

CESifo CONFERENCES 2021

12th Norwegian German Seminar on Public Economics

Munich, 5 – 6 November 2021

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

Henrik Svensli



The Effect of Foreign Activities Located in Tax Havens on Corporate Income Taxes*

Henrik Svensli[†]

October 22, 2021

Abstract

This paper investigates the effect of tax haven activities on the effective tax burden of corporate groups. Using consolidated accounting data and ownership records from the historical Orbis database between 2007 and 2016, I find that the consolidated tax burden 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 by 2.37 percentage points. However, after controlling for firm-specific fixed effects the results are no longer significant. A concern is that measurement errors, due to Orbis' increasing coverage over time, results in a biased tax haven estimator. When controlling for measurement errors in the ownership data, I obtain a larger point estimator on the tax haven variable, both with and without, firm fixed effects. I also provide an instrumental variable estimate which indicate that the tax haven effect is larger in magnitude than previously established.

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

JEL Classification F23 · H25 · H26 · H32

*I am indebted to Ron Davies and audiences at the 77th IIPF Annual Congress, the Scottish Economic Society 2021 Annual Conference, the University of Jönköping and the Norwegian School of Economics for constructive comments.

[†]Department of Business and Management Science, NHH Norwegian School of Economics, Bergen, Norway.
E-mail: Henrik.Svensli@nhh.no.

1 Introduction

Tax havens are jurisdictions that offer low or zero tax rates and favorable regulatory policies to foreign investors.¹ 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 (e.g., Panama papers) 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 tax avoidance, or profit shifting, activities by MNCs.² 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, I 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 by 2.37 percentage points. When using the ratio of tax expenses to total assets, the comparable result shows a 0.07 percentage point reduction. 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. Furthermore, using dummy variables to capture the extent of tax haven activities I find that firms benefit from a considerable presence in tax havens. When using the ratio of tax expenses to total assets (Tax-asset ratio), I 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 income (ETR).

In further analysis, I focus on different tax haven lists. Particular emphasis is given to

¹For 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).

²It is important to emphasize that tax avoidance does not imply that firms are engaging in any unlawful activities. There are numerous provisions in national and international tax standards that allow firms to legally reduce or defer their tax expenses. Following Dyreng et al. (2008) I consider tax avoidance broadly as anything that reduces the firm's effective tax burden, such as shifting taxable income raised in non-haven countries to tax havens.

smaller tax haven countries ("Dot"-havens), where the relationship between the ETR and tax haven activities is now both negative and significant. A concern in the data is that measurement errors, due to Orbis' increasing coverage over time, gives rise to a biased relationship between the effective tax burden and tax haven activities. When controlling for measurement errors in the ownership data, I obtain a significant and larger point estimator on the tax haven variable, both with and without, firm fixed effects. I also provide an instrumental variable estimate, utilizing the 2014 Luxembourg Leaks to isolate exogenous variation in the demand for tax haven activities. This result also indicate that the tax haven effect is larger in magnitude than previously established.

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 information on ownership of affiliates from the Orbis database. 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 which 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 activities 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. She is unable to establish any significant difference between a cross-sectional and fixed effects specification, but find evidence for a negative relationship between the tax burden and tax haven activities when distinguishing countries with a territorial or worldwide tax system.

In this paper I 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. I apply consolidated accounting figures at the parent level as opposed to unconsolidated figures at the affiliate level.³ The strength in applying consolidated accounting data is the potential coverage of the firm's group structure, as the majority of accounting data found in Orbis suffers from missing values. In particular, roughly 44% of all firm-year observations covered in our database have no financial data at all.

³An extensive literature on profit shifting studies reported profitability at the affiliate level, taking into account corporate tax rate differentials among related affiliates at the group level (e.g., Hines and Rice (1994) and Huizinga et al. (2008)).

Furthermore, 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.⁴ 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 listed 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. Thus, Exhibit 21 offers the ability to detect variation in tax haven activities among US public firms. With the exception of Jaafar and Thornton (2015), there doesn't appear to be a study who has exploited this feature in Orbis' historical ownership records, and thus I 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.)⁵ 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 Dole⁶, Ikea⁷, Nike⁸ and Apple⁹ among 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

⁴This issue is also discussed in Tørsløv et al. (2018), where the authors highlights that large amounts of profits in tax haven affiliates are missing in the Orbis data. For instance, of the \$55.3 billion in consolidated profits reported by Apple in 2016, only \$2.0 billion show up in the affiliate-level data from Orbis.

⁵Of course, one could argue that this is, at least in part, driven by the low tax rates in tax havens. However, in theory, profit shifting still exist in a world without tax havens.

⁶Lawrence and Griffiths (2007): "Revealed: how multinational companies avoid the taxman"

⁷Boffey (2017): EU investigates Ikea after Dutch deals reduce tax bill by €1bn

⁸Bowers (2017a): "How Nike Stays One Step Ahead of the Regulators"

⁹Bowers (2017b): Leaked Documents Expose Secret Tale of Apple's Offshore Island Hop.

