partially driven by the fact that the firm is multinational.

*TTS* is a dummy variable equal to one if a country employs a territorial system of corporate taxation. Several studies have shown that the tax system is an important determinant of the effective tax burden (e.g., Markle and Shackelford (2012a) and Maffini (2009)). However, as we control for firm and country-year effects in this paper, only countries that are shifting system of corporate taxation will be captured by TTS. As far as we know, only the UK and Japan in

2009 changed from a worldwide system to a system based on territoriality. With a shift to a territorial tax system, foreign-source income is exempt from taxation in the home country and thus profit shifting becomes more profitable on the margin. One could therefore expect a positive relationship between a territorial tax system and tax haven activities.

In some specifications, we will also use dummy variables indicating the use of auditor. Jones et al. (2018) analyzes the role played by the Big 4 accountancy firms and the extent of tax haven operations by multinational firms. They show that there is a causal link between the size of an MNCs tax haven network and their use of a Big 4 accountancy firms. We therefore include *Big4 Auditor* as a dummy equal to one if the company employs one of the big 4 accountancy firm as their auditor and is zero otherwise.<sup>16</sup> Whether the use of auditors has an effect on the effective tax rate is ambiguous. Sikka and Hampton (2005) discusses the big 4 accountancy firms' role in tax avoidance activities, and findings by Janssen et al. (2005) suggests that hiring a big 4 accountancy firm as an auditor reduces effective tax rates by 2 percentage points.

### **3.2 Tax Havens and International Profit Shifting**

Tax havens are known to offer a variety of preferential tax regimes (PTRs) and zero or low corporate tax rates that facilitate tax avoidance activities by multinational firms. Table 1 lists the 52 countries considered to be tax havens by Hines (2010). The list is similar to those in Hines and Rice (1994), the Unco-operative tax havens in OECD (2000) and the U.S. Government Accountability Office (2008). We acknowledged that there are no universal list of countries considered to be tax havens, and a degree judgment needs to be made. In robustness analysis we provide a quantification of our empirical findings using different lists found in the previous literature.

Trade between related affiliates of a multinational group located in countries with different tax rates provide numerous possibilities for sophisticated tax avoidance. Beer et al. (2020) emphasizes transfer mispricing, the strategic location of intangible assets, international debt shifting and treaty shopping among the most popular methods used by MNCs.

It is widely suspected that firms select transfer prices used for intra-firm transactions with the goal of reducing their worldwide tax expenses. The OECD Model Double Tax Convention require firms to use transfer prices that would result from trade between unrelated parties. Given the difficulties in establishing arm's length prices, it is entirely possible for firms to adjust

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<sup>16</sup>The "Big 4" accountancy firms are Deloitte, EY, KPMG and PwC.

**Table 1:** List of tax havens

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Andorra	Liechtenstein
Anguilla	Luxembourg
Antigua and Barbuda	Macao
Aruba	Maldives
Bahamas	Malta
Bahrain	Marshall Islands
Barbados	Mauritius
Belize	Micronesia
Bermuda	Monaco
British Virgin Islands	Montserrat
Cayman Islands	Nauru
Cook Islands	Netherlands
Costa Rica	Niue
Cyprus	Panama
Djibouti	Samoa
Dominica	San Marino
Gibraltar	Seychelles
Grenada	Singapore
Guernsey	St. Kitts and Nevis
Hong Kong	St. Lucia
Ireland	St. Martin
Isle of Man	St. Vincent and the Grenadines
Jersey	Switzerland
Jordan	Tonga
Lebanon	Turks and Caicos Islands
Liberia	Vanuatu

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Source: Hines (2010).

transfer prices in a tax-sensitive fashion (Desai et al., 2006). Clausing (2003) finds that there is substantial evidence of tax-motivated transfer pricing in US intra-firm transactions. Davies et al. (2018) finds that transfer price manipulation by French MNCs are confined largely to transactions with a selection of different tax havens. No evidence was found for transfer pricing manipulation in transactions with other countries.

The strategic location of intellectual property (IP) and other forms of intangible assets offers another possibility for tax avoidance through tax havens. Companies can conduct their research and development (R&D) activities in a high-tax country but transfer the ownership of the patent subsequently created to a tax haven, for then to license the use of the asset back to the high-tax country to reduce tax expenses. Empirical evidence show that the location of valuable intangible assets is systematically distorted toward low-tax locations (e.g., Dischinger and Riedel (2011) and Karkinsky and Riedel (2012)). A PTR known as Patent Boxes provides considerable tax advantages on income from IP. According to Alstadsæter et al. (2018), patent boxes resulted in a 17.9 percentage points reduction in the corporate income tax rate on income from IP in certain European countries.

The strategic use of debt in high-tax countries and equity injections in low-tax countries provides another tax avoidance opportunity. Most corporate tax system gives deduction for costs related to debt but not to equity, thus incentivizing multinationals to relocate debt and equity among its affiliates to reduce tax payments (e.g., Huizinga et al. (2008)). For instance, Belgium and Luxembourg offers PTRs for financial coordination centers that engage in intra-firm lending.

There is considerable variation in withholding tax (WHT) rates in more than 3000 bilateral tax treaties that creates opportunities for treaty shopping. This enables MNCs to link different tax treaties and divert cross-border payments on dividends, royalties fees and interest payments through the country with the lowest WHT rate (Beer et al., 2020). Weyzig (2013) shows that reduced WHT rate on dividend payments in Dutch tax treaties is the key driver of FDI diversion through Dutch conduit companies.

In the recent years, the European Commission (EC) has undertaken multiple State aid investigations into tax agreements granted by Belgium, Luxembourg, Ireland and the Netherlands. According to the EC these agreements have violated Article 108 of the Treaty on the Functioning of the European Union (EU) by giving selected companies preferential tax treatment. In the cases against Luxembourg, Ireland and the Netherlands disputes over correct transfer prices

was central, whereas Belgium was accused of a special arrangement that allowed affiliates of a multinational group face a reduction in the tax base that resulted from just being a member of a multinational group (EC 2014, 2015).

The discussion so far highlights the incentives of multinational firms to establish multiple affiliates in tax havens as to take advantage of a low corporate tax rate or preferential tax regimes. There might also be other factors not related to differences in tax rates driving the decision of establishing several affiliates in tax havens. As Dyreng et al. (2013) argues, multinationals may use separate legal entities for different assets to isolate risk. Dyreng et al. (2013) also point to the different operating segments within a company which can have distinct legal structures. In the case of Delaware as a US domestic tax haven, firms often have multiple Delaware subsidiaries when implementing a tax avoidance strategy. According to a Norwegian Official Report (NOU 2009: 19), on tax havens and development issues, many tax havens allow companies to be moved to another jurisdiction with few effective procedures, a process known as "redomiciliation". Redomiciliation contributes to reducing or obstructing the possibility for access and legal action from third parties. A multinational firm might split ownership of an asset into multiple tax haven affiliates to reduce risk if the tax authorities becomes suspicious of aggressive tax avoidance.

### **3.3 Identification and Endogeneity Issues**

There are two sources of variation in the tax haven variables that identify the effects on the firms' tax burden. First, firms will incorporate and liquidate affiliates in tax havens; and second, firms will increase or reduce activity due to M&A activities. The empirical strategy assumes that all of this variation is exogenous with respect to the firm's effective tax rate. This is not an innocuous assumption, and deserves further attention.

Demand for tax havens are likely to be correlated with observable characteristics of the firm, such as profitability and other well-known tax avoidance strategies such as the use of debt and intangible assets. We therefore include a set of firm-specific control variables. On the other hand, as pointed out by Maffini (2009), the presence in tax havens could be correlated with unobserved characteristics of the firm, such as the ability of the tax department to reduce the tax burden of the group. To control for this issue, we assume that such unobserved characteristics are time-invariant and include firm-specific fixed effects.

A potential concern is that tax haven activities are correlated with regions of foreign operations. One example of such an endogeneity problem is that firms' demand for tax havens

changes with the location of foreign investments. A US firm that expands into the European market might simultaneously demand tax haven operations that have a closer proximity to Europe. Desai et al. (2006) provides empirical evidence for this hypothesis, where they show that ownership of regional tax haven affiliates is associated with a significant decrease in effective tax rates - more so than a broader ownership of tax haven affiliates. We attempt to correct for this issue by including a set of geographical (or regional) dummies for foreign operations in robustness analysis.

One should also be cautious when using firm-level data from financial statements, as reporting under GAAP/IFRS differs from the requirement under tax accounting principles. Thus, our measure of the effective tax burden might not reflect the actual tax burden of the firm. Another deficiency with the Orbis database is that we only observe total tax expenses, and not current or deferred tax expenses or cash taxes paid. This is due to the accounting rules in most countries not requiring such items to be reported in the financial statements.