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

The 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 publicly listed firms from Compustat with static ownership data from Orbis for a wide range of countries worldwide.¹⁰ 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 ratio of tax expenses to pre-tax income.¹¹ They show that firms with affiliates in tax havens experience lower effective tax rates than firms without tax haven activities.¹² 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.

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, determines its effective tax rate. Among the findings are that Japanese firms always face the

¹⁰An 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.

¹¹Specifically, 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.

¹²More 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 relative to foreign affiliates reduces the ETR by 0.15 percentage points.

highest ETRs; US firms are also 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 and 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.¹³ As 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 a negative or zero tax expenses or pre-tax income.¹⁴ As Maffini points out, this selection is of importance as profitable firms and unprofitable firms might have different incentives from utilizing tax havens.¹⁵ 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.

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.¹⁶ To capture time-variation in tax haven activities, they utilize the historical

¹³The countries includes: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

¹⁴An alternative is to keep observations with negative pre-tax income and replace negative ETRs by zero (See e.g., Henry and Sansing (2018)).

¹⁵An alternative is to use sales as the denominator (e.g., Desai et al. (2006)). However, sales figures is scarce in Orbis.

¹⁶The countries include: Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Nor-

Amadeus database.¹⁷ Jaafar and Thornton (2015) construct effective tax rates as the ratio of tax expenses to pre-tax income.¹⁸ Jaafar and Thornton (2015) show that tax haven activities reduces the ETRs of both private and public 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 a specification without accounting 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 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 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

way, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

¹⁷BvD 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.

¹⁸They also construct the ETR as the ratio of tax expenses to cash-flow from operation. The results remain qualitatively the same.

state income tax burden between 15% and 24% when compared to other firms. Harris et al. (1991) analyze the effective tax burden, 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 the tax burden is lower for firms with operations in tax havens. Janský and Prats (2015) show 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 assets 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 foreign 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 (the "Big 7") is to reallocate taxable income among its foreign affiliates, whereas the use of affiliates in smaller tax haven countries (the "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.

A working paper by Fuest et al. (2021) explores the profit allocation among affiliates of German MNCs using country-by-country (CbC) reports. They show that tax haven affiliates are more profitable than non-haven affiliates. The results suggests that 40% of the profits reported in tax havens are due to tax-induced profit shifting. They further compare the coverage of CbC reports to the Orbis database, and shows that Orbis' coverage in tax havens is poor, and in particular, Non-European tax havens.

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, I describe the research design. I begin by specifying the empirical strategy, and then describe how multinational firms can use tax havens for profit shifting purposes. Finally, I 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 at the consolidated level for (parent) firm p in year t .¹⁹ I consider two different measures of Y_{pt} . The first is the conventional measure of the effective tax burden used in the literature, defined as total tax expenses divided by pre-tax earnings (ETR). As pointed out by Henry and Sansing (2018), the ETR lacks an economic interpretation for a negative pre-tax income or tax expense, and as a result, I drop these observations for the sample using the ETR. In order to cope with this selection bias, I follow Maffini (2009) and use the ratio of total tax expenses to total assets (Tax-asset ratio) as our second measure of the effective tax burden.²⁰

The independent variable of main interest is $Haven_{pt}$, capturing the extent of tax haven activities. In the first specification, I define $Haven_{pt}$ as the ratio of tax haven affiliates to foreign affiliates. In this specification, β_1 will capture the average effect on the effective tax burden from a percentage point increase in the number of tax haven affiliates relative to the total number of foreign affiliates at the group level. In a second specification, $Haven_{pt}$ is captured

¹⁹Also book-tax differences are frequently used to measure tax avoidance (e.g., Manzon and Plesko (2001) and Wilson (2009)). Since our focus is on multinational firms, there are conceptual problems related to this measure. In particular, book-tax differences relies on the statutory tax rate, and since MNCs, by definition, have foreign source income taxed at different rates, this introduces bias in the book-tax measure (see Hanlon (2003)).

²⁰See section 3.3 for a discussion on the issues in the construction of the effective tax burden in capturing tax avoidance.

by dummy variables denoting whether the firm has tax haven affiliates. In this specification β_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 will compare across three groups: (i) MNCs with affiliates in tax havens; (ii) MNCs; and (iii) domestic firms. For both measures of $Haven_{pt}$, I predict a negative relation with respect to the effective tax burden ($\beta_1 < 0$).

X_{pt} is our set of control variables, and α_p , λ_t , $\lambda_t \times \psi_C$, $\lambda_t \times \phi_I$ and ϵ_{pt} are error components. In particular, α_p captures unobserved firm-specific effects; λ_t captures time effects common to all firms; $\lambda_t \times \psi_C$ 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, ϵ_{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. I estimate the model by ordinary least squares (OLS) using a within-group transformation to control for firm effects, time, country-year and industry-year effects.²¹

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 depreciation that will reduce tax expenses.²² 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 (e.g., Dischinger and Riedel (2011)).

Profitability is measured as the ratio of operating pre-tax earnings (EBIT) to total assets. One could expect profitable firms to be 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-

²¹I utilize the `reghdfe` command in Stata (see Correia (2016)).