To avoid potential mis-classification of multinational or tax haven status we remove observations around a one-year interval for these status shifts'. The reason for removing observations in the year the firm shifts status is that we are unable to identify the date of the shift, and thus the firm will have both status' within the same year. We also remove observations one year before and after the shift as there might be lags in reporting and that firms might undertake unobserved investments during this period that will cause endogeneity concerns.

## **4 Data and Descriptive Statistics**

In this section we describe the sample selection procedure employed in obtaining the working sample and present some descriptive statistics. The source of the firm-level data is the Orbis historical database. Orbis is an administrative micro-level dataset compiled by Bureau van Dijk (BvD). The database provides data on firms' financial and productive activities from balance sheets and profit and loss accounts (henceforth: financial statements) together with detailed information on domestic and international ownership structure for over 130 million companies across the world. See Appendix A for more information on how we processed the data from BvD.

## 4.1 Data and Sample Selection

Table 2 provides a summary of the sample selection criteria used for this paper. First, after merging the various firm-level data sets contained in Orbis, we have 11,326,038 firm-year observations covering the period from 2007 to 2016. Second, we constrain attention to parents or affiliates that are limited liability firms. Third, we keep only groups that are classified as either industrial or financial by BvD.<sup>17</sup> Fourth, we also remove certain industrial sectors according to NACE Rev. 2 classification sections. These includes Public administration and defence and compulsory social security ("O"); Activities of households as employers and undifferentiated goods- and services-producing activities of households for own use ("T"); Activities of extra-territorial organisations and bodies ("U"). Fifth, we remove parent firms resident in tax havens. Sixth, we keep only parent-year observations. Seventh, we remove parent firms with multiple entrances into tax havens or shifts between domestic and multinational.<sup>18</sup>

Furthermore, Orbis is well-known to suffer from a significant number of outliers. As an eighth restriction, affiliates with a ratio of total expenses to total assets (Leverage) outside a [0,1] interval is removed; ninth, we remove the top and bottom 1 percent of observations for the ratio of fixed assets to total assets (Fixed asset ratio) and the ratio of EBIT to total assets (Profitability). Tenth, we omit countries with less than 300 firm-year observations.<sup>19</sup> Eleventh, we remove firm-year observations with missing values for any of the key variables listed in Table 3. Finally, we consider two variations in our working sample. For the sample using the ratio of tax expenses to pre-tax earnings (ETR), we remove observations with either negative or zero pre-tax earnings or tax expenses. We also remove observations with ETRs above 70% which corresponds to the 99th percentile. For the sample using the ratio of tax expenses to total assets (Tax-asset ratio), we remove the top and bottom 1 percent of observations in terms of the Tax-asset ratio. As a result, we end up with a sample of 205,449 (282,921) firm-year observations using the ETR (Tax-asset ratio).

We further consider one variation in the two samples discussed above. To make our analysis comparable to the previous literature following the Markle and Shackelford (2009, 2012a,b, 2014), we consider static versions of the samples using the year 2016 as the reference for ownership relations. We also need to remove all firms that were either established or liquidated

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<sup>17</sup>Industrial is a generic term that refers to all companies that are not insurance, banks or financial firms. For more information, see BvD user guide for historical ownership databases.

<sup>18</sup>In addition, we also correct for affiliate-parent relations where an affiliate is observed with a specific parent in one year, then in the next have a different parent for then to return to the original parent the next year.

<sup>19</sup>We also remove Kuwait and Saudi Arabia as we are unable to classify their system of corporate taxation.



between 2007 and 2016. Thus, we refer to these variations as static and historical versions of two samples.

**Table 2:** Sample Selection

	Number of observations
(1) All observations between 2007 to 2016	11,326,038
(2) Exclude firms that are not limited liability	5,577,149
(3) Exclude parent firms that are not industrial or financial	5,452,412
(4) Exclude industries for parent firms	5,447,798
(5) Exclude parent firms resident in tax havens	4,954,395
(6) Keep only parent-year observations	455,761
(7) Exclude firms with multiple shifts in multinational or tax haven status	454,034
(8) Exclude firms if Leverage is outside [0,1] interval	426,596
(9) Exclude firms with outliers in Fixed asset ratio or Profitability	409,808
(10) Remove countries with firm-year observations less than 300	405,514
(11) Exclude firms with missing values in any of the variables in Table 2	288,695
(12) Exclude firms with outliers in effective tax rates (Tax-asset ratio)	204,908 (282,921)
ETR (Tax-asset ratio) sample	204,908 (282,921)

The table shows data selection criteria and trimming procedures used in order to obtain the working sample. The working sample consists of domestic and multinational firms, whose historical ownership data and balance sheet and profit and loss accounts has been obtained from the historical Orbis database. More information can be found in Appendix A.

## 4.2 Descriptive Statistics

The ETR sample represents 204,908 observations covering the 10 years between 2007 and 2016, with firms from 43 different countries. The majority of the sample constitutes purely domestic firms, and we observe 7,181 firms with operations in tax havens and 20,427 multinational firms. There are on average 3.29 observations per firm. The number of affiliates per group varies substantially with the smallest number of affiliates per group being zero, whereas the largest group have 2,390 affiliates. The number of tax haven affiliates per group varies from zero with the largest number of tax haven affiliates per group being 215. However, this being highly skewed to the right. For instance, among the sub-sample of firms with tax haven activities at some point, having zero or one tax haven affiliate constitutes 45% of the observations. In Appendix B.1 Table 15 we provide some summary statistics by country. In most countries, the ETRs are slightly lower than the statutory corporate tax rate. However, in some countries, such as Italy and Greece, the ETR is much greater than the tax rate.<sup>20</sup>

Descriptive statistics of the main variables are provided in Table 3. In Appendix B.2, Table

<sup>20</sup>In robustness test, we omit countries where the ETR is greater than the statutory corporate tax rates.

16, we show the descriptive statistics for the sample using the Tax-asset ratio. Overall the descriptive statistics remain fairly equal across the two samples. On average, we see that the ETR increases when a firm becomes multinational. However, this is due to MNCs, on average, being resident in countries with a higher statutory corporate tax rates than domestic firms. We also see that MNCs with tax haven activities are resident in countries with the highest statutory tax rates but have lower ETRs than MNCs. MNCs with tax haven activities have on average 30% of their foreign affiliates in tax havens. Roughly 13% of the observations capture firms with presence in tax havens. This is due to most of the sample consisting of domestic firms, with 37% of the observations consisting of multinational firms.

We see little variation in Profitability, however MNCs appears to be more profitable than domestic firms. Domestic firms seems to rely more on fixed assets than MNCs. However, this masks an important difference. Domestic firms rely more on fixed tangible assets whereas MNCs rely more on intangible assets. Surprisingly, domestic firms also have greater leverage than multinational firms. Multinational firms can re-balance equity and debt more aggressively than domestic firms, and one could therefore expect that MNCs have a greater leverage (e.g., Egger et al. (2010)). Loss carryforward takes into account extra items in the profit& loss accounts and is therefore marginally different than zero. We see that MNCs with tax haven affiliates incurs more frequent losses than other firms. MNCs are also, on average, larger than domestic firms in terms of total assets. The largest firms are those who have tax haven activities. Similar statistics holds also for the number of employees. We also see that the use of a Big 4 accountancy firm as auditor is substantially greater for multinational firms and in particular those with tax haven activities. Finally, roughly 80% of our sample consists of firms that are resident in countries with a territorial tax system (TTS).

**Table 3:** Descriptive Statistics: ETR Sample

	Full Sample	Domestic	Multinationals			
				Without tax	With tax	Total
				haven affiliates	haven affiliates	
Mean/(SD)	Mean/(SD)	Mean/(SD)	Mean/(SD)	Mean/(SD)		
Effective tax rate	0.277 (0.126)	0.268 (0.123)	0.293 (0.131)	0.287 (0.125)	0.291 (0.129)	
Corporate tax rate	0.280 (0.057)	0.268 (0.050)	0.293 (0.058)	0.317 (0.061)	0.302 (0.060)	
Share of tax haven affiliates	0.041 (0.154)	0.000 (0.000)	0.000 (0.000)	0.307 (0.311)	0.110 (0.237)	
At least 1 tax haven affiliate	0.132 (0.339)	0.000 (0.000)	0.000 (0.000)	1.000 (0.000)	0.357 (0.479)	
MNC	0.371 (0.483)	0.000 (0.000)	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)	
Profitability	0.092 (0.070)	0.091 (0.072)	0.093 (0.066)	0.092 (0.062)	0.093 (0.065)	
Fixed asset ratio	0.428 (0.245)	0.430 (0.260)	0.404 (0.217)	0.466 (0.210)	0.426 (0.217)	
Leverage	0.556 (0.214)	0.564 (0.222)	0.544 (0.204)	0.536 (0.192)	0.541 (0.200)	
Loss carryforward	0.007 (0.081)	0.005 (0.069)	0.009 (0.095)	0.011 (0.102)	0.010 (0.098)	
Log(Employees)	5.609 (2.073)	4.945 (1.759)	6.075 (1.771)	7.920 (2.073)	6.734 (2.082)	
Log(Total assets)	17.910 (2.155)	17.187 (1.814)	18.404 (1.775)	20.457 (2.088)	19.137 (2.133)	
Big4 Auditor	0.158 (0.365)	0.099 (0.299)	0.197 (0.397)	0.369 (0.482)	0.258 (0.438)	
TTS	0.809 (0.393)	0.832 (0.374)	0.835 (0.371)	0.650 (0.477)	0.769 (0.421)	
Observations	204,908	128,924	48,839	27,145	75,984	

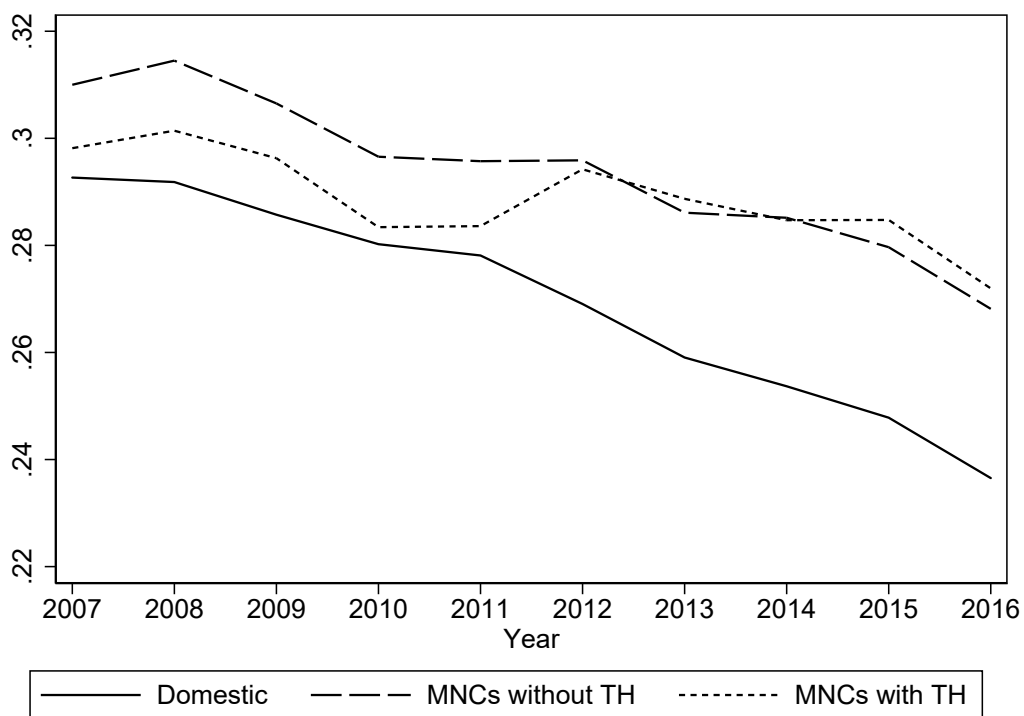
The table gives descriptive statistics for all dependent and independent variables used in our analysis. The dependent variable is the tax-asset ratio constructed as the ratio between tax expenses and total assets. Corporate tax rate is the statutory corporate tax rate in the countries where a parent firm is resident. Our independent variables of main interest are: (1) the ratio of tax haven affiliates to foreign affiliates, (2) a dummy variable equal to one if the firm has at least one tax haven affiliate. We employ nine firm-level control variables: (1) MNC is a dummy variable equal to one if a firm has a foreign affiliate, and 0 otherwise; (2) Profitability is measured as the ratio of pre-tax income to total assets; (3) Fixed asset ratio which is measured as the ratio of fixed assets to total assets; (4) Leverage which is measured as the ratio of current and non-current liabilities to total assets; (5) Loss carryforward which is a dummy variable that equals one if the company has losses to be carried forward that can reduce their future tax liabilities; (6) Log(Employees) is the natural logarithm of the number of employees; (7) Log(Total assets) is the natural logarithm of total assets; (8) Big4 Auditor is a dummy variable equal to one if the company employs one of the big 4 accountancy firm as their auditor, and is zero otherwise, (9) TTS is a dummy variable equal to one if the country of residence employs a territorial tax system, and is zero otherwise.

In Figure 1 we show the development in the ETR and the Tax-asset ratio over time, where we distinguish firms into domestic firms, multinational firms without tax haven activities and multinational firms with tax haven activities. The relationship found in Table 3 appears to be stable over time, with a slight decrease in the ETR over the period. This is line with Markle and Shackelford (2014) which documents stable ETRs between 2006 and 2011. The Tax-asset ratio appears to be decreasing rapidly in the years following the global financial crisis in 2008/09.

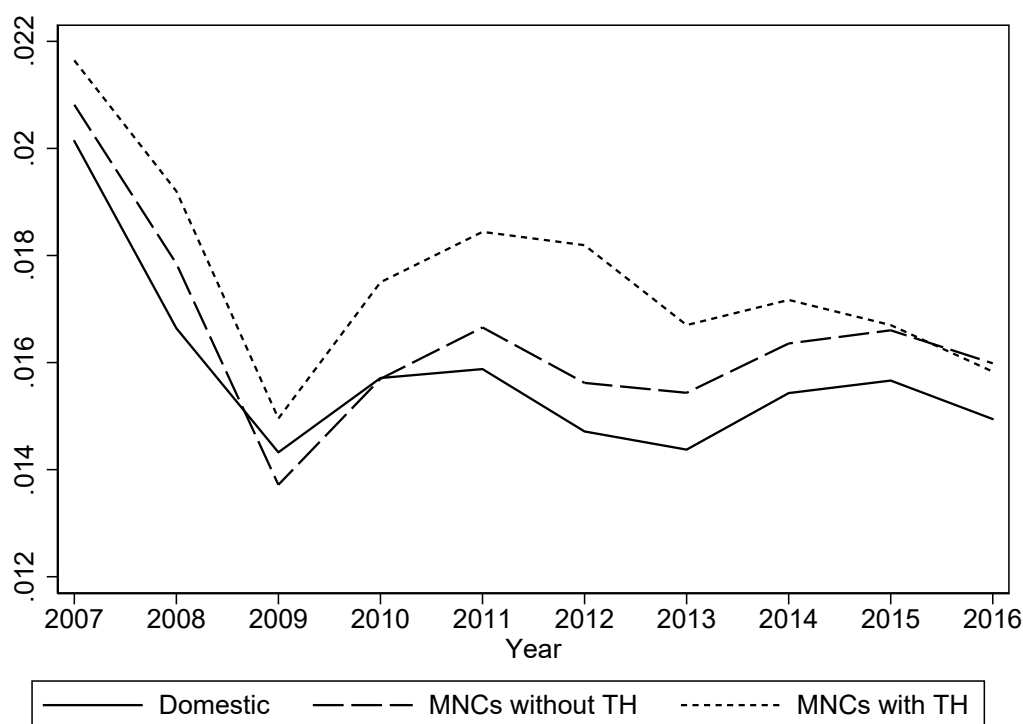
**Figure 1:** Effective tax burden

The figures shows the development in the effective tax rate (panel a) the tax-asset ratio (panel b) among purely domestic and multinational firms. For multinational firms we distinguish between those without tax haven affiliates (dashed line) and those with tax haven affiliates (dotted line).

(a) Effective tax rates



(b) Tax-asset ratio



## 5 Empirical Results

In Table 4 we estimate Eq. (1) using the share of tax haven affiliates to foreign affiliates as the independent variable. Columns (1)-(3) uses the ETR as the dependent variable whereas columns (4)-(6) uses the Tax-asset ratio. Columns (1) and (4) relies on a static version of the Orbis database where we assume constant ownership of affiliates and only observes firms that are active in the period between 2007 and 2016. Finally, the remaining columns utilizes the historical variation found in Orbis.

Column (1) is similar to that reported in the baseline specification by Markle and Shackelford (2012b). Our tax haven estimator shows that a one percentage point increase in the share of tax haven affiliates (relative to total foreign affiliates) decreases the ETR by 2.43 percentage points, and is of roughly 16 times larger than Markle and Shackelford (2012b). A source of bias in this estimator is the reliance on a static sample, and thus we are likely to mis-specify the share of tax haven affiliates in years prior to 2016. In column (2), we correct for such mis-classification of affiliate-parent relationships. The results shows a slight reduction in the tax haven estimator, from 2.43 to 2.37 percentage points reduction in ETRs. The estimator in column (2) is still biased as we have not controlled for unobserved firm-specific characteris-

tics. As pointed out by Maffini (2009), the use of tax havens is likely correlated with the tax aggressiveness of the firm. Assuming such tax aggressiveness to be constant, we can control for such an effect with firm fixed effects. Column (3) thus controls for firm fixed effects. The result shows that the tax haven variable reduces further by 0.10 percentage points compared to column (2), but is no longer significant at any reasonable level. This result is quite remarkable given the lack of firm fixed effects in the prior literature. One explanation is simply that tax aggressive firms can utilize deductions and other forms of tax subsidies to reduce their tax expenses. For instance, a joint report by the Institute for Policy Studies and Americans for Tax Fairness notes that General Electric's tax return in 2011 totaled more than 57,000 pages.

The analysis above is repeated for the Tax-asset ratio, and we see a similar pattern. Neglecting firm fixed effects results in a highly significant tax haven estimator, which reduces the Tax-asset ratio between 0.011 and 0.07 percentage points. When controlling for firm fixed effects in column (6) the estimator reduces to zero and is no longer significant.

The majority of the control variables turn out highly significant. Surprisingly, the MNC dummy is positive and no longer significant in the fixed effects specifications. This stands in contrast to previous literature that documents a decreasing ETR as firms become multinational (see e.g., Grubert et al. (1993) and Bilicka (2019)). It's important to control for MNC status as MNCs will still face tax differentials that gives rise to profit shifting opportunities. This effect has often been neglected in the previous literature (e.g., Markle and Shackelford (2012b) and Dyreng and Lindsey (2009)). Also an increase in profitability reduces the ETR but increases the Tax-asset ratio. An increase in the Fixed asset ratio reduces the effective tax burden. Increasing the use of debt relative to equity increases the ETR but reduces the Tax-asset ratio. Incurring losses, increases the ETR and reduces the the Tax-asset ratio. Increasing the number of employees increases both the ETR and the Tax-asset ratio. Increased firm size, measured by the logarithm of total assets, reduces both the ETR and the Tax-asset ratio. Finally, shifting from a worldwide system of corporate taxation to a system based on territoriality reduces both the ETR and the Tax-asset ratio.

**Table 4:** Effective tax rates and the share of tax haven affiliates

	Effective tax rates			Tax-Asset ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
Share of tax haven affiliates	-0.0243*** (0.0056)	-0.0237*** (0.0030)	-0.0027 (0.0047)	-0.0011** (0.0006)	-0.0007** (0.0003)	-0.0000 (0.0005)
MNC	0.0044*** (0.0016)	0.0049*** (0.0010)	0.0026 (0.0017)	0.0007*** (0.0002)	0.0010*** (0.0001)	0.0000 (0.0002)
Profitability	-0.0772*** (0.0080)	-0.0876*** (0.0050)	-0.2646*** (0.0072)	0.1628*** (0.0016)	0.1358*** (0.0011)	0.1191*** (0.0013)
Fixed asset ratio	-0.0173*** (0.0026)	-0.0122*** (0.0018)	0.0022 (0.0045)	-0.0083*** (0.0003)	-0.0088*** (0.0002)	-0.0117*** (0.0005)
Leverage	0.0411*** (0.0028)	0.0541*** (0.0019)	0.0759*** (0.0043)	-0.0111*** (0.0003)	-0.0109*** (0.0002)	-0.0011** (0.0005)
Loss carryforward	0.0177** (0.0074)	0.0165*** (0.0052)	0.0290*** (0.0056)	0.0020*** (0.0002)	-0.0001 (0.0001)	-0.0008*** (0.0001)
Log(Employees)	0.0092*** (0.0005)	0.0082*** (0.0004)	0.0056*** (0.0007)	0.0009*** (0.0000)	0.0009*** (0.0000)	0.0005*** (0.0001)
Log(Total assets)	-0.0087*** (0.0006)	-0.0081*** (0.0004)	-0.0047*** (0.0015)	-0.0009*** (0.0001)	-0.0012*** (0.0000)	-0.0029*** (0.0002)
TTS	-0.0455** (0.0223)	-0.0428** (0.0192)	-0.0542* (0.0296)	-0.0019 (0.0024)	-0.0034 (0.0022)	-0.0084*** (0.0027)
Observations	106,440	202,440	202,440	142,085	280,866	280,866
Adj. R-squared	0.176	0.188	0.064	0.573	0.522	0.363
No. of firms	20,682	57,332	57,332	22,947	69,034	69,034
Firm FE	No	No	Yes	No	No	Yes
Ownership	Static	Historic	Historic	Static	Historic	Historic

Detailed variable definitions are given in Table 3. Column (3) is our baseline specification. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

In Table 5 we estimate Eq. (1) using dummies for the presence in tax havens. Columns (1)-(3) uses the ETR as the dependent variable whereas columns (4)-(6) uses the Tax-asset ratio. All columns utilizes the historical data. In column (1) we run a similar regression to that reported by Jaafar and Thornton (2015), where the tax haven variable is a dummy equal to one if the firms has at least one tax haven affiliate. The result shows that the average effect of entering a tax haven reduces the ETR by 1.04 percentage points, and is of a smaller magnitude compared to Jaafar and Thornton (2015) estimator. In column (2) we control for firm fixed effects and as previously, the estimator on the tax haven variable is no longer significant. In column (3) we distinguish presence in tax havens into several dummy variables to capture the extent of tax haven activities. We see a monotonously reduction on the ETR as the firms increase their presence in tax havens. However, with fixed effects, no dummy variable returns significant. In Column (6) we repeat the specification for the Tax-asset ratio. We see the same monotonously reduction in the Tax-asset ratio as the firm expands its tax haven operations, and the dummies are now also highly significant. Whereas a firm with between 1 and 4 tax haven affiliates is not expected to reduce its Tax-asset ratio compared to firms with no tax haven activities, a firm with between 5 and 9 tax haven affiliates has on average a 0.10 percentage points lower Tax-asset ratio. Firms with more than 15 tax haven affiliates has on average a 0.20 percentage lower Tax-asset ratio.



**Table 5:** Effective tax rates and dummies for tax haven activities

	Effective tax rates			Tax-Asset ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
At least 1 tax haven affiliate	-0.0104*** (0.0014)	0.0012 (0.0021)		0.0006*** (0.0002)	0.0000 (0.0002)	
Between 1 and 4 tax haven aff.			0.0013 (0.0021)			0.0001 (0.0002)
Between 5 and 9 tax haven aff.			-0.0011 (0.0037)			-0.0010** (0.0004)
Between 10 and 15 tax haven aff.			-0.0050 (0.0055)			-0.0014** (0.0006)
More than 15 tax haven aff.			-0.0086 (0.0079)			-0.0020*** (0.0007)
MNC	0.0050*** (0.0010)	0.0024 (0.0017)	0.0023 (0.0017)	0.0009*** (0.0001)	-0.0000 (0.0002)	-0.0000 (0.0002)
Observations	202,440	202,440	202,440	280,866	280,866	280,866
Adj. R-squared	0.188	0.063	0.063	0.522	0.363	0.363
No. of firms	57,332	57,332	57,332	69,034	69,034	69,034
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Ownership	Historic	Historic	Historic	Historic	Historic	Historic

Detailed variable definitions are given in Table 3. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

## 6 Robustness Tests

Several features of our data is explored further in robustness analysis. With the exception of Section 6.1, in the remainder of this paper we will use the ETR as the measure of the effective tax burden and the share of tax haven affiliates as our measure of tax haven activities.

### 6.1 Sample Selection: Loss-making Firms

An interesting observation follows from the discussion in the preceding section. A key difference in using the two measures of the effective tax burden is how we treat firms in year with losses. Using the conventional measure of tax burden, pre-tax income in the denominator, we effectively eliminate firms in year with losses. In Table 6 we therefore focus attention along this dimension, using the Tax-asset ratio and dummy variables for tax haven activities. Column (1) is the specification from Table 5, column (6). In column (2) we include only observations where firms incurs losses. We see a similar pattern as the specification in Table 5, column (6) but the estimators that are larger in magnitude. In column (3) we exclude observations of firms in loss-years. A similar pattern again arises, however, the estimators on the dummy variables are of a smaller magnitude.

To further explore the effects of loss observations, column (4) focus on the subset of firms that incurs a loss at least once during our sample period and in column (5) we focus on the subset of firms that never incurs losses over the ten year period. The intuition here is that profitable firms should have greater incentives to utilize tax havens than firms that can reduce tax liabilities due to loss carryforwards. Whereas the results in column (4) show a similar pattern, the estimators is no longer significant for the subset of profitable firms. The results therefore suggests that it's the subset of loss-making firms that are driving the negative effect of tax haven activities when controlling for firm fixed effects.

**Table 6:** Effect of tax haven activities on the ETR: Loss-making firms

	(1)	(2)	(3)	(4)	(5)
	Baseline	Only Loss-makers	Excluding Loss-makers	Once a Loss-maker	Never a Loss-maker
Between 1 and 4 tax haven aff.	0.00007 (0.00022)	0.00037 (0.00056)	-0.00016 (0.00020)	0.00036 (0.00032)	-0.00031 (0.00026)
Between 5 and 9 tax haven aff.	-0.00102** (0.00040)	-0.00175 (0.00137)	-0.00092*** (0.00033)	-0.00099 (0.00061)	-0.00062 (0.00042)
Between 10 and 15 tax haven aff.	-0.00142** (0.00059)	-0.00413* (0.00215)	-0.00088* (0.00049)	-0.00227** (0.00094)	-0.00033 (0.00060)
More than 15 tax haven aff.	-0.00202*** (0.00073)	-0.00693*** (0.00267)	-0.00108* (0.00062)	-0.00303*** (0.00115)	-0.00027 (0.00078)
Observations	280,866	58,991	221,875	140,774	140,092
Adj. R-squared	0.363	0.057	0.526	0.302	0.588
No. of firms	69,034	29,411	60,714	29,530	39,504
Firm FE	Yes	Yes	Yes	Yes	Yes

The dependent variable is the Tax-asset ratio. Detailed variable definitions are given in Table 3. Column (2) includes firm-year observations with losses. Column (3) excludes firm-year observations with losses. Column (4) includes only firms which incurred losses. Column (5) excludes firms which incurred losses. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

## 6.2 Active versus Passive Affiliates

One particular dimension of tax haven activity that seems to have been neglected so far in the literature is whether one can expect that all affiliates located in tax havens engage in profit shifting. An obvious reason for this is simply that the lack of transparency and public registers in tax havens do not allow us to observe the affiliates' financial records. Still, some affiliates in tax havens have public insight and we can use this to distinguish between active and passive affiliates. If most tax haven affiliates are passive firms one could expect that such firms do not engage in profit shifting. In Table 7 we define active tax haven affiliates as those who report either a positive total asset or operating revenues. In most columns we see little impact on the ETR from distinguishing between the two types. In fact, the results in columns (1) and (2) suggests that having active affiliates in tax havens seems to increase the groups' consolidated ETR.

**Table 7:** Effect of tax haven activities on the ETR: Active versus passive affiliates

	(1)	(2)	(3)	(4)	(5)
Have financial items	0.0060 (0.0044)				
Have Op. revenues		0.0073* (0.0040)			
Growth in Op. revenues			-0.0005 (0.0004)		
Share of active tax haven affiliates				-0.0117 (0.0072)	-0.0026 (0.0101)
Observations	14,717	14,717	7,784	208,915	208,915
Adj. R-squared	0.063	0.063	0.074	0.185	0.067
No. of firms	3,775	3,775	2,173	58,194	58,194
Firm FE	Yes	Yes	Yes	No	Yes

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. Have financial items is a dummy variable equal to one if the firm has reported non-zero financial items (operating revenues or total assets) in any tax haven affiliate. Have Op. revenues is a dummy variable equal to one if the firm reports operating revenues in any tax haven affiliates. Growth in Op. revenues measures the yearly change in operating revenues reported in any tax haven affiliates. Share of active tax haven affiliates considers only an affiliate to be a tax haven affiliate if it reports a financial item (operating revenue or total assets). \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

### 6.3 Variations in sub-samples

In Table 8 we divide our sample period into sub-periods to capture whether our results are sensitive to Orbis' increasing coverage over time. In column (1) and (2) we follow Johansson et al. (2017) and divide our sample into two five-year periods. The result in column (1) remain largely unaffected compared to the baseline specification in Table 4. However, in column (2) we see that the coefficient changes sign. In column (3) we follow the selection in Janský (2019). Again we restrict attention to the five-year period between 2012 and 2016 but now for all firms that have at least three years of observations during this period. Surprisingly, the coefficient, compared to column (2), one again changes sign. Finally, in column (4) we remove 2007 and 2016. Again, we see that the coefficient on the tax haven variable changes sign compared to the baseline specification.

**Table 8:** Effect of tax haven activities on the ETR: Sample periods

	(1)	(2)	(3)	(4)
	Between 2007 and 2011	Between 2012 and 2016	Between 2012 and 2016 Min. 3 years	Between 2008 and 2015
Share of tax haven affiliates	-0.01498 (0.01006)	0.00018 (0.00758)	-0.00194 (0.00773)	0.00045 (0.00563)
MNC	0.00402 (0.00296)	0.00432 (0.00274)	0.00470* (0.00281)	0.00415** (0.00198)
Profitability	-0.26625*** (0.01094)	-0.30888*** (0.01113)	-0.30321*** (0.01164)	-0.29072*** (0.00830)
Fixed asset ratio	0.02654*** (0.00776)	-0.01716** (0.00723)	-0.02002*** (0.00748)	-0.00446 (0.00528)
Leverage	0.09275*** (0.00757)	0.09132*** (0.00712)	0.09471*** (0.00734)	0.07681*** (0.00511)
Log(Employees)	0.00343*** (0.00107)	0.00685*** (0.00118)	0.00717*** (0.00120)	0.00675*** (0.00086)
Log(Total assets)	-0.00706*** (0.00264)	-0.00748*** (0.00259)	-0.00795*** (0.00267)	-0.00474*** (0.00182)
TTS	-0.04517* (0.02672)	0.00000 (.)	0.00000 (.)	-0.02707 (0.02991)
Observations	93,266	109,174	88,728	163,119
Adj. R-squared	0.037	0.056	0.057	0.059
No. of firms	38,017	41,859	26,391	49,789
Firm FE	Yes	Yes	Yes	Yes

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. In column (1) we focus on the sample period between 2007 and 2011. In column (2) we focus on the sample period between 2012 and 2016. In column (3) we focus on the sample period between 2012 and 2016, and include only firms with at least three years of observations. In column (4) we remove 2007 and 2016 from the sample. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

## 6.4 Large and small firms

In Table 9 we restrict the sample to investigate whether tax haven activities is confined to particular firms. Large MNCs may have more opportunities to engage in tax planning and also lower costs in doing so. In this subsection, we explore this issue by splitting the original sample into large and small firms. In columns (1) and (2), we split according to the number of affiliates in the group. The median number of affiliates is 4.<sup>21</sup> The coefficient on the tax haven variable remain largely unaffected compared to the baseline specification.

Columns (3) to (6) splits the sample according to total assets (in millions). In column (3) we take corporate groups with values below the median (259.15) and column (4) captures firms with total assets above the median; column (5) captures firms above the 75th percentile (1,245.90); column (6) captures firms above the 90th percentile (6,762.01); whereas column (7) captures firms above the 99th percentile (140,821.20). Again, we see that the coefficient on the tax haven variable remain largely unaffected compared to baseline specification.

<sup>21</sup>This includes domestic firms as well, and the median number of affiliates for multinational firms is 9.

**Table 9:** Effect of tax haven activities on the ETR: Small and large multinational firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Small MNCs	Large MNCs	Small MNCs	Large MNCs	Very Large MNCs	Very Large MNCs
	< 4 affiliates	≥ 4 affiliates	< 50th percentile	≥ 50th percentile	≥ 75th percentile	≥ 90th percentile
Share of tax haven affiliates	-0.00478 (0.00838)	-0.00029 (0.00633)	-0.00973 (0.01116)	-0.00124 (0.00523)	0.00626 (0.00650)	-0.00313 (0.01009)
MNC	0.00145 (0.00282)	0.00329 (0.00249)	0.00151 (0.00298)	0.00376* (0.00212)	0.00139 (0.00310)	0.00731 (0.00504)
Profitability	-0.22593*** (0.00894)	-0.30266*** (0.01160)	-0.24310*** (0.00895)	-0.28229*** (0.01260)	-0.25224*** (0.01964)	-0.21294*** (0.02999)
Fixed asset ratio	0.00294 (0.00635)	-0.00189 (0.00649)	0.01597** (0.00631)	-0.01249* (0.00657)	-0.02564*** (0.00920)	-0.03808*** (0.01334)
Leverage	0.05540*** (0.00597)	0.09858*** (0.00616)	0.07111*** (0.00609)	0.07960*** (0.00622)	0.06838*** (0.00843)	0.07265*** (0.01381)
Log(Employees)	0.00672*** (0.00126)	0.00526*** (0.00088)	0.00942*** (0.00142)	0.00434*** (0.00084)	0.00386*** (0.00107)	0.00186 (0.00157)
Log(Total assets)	0.00079 (0.00215)	-0.00852*** (0.00202)	-0.00539** (0.00223)	-0.00180 (0.00200)	-0.00352 (0.00249)	-0.00391 (0.00388)
TTS	-0.17226 (0.13478)	-0.05341* (0.02988)	-0.04299 (0.11694)	-0.05608* (0.03014)	-0.07980** (0.03170)	-0.05600* (0.02904)
Observations	112,821	106,775	102,242	100,781	50,041	20,004
Adj. R-squared	0.069	0.059	0.075	0.055	0.045	0.048
No. of firms	39,843	29,881	37,431	20,021	8,620	2,974
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. The table splits the data sample into large and small firms according to the total number of affiliates (columns (1) and (2)), and according to total assets (columns (3)- (7)). The median number of affiliates is 4, while the median value of total assets is 226.98 million euros. Column (5) is run on a sample of the 25% largest firms (total assets at least 1,231.71 mln euros). Column (6) is run on a sample of the 10% largest firms (total assets at least 7,635.67 mln euros). Column (7) is run on a sample of the 1% largest firms (total assets at least 176,831.10 mln euros). \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

## 6.5 Various Measures of Tax Haven Activities

Table 10 consider different measures of the tax haven variable. In column (1), we remove outliers above the 99 percentile in terms of the number of tax haven affiliates. The result is an increase in the coefficient from tax haven activities on the ETR compared to the baseline specification in Table 4. However, the estimator is still not significant. In column (2), we instead use the number of tax haven affiliates and also the number of tax haven affiliates squared to capture potential diminishing returns to tax haven activities. Again, we see minor differences compared to the baseline specification. In column (3), the tax haven variable is measured as the growth rate of the number of tax haven affiliates. In column (4) we distinguish between firms with at least one tax haven affiliate, and those with at least five tax haven affiliates. In column (5) we instead distinguish between firms with at least one tax haven affiliate, and those with at least thirty tax haven affiliates. As in Table 5 in the last section, we see that the coefficient estimates from tax haven activities is increasing in the number of tax haven affiliates. However, they are not significant.

**Table 10:** Effect of tax haven activities on the ETR: measures of tax haven activity

	(1)	(2)	(3)	(4)	(5)
	Removing outliers	Number of tax haven affiliates squared	Growth in tax haven aff.	Dummies for tax haven aff.	Dummies for tax haven aff.
Share of tax haven affiliates	-0.00089 (0.00469)				
No. of tax haven aff.		-0.00049 (0.00035)			
No. of tax haven aff. sq.		0.00001*** (0.00000)			
Growth in tax haven aff.			-0.00071 (0.00086)		
At least 1 tax haven affiliate				0.00137 (0.00209)	0.00121 (0.00209)
At least 5 tax haven affiliate				-0.00339 (0.00316)	
At least 30 tax haven affiliate					-0.00748 (0.01196)
Observations	200,288	202,440	202,440	202,440	202,440
Adj. R-squared	0.065	0.064	0.064	0.064	0.064
No. of firms	57,174	57,332	57,332	57,332	57,332
Firm FE	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes

The dependent variable is the ETR. Detailed variable definitions are given in Table 3 In column (1), we remove outliers at the 99th percentile level in terms of the number of tax haven affiliates. In column (2), the tax haven variable is measured as the number of tax haven affiliates in addition to number of tax haven affiliates squared. In column (3), the tax haven variable is measured as the growth rate of the number of tax haven affiliates. In column (4)-(5) we include dummy variable indicating the minimum number of the tax haven affiliates. t statistics in parentheses. \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

## 6.6 Various tax haven lists

Table 11 explores various lists to identify jurisdictions as tax havens. There is no universal definition of tax havens, and as a result, there is challenges in agreeing on a particular set of characteristics that identify tax havens.<sup>22</sup> Column (1) is the baseline specification, where we employed the list in Hines (2010). In column (2) we focus on the small economies referred to as Dot-havens in Hines and Rice (1994). In column (3) we use the list in Dyreng and Lindsey (2009). The results are largely unaffected by this, which points towards a consistency across most lists.

**Table 11:** Effect of tax haven activities on the ETR: Various tax haven lists

	(1) Hines (2010) list	(2) Hines and Rice (1994) Dots-list	(3) Dyreng and Lindsey (2009) list
Share of tax haven affiliates	-0.00267 (0.00470)	-0.01736 (0.01149)	-0.00267 (0.00470)
MNC	0.00269 (0.00172)	0.00271 (0.00169)	0.00269 (0.00172)
Profitability	-0.26603*** (0.00725)	-0.26598*** (0.00725)	-0.26603*** (0.00725)
Fixed asset ratio	0.00224 (0.00448)	0.00227 (0.00448)	0.00224 (0.00448)
Leverage	0.07673*** (0.00431)	0.07668*** (0.00431)	0.07673*** (0.00431)
Log(Employees)	0.00565*** (0.00073)	0.00566*** (0.00073)	0.00565*** (0.00073)
Log(Total assets)	-0.00484*** (0.00146)	-0.00483*** (0.00146)	-0.00484*** (0.00146)
TTS	-0.05299* (0.03000)	-0.05316* (0.03001)	-0.05299* (0.03000)
Observations	202,440	202,440	202,440
Adj. R-squared	0.063	0.063	0.063
No. of firms	57,332	57,332	57,332
Firm FE	Yes	Yes	Yes
Covariates	Yes	Yes	Yes

The dependent variable is the tax-asset ratio. Detailed variable definitions are given in Table 3 In column (1), we use the Hines (2010) which is our baseline specificatin. In Column (2), we use the tax haven referred to as Dots in Hines and Rice (2010). In Column (3) we use the list reported in Dyreng and Lindsey (2010). In Column (4), we use the OECD list ... . t statistics in parentheses. t statistics in parentheses. \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

<sup>22</sup>For instance, a part of the literature have relied on the Tax Justice Networks' list of Offshore Financial Centers (OFC). However, as pointed out by Palan et al. (2013), there are important differences between OFCs and tax havens.



## 6.7 Selected Samples and covariates

Table 12 explore variations in the sample and covariates. Column (1) include only firms operating in the manufacturing sector. Column (2) includes only firms that are defined as financial firms by BvD. These include firms in holding activities, real estate but also retail and scientific activities etc. This selection returns an insignificant and positive estimator. Column (3) includes only industrial firms. Industrial firms are meant to capture all firms that are not banks, insurance or financial firms. Column (4) excludes Profitability as a covariate. Column (5) excludes Log(Employees) as a covariate. Column (6) controls for the use of a big 4 accountancy firm as auditor. Column (7) splits total assets into quintiles instead of using a log-transformation. Column (8) omit firms in various sectors. These include: Mining and quarrying; Real estate; Agriculture, forestry and fishing; Electricity, gas and water supplies. In all specifications, the coefficient on the tax haven variable is not significant and of roughly equal magnitudes as that found in the baseline specification in 4 column (3). The exception is columns (1), (2) and (6) which returns a positive but insignificant estimator.

**Table 12:** Effect of tax haven activities on the ETR: Variations in sample and covariates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Manufacturing	Financial firms	Industrial firms	Excluding Profitability	Excluding Log(Employees)	Including auditors	Asset quintiles	Selected sectors
Share of tax haven affiliates	0.00937 (0.00761)	0.01523 (0.01830)	-0.00288 (0.00497)	-0.00239 (0.00477)	-0.00242 (0.00476)	0.00053 (0.00487)	-0.00269 (0.00476)	-0.00293 (0.00484)
MNC	-0.00236 (0.00358)	0.00241 (0.00433)	0.00322* (0.00187)	0.00353** (0.00173)	0.00329* (0.00173)	0.00055 (0.00176)	0.00253 (0.00173)	0.00304* (0.00177)
Profitability	-0.23213*** (0.01506)	-0.23410*** (0.02015)	-0.26235*** (0.00789)		-0.25607*** (0.00730)	-0.24175*** (0.00725)	-0.25699*** (0.00729)	-0.25927*** (0.00734)
Fixed asset ratio	0.00336 (0.01006)	0.00480 (0.01168)	-0.00139 (0.00503)	0.02660*** (0.00448)	0.00014 (0.00458)	0.01141** (0.00469)	0.00064 (0.00454)	0.00261 (0.00466)
Leverage	0.05052*** (0.00862)	0.07957*** (0.01226)	0.07064*** (0.00468)	0.09209*** (0.00431)	0.07689*** (0.00437)	0.12033*** (0.00413)	0.07374*** (0.00428)	0.07338*** (0.00444)
Log(Employees)	0.00273* (0.00141)	0.00407** (0.00161)	0.00652*** (0.00083)	0.00520*** (0.00073)		0.00553*** (0.00074)	0.00529*** (0.00072)	0.00603*** (0.00075)
Log(Total assets)	0.00041 (0.00308)	-0.00425 (0.00391)	-0.00209 (0.00158)	-0.00239 (0.00147)	0.00018 (0.00146)	-0.02187*** (0.00118)		-0.00361** (0.00151)
TTS	-0.13625*** (0.02873)	-0.20805** (0.09264)	-0.05027* (0.02990)	-0.05771* (0.03043)	-0.05450* (0.02978)	-0.02112*** (0.00156)	-0.05421* (0.02979)	-0.05353* (0.03151)
Total assets quintile 2							-0.00176 (0.00191)	
Total assets quintile 3							-0.00140 (0.00269)	
Total assets quintile 4							0.00085 (0.00344)	
Total assets quintile 5							0.00123 (0.00422)	
Big 4						-0.01525*** (0.00175)		
Observations	49,419	24,127	173,429	203,016	203,016	203,016	203,016	194,286
Adj. R-squared	0.055	0.056	0.062	0.048	0.061	0.033	0.061	0.062
No. of firms	12,723	7,950	48,234	57,451	57,451	57,451	57,451	55,255
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. Column (1) includes only firms in the manufacturing sector. Column (2) includes only financial firms. Column (3) includes only industrial firms. Column (4) excludes profitability as a covariate. Column (5) excludes Log(Employees) as a covariate. Column (6) include the use of a Big4 auditor as a covariate. Column (7) includes quintiles for total assets instead of Log(Total assets). Column (8) omit firms in various sectors. These include: Mining and quarrying; Real estate; Agriculture, forestry and fishing; Electricity, gas and water supplies. \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

## 6.8 Geographical regions

In Table 13, we focus on separate geographical regions depending on where the firm is resident. In column (1) we include only corporate groups operating under the Schengen (EU/EEA) area. Roughly 80% of the sample include firms operating from the Schengen area. The results shows a negative but insignificant effect from tax haven activities on the ETR. In column (2) we only include firms resident outside the Schengen area. The coefficient on tax haven variable returns positive but insignificant. In columns (3) and (4) we further distinguish firms between OECD and non-OECD countries. Focusing on firms outside the OECD-area returns a somewhat significant and positive tax haven coefficient. For firms within the OECD-area, the results remain unaffected compared to the baseline specification. Finally, in column (5) we focus on firms resident in the US. We also add an interaction term to the tax haven variable - a dummy variable equal to one if the state of incorporation is either in Delaware, Nevada, Wyoming, Florida, Texas, Oregon or South Dakota. These states have been criticized as regional tax havens in various settings (e.g., Dyreng et al. (2013) and Bullough (2019)). In this case, we see that coefficient on the tax haven variable is highly significant and positive. The opposite is the case for the interaction term, pointing towards an important heterogeneity for firms located in the US.

**Table 13:** Effect of tax haven activities on the ETR: Different geographical regions

	(1)	(2)	(3)	(4)	(5)
	EU/EEA	Non-EU/EEA	OECD	Non-OECD	US
Share of tax haven affiliates	-0.00901 (0.00660)	0.00621 (0.00683)	-0.00427 (0.00544)	0.01692* (0.00997)	0.03632** (0.01746)
Share of tax haven aff. × US State					-0.03822* (0.02289)
MNC	0.00332* (0.00196)	0.00043 (0.00361)	0.00350* (0.00179)	-0.01006 (0.00656)	0.00469 (0.00534)
Profitability	-0.27444*** (0.00774)	-0.14304*** (0.02051)	-0.25771*** (0.00749)	-0.24125*** (0.03212)	0.01219 (0.02930)
Fixed asset ratio	0.00678 (0.00500)	-0.01281 (0.01065)	0.00588 (0.00476)	-0.04520*** (0.01548)	0.01338 (0.01700)
Leverage	0.08941*** (0.00481)	0.01736* (0.00987)	0.07430*** (0.00455)	0.08149*** (0.01505)	-0.04706*** (0.01438)
Log(Employees)	0.00790*** (0.00090)	0.00080 (0.00121)	0.00613*** (0.00076)	0.00200 (0.00308)	-0.00068 (0.00481)
Log(Total assets)	-0.00693*** (0.00165)	0.01105*** (0.00326)	-0.00346** (0.00156)	0.00121 (0.00470)	0.01621*** (0.00574)
TTS	-0.05749* (0.02992)	-0.04645** (0.01951)	-0.05451* (0.03004)	0.00000 (.)	0.00000 (.)
Observations	162,364	42,108	189,896	14,576	15,005
Adj. R-squared	0.071	0.030	0.062	0.053	0.013
No. of firms	46,175	11,795	52,644	5,417	3,231
Firm FE	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes

The dependent variable is the ETR. Detailed variable definitions are given in Table 3 In column (1) we include only firms resident in EU/EEA (Schengen) area. In column (2) we include only firms resident outside the Schengen area. In column (3) we include only firms resident outside the OECD countries. In column (4) we include only firms resident in the OECD countries. In column (5) we include only firms resident in the US. US State is a dummy variable equal to one if the firm is incorporated in either Delaware, Nevada, Wyoming, Florida, Texas, Oregon or South Dakota. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

## 6.9 Expansion into regions

In Table 14, we focus on separate geographical regions depending on where the firm is expanding or contracting operations. As discussed earlier, tax haven activities might be correlated with regional operations due a desire of proximity of foreign operations. Desai et al. (2006) shows that there is a regional effect of tax haven activities on the effective tax rate of affiliates of US multinational parents. Thus, in column (1), we add dummies equal to one if the group have operations in different continents. North America is left in the reference category. Most coefficients on the dummies for regional operations are positive and insignificant, with the exception of operations in Oceania. The coefficient on the number of tax haven affiliates on the ETR remain unchanged compared to the baseline specification. In column (2) we add a control variable that captures the number of affiliates in the group. The intuition here is that tax haven activities might be correlated with either an expansion or contraction of operations. Again, the coefficient on the tax haven variable remain fairly unaffected.

**Table 14:** Effect of tax haven activities on the ETR: Different geographical regions

	(1)	(2)
Share of tax haven affiliates	-0.00253 (0.00472)	-0.00270 (0.00470)
Europe	0.00031 (0.00332)	
Africa	0.00127 (0.00327)	
Asia	0.00238 (0.00263)	
Oceania	-0.00076 (0.00252)	
South America	0.00167 (0.00266)	
No. of aff. excl. tax haven aff.		-0.00001 (0.00002)
Observations	202,440	202,440
Adj. R-squared	0.064	0.064
No. of firms	57,332	57,332
Firm FE	Yes	Yes
Covariates	Yes	Yes

The dependent variable is the ETR. Europe is a dummy variable equal to one if the group have activities in Europe, and is zero otherwise. Africa is a dummy variable equal to one if the group have activities in Africa, and is zero otherwise. Asia is a dummy variable equal to one if the group have activities in Asia, and is zero otherwise. Oceania is a dummy variable equal to one if the group have activities in Oceania, and is zero otherwise. South America is a dummy variable equal to one if the group have activities in South America, and is zero otherwise. No. of aff. excl. tax haven aff. is the number of affiliates at the group level not resident in a tax haven. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . The regressions are estimated by ordinary least squares, and include year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

## **7 Conclusion**

This paper investigates the effect of tax haven operations on the tax liabilities of corporate groups in a cross-country setting, using consolidated accounting data and historical ownership records from Orbis. Our main finding is that taxes paid at the consolidated (group) level is significant and negatively associated with tax haven operations, although not by a substantial amount. Using the total number of tax haven affiliates as the independent variable, the results suggests that the average effect of extending tax haven operations by one affiliate reduces the ratio of tax liabilities to total assets (tax-asset ratio) by 0.006 percentage points. We also find that profit shifting appears to be driven by firms with an extensive presence in tax havens. Whereas firms with at least one tax haven affiliate have on average 0.03 percentage points lower tax-asset ratio than firms with no tax haven affiliates, firms with at least five tax haven affiliates have on average 0.12 percentage points lower tax-asset ratio.

# Appendices

## A Data Appendix for Orbis Files

This appendix describes the construction of the working sample used in the paper. The sample is constructed by utilizing data from the global firm-level dataset for public and private companies Orbis, compiled by Bureau van Dijk (BvD). The data was obtained by purchasing historical disks provided by BvD. For a discussion on the various methods to obtain and process data from BvD, we refer to Kalemli-Ozcan et al. (2015).

The raw data provided in the balance sheet and profit and loss accounts (henceforth financial statements) contains in total of 369,484,947 firm-year observations from as far back as 1990 to 2017, for 117,022,235 different firms and various institutional units covering 189 countries. To limit the data for the paper, we make a number of assumptions to trim the data. We match the data on financial statements with ownership and various other time-invariant firm-level data sets provided in Orbis. We do this to reduce potential measurement errors. The data from Orbis encompasses not only industrial firms, but also different types of ownership relationship such as Private Equity, Individual shareholders, state ownership etc. In the following subsections, we provide an overview.

### A.1 Ownership Selection Criteria

The time period covered in the historical ownership records is between the years 2007 to 2016. There is one txt-file for each year, and to reduce computer processing, all the separate files were chunked into pieces and for each chunk we apply the following selection criteria. We generate the variable "Global Ultimate Owner" (GUO) from the Orbis classification. Where no global ultimate owner is determined by Orbis, the first-level shareholder is used to define the appropriate company as the GUO. The first-level shareholder is here defined as the company with the largest registered ownership stake. Due to size issues we eliminate the latter firms (roughly 50 million observations), and thus only keep firms where Orbis have a clear definition of a corporate group, where we rely on GUO's that are either of an industrial, bank, insurance or financial entity type. In addition, we also correct for affiliate-parent relations where an affiliate is observed with a specific parent in one year, then in the next have a different parent for then to return to the original parent the next year.

## **A.2 Financial Statements Selection Criteria**

For the raw data provided in the financial statements, we remove firm-year observations where (on selected items we report the amount of observations removed in parenthesis):

- Consolidation code equal U1
- Consolidation code equal U2
- Consolidation code equal LF (- 163,952,224)
- Years between 2007 and 2016
- Accounting year is not equal to 12 months
- When total assets is not within a 10% error margin of total liabilities plus equity
- Total Assets is negative or missing
- Sales is missing
- Number of employees is negative
- Pre-tax income is missing
- Tax expenses is missing
- Firm-year duplicate<sup>23</sup>

### **A.2.1 Industry Classification**

The regression framework corrects for industry-specific fixed effects. Although Orbis reports a wide range of industry classifications (NACE, NACIS, US SIC), in this paper we utilize Nace Rev. 2, 4 digits core codes. For data on industry classifications we drop duplicates of firm-Nace observations.

### **A.2.2 Data on Legal Information**

Information on organizational form, entity type and incorporation date comes in a separate file containing various legal information. We drop duplicates of firm-incorporation observations.

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<sup>23</sup>This is not an innocuous assumption, and other methods, such as imputation, could be a more appropriate solution to dealing with firm-year duplicates.

### **A.2.3 Auditor data**

Information on the use of auditors come in a separate file.

### **A.2.4 Merging Orbis data files**

To construct our working sample, we merge the various firm-level data sets provided by BvD. In doing so, we remove any firm-year observations that did not match. This means that a number of firms in the (historical) Orbis database have missing values on either Nace 4 digit codes, incorporation date, organizational form or entity type. We do not remove firm-year observations where we found no match with data on auditors.

## **B Tables and Figures**

### **B.1 Descriptive Statistics on Countries - ETR Sample**



**Table 15:** List of countries - ETR sample

Country	No. of obs	ETR (in %)	Tax rate (in %)
Austria	910	27.12	30.00
Australia	458	23.61	25.00
Belgium	3,120	30.72	33.99
Brazil	292	27.55	34.00
Canada	183	24.45	28.08
Chile	91	19.55	19.52
China	8,504	20.15	25.53
Croatia	145	18.59	20.00
Denmark	5,184	25.27	24.47
Egypt	36	22.69	22.91
Finland	10,775	24.91	23.84
France	5,051	29.37	36.53
Germany	18,037	29.05	30.95
Greece	829	29.84	24.86
Hungary	315	14.45	19.23
Iceland	250	21.12	19.73
India	875	26.45	33.89
Israel	1,045	23.20	25.69
Italy	13,311	40.34	31.91
Japan	11,495	35.87	35.98
Latvia	588	19.21	15.00
Lithuania	534	18.28	15.23
Malaysia	638	24.87	25.22
Mexico	128	30.10	29.42
Netherlands	11,540	25.37	25.17
New Zealand	86	28.97	28.65
Norway	271	25.81	27.52
Pakistan	146	24.37	33.56
Philippines	291	23.29	30.54
Poland	788	20.31	19.00
Portugal	240	28.87	27.12
Russia	611	27.67	20.51
South Korea	494	24.39	24.22
South Africa	800	28.74	31.82
Spain	9,134	26.57	29.52
Sri Lanka	221	22.80	28.79
Sweden	29,359	26.03	25.33
Thailand	112	24.23	29.46
Turkey	213	19.47	20.00
Ukraine	200	24.55	18.34
UK	52,436	25.45	24.22
US	14,763	30.54	39.12
Vietnam	409	19.49	22.74

## **B.2 Descriptive Statics on the Tax-Asset Ratio Sample**

**Table 16:** Descriptive Statistics: Tax-asset ratio sample

	Full Sample	Domestic	Multinationals		
	Mean/(SD)	Mean/(SD)	Without tax	With tax	Total
			haven affiliates	haven affiliates	
	Mean/(SD)	Mean/(SD)	Mean/(SD)	Mean/(SD)	Mean/(SD)
Tax-asset ratio	0.016 (0.020)	0.016 (0.020)	0.016 (0.020)	0.017 (0.019)	0.017 (0.020)
Corporate tax rate	0.282 (0.057)	0.270 (0.051)	0.293 (0.058)	0.316 (0.061)	0.301 (0.060)
Share of tax haven affiliates	0.041 (0.156)	0.000 (0.000)	0.000 (0.000)	0.320 (0.314)	0.109 (0.238)
At least 1 tax haven affiliate	0.130 (0.336)	0.000 (0.000)	0.000 (0.000)	1.000 (0.000)	0.341 (0.474)
MNC	0.380 (0.485)	0.000 (0.000)		1.000 (0.000)	1.000 (0.000)
Profitability	0.056 (0.094)	0.058 (0.092)	0.050 (0.102)	0.056 (0.092)	0.052 (0.099)
Fixed asset ratio	0.448 (0.249)	0.452 (0.264)	0.424 (0.224)	0.474 (0.214)	0.441 (0.222)
Leverage	0.576 (0.224)	0.584 (0.230)	0.567 (0.217)	0.554 (0.203)	0.563 (0.212)
Loss carryforward	0.210 (0.407)	0.197 (0.398)	0.244 (0.429)	0.208 (0.406)	0.231 (0.422)
Log(Employees)	5.506 (2.036)	4.893 (1.754)	5.919 (1.761)	7.640 (2.143)	6.506 (2.068)
Log(Total assets)	17.859 (2.098)	17.189 (1.800)	18.299 (1.744)	20.218 (2.125)	18.954 (2.091)
Big4 Auditor	0.152 (0.359)	0.098 (0.297)	0.188 (0.391)	0.342 (0.474)	0.241 (0.428)
TTS	0.805 (0.396)	0.827 (0.378)	0.828 (0.377)	0.657 (0.475)	0.769 (0.421)
Observations	284,273	176,327	71,116	36,830	107,946

The table gives descriptive statistics for all dependent and independent variables used in our analysis. The dependent variable is the tax-asset ratio constructed as the ratio between tax expenses and total assets. Corporate tax rate is the statutory corporate tax rate in the countries where a parent firm is resident. Our independent variables of main interest are: (1) the number of tax haven affiliates, (2) dummies indicating a minimum amount of affiliates in tax havens. We employ ten firm-level control variables: (1) Non-haven MNC is a dummy variable equal to one if a firm has a foreign subsidiary in a non-tax haven jurisdiction and 0 otherwise; (2) Profitability is measured as the ratio of pre-tax income to total assets; (3) Tangibility which is measured as the ratio of fixed tangible assets to total assets; (4) Intangibility which is measured as the ratio of fixed intangible assets to total assets; (5) Loss carryforward which is a dummy variable that equals one if the company has losses to be carried forward that can reduce their future tax liabilities; (7) Leverage is measured as the ratio of current and non-current liabilities to total assets; (8) Log(Sales) is the natural logarithm of sales, (9) Big4 Auditor is a dummy equal to one if the company employs one of the big 4 accountancy firm as their auditor and is zero otherwise, (10) Not Big4 Auditor is a dummy equal to one if the company employs an auditor which is not one of the big 4 accountancy firms and is zero otherwise.

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