²²Prior literature have used property, plant, and equipment to capture depreciation tax shields, however, this variable is not accessible in the Orbis database. The same applies for inventory. According to Gupta and Newberry (1997), to the extent inventories is a substitute for capital investments, inventory-intensive firms should face relatively higher ETRs.

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 substitute for 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 and thus their effective tax burden. The idea is that the demand for tax havens may be lower if the firm has no profits to shift.²³ As argued by Henry and Sansing (2018), loss firms have little incentives to engage in aggressive tax avoidance. However, 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 expected to be negative.

I 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 affiliates. The relationship with respect to the effective tax burden is ambiguous. On one hand, larger firms should have lower tax burden than smaller firms because larger firms have greater resources to e.g., develop expertise in tax planning. On the other side, larger firms are expected to have greater insight from the public which causes them to be victims of greater regulatory actions, and thus larger firms could face higher ETRs (see e.g., Gupta and Newberry (1997)) Prior literature have found a positive relationship between firm size and effective tax rates (e.g., Rego (2003)).

Firm size is likely to be an important factor for corporate tax policies, and much anecdotal evidence suggest that profit shifting activities through tax havens is restricted to a few, but very large multinational firms. According to Bilicka (2019), there is likely to be fixed costs associated with shifting profits. Thus, large companies might be more willing to invest in the legal and accounting expertise required to shift profits from non-haven countries to tax havens. As a result, I also include *Log(No. of affiliates)* as an additional proxy for firm size. The demand for tax haven activities are likely to be correlated with the total number of affiliates at the group level. Thus, what appears to be a tax haven effect on the tax burden could simply reflect that large companies have a greater number of affiliates overall, therefore generating taxable income from multiple countries with different statutory tax rates.²⁴

²³To control for potential non-contemporaneous effects of losses, I include the lag of Loss carryforward in robustness analysis.

²⁴I'm grateful to Ron Davies for pointing this out.

Following Harris et al. (1991), I also control for $\text{Log}(\text{Employees})$ which is defined as the natural logarithm of the number of employees. Employees carry tax deductible expenses which affect the tax burden, and potentially substitute for tax haven activities. However, whether the number of employees affects the demand for tax haven activities is an empirical question. If one were to view the number of employees as a proxy for firm size (e.g., Maffini (2009)), one could expect larger firms to have more foreign activities than smaller firms. In robustness analysis, I also provide an estimate using the logarithm of wage costs.

MNC is a dummy variable equal to one if a firm has at least one foreign affiliate. Studying US firms, Rego (2003) finds that multinational firms have lower ETRs than domestic firms. In their cross-country study, Markle and Shackelford (2012a) finds rather small differences in ETRs between MNCs and domestic firms. A firm's status as a multinational rather than purely domestic is likely to affect the demand for tax haven activities. A natural question is 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. Utilizing US firms' tax returns, Dowd et al. (2017) shows that the relationship between reported profits in foreign affiliates and its tax rates are likely to be nonlinear, in the sense that the tax responsiveness is greater with respect to tax haven affiliates than affiliates in non-haven countries. Therefore, I hypothesize that the tax haven effect is negative after controlling for multinational status.

I 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 activities by multinational firms. They show that there is a causal link between the size of an MNC's tax haven network and their use of a Big 4 accountancy firm. I therefore include *Big 4 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.²⁵ 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 among Belgium firms.

²⁵The "Big 4" accountancy firms are Deloitte, EY, KPMG and PwC. A number of firms have no auditor reported.

Table 1: List of tax havens

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 Antilles
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

Source: Hines (2010).

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 rather similar to those in Hines and Rice (1994), the Unco-operative tax havens in OECD (2000) and the U.S. Government Accountability Office (2008). I acknowledge that there is no universal list of countries considered to be tax havens, and a degree of judgment needs to be made. In robustness analysis I provide a quantification of the 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 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 liabilities (e.g., Huizinga et al. (2008)). For instance, 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.

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.

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.²⁶ First, firms will incorporate and liquidate affiliates in tax havens; and second, firms will increase or reduce activity due to mergers and acquisition (M&A). 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 haven activities 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. I therefore include a set of firm-specific control variables. On the other hand, as pointed out by Maffini (2009), the demand for tax haven activities could also 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, I 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 haven activity 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 the effective tax burden - more so than a broader geographic ownership of tax haven affiliates. I 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 re-

²⁶A third form of variation is due to changes in jurisdictions classified as tax havens. However, there are no annual list of tax havens and most lists are consistent across time. I explore this issue further in robustness analysis in Section 7.1.

porting under GAAP/IFRS (and local regulations) differs from the requirement under tax accounting principles (see Hanlon (2003) for a discussion). Thus, our measure of the effective tax burden might not reflect the actual tax burden of the firm as reported to the tax authorities. Since tax returns are confidential data, it is not possible to verify that book tax expenses correspond with the tax return. However, our interest is not in capturing book-tax differences but in the tax avoidance behavior of multinational firms. Studying public US firms' tax returns and financial statements, Mills (1998) provides empirical evidence for the dependency between book and tax accounts. Thus, the tax expense on the firm's financial statements is a valid proxy for the firm's (true) tax liability (see also Hanlon (2003)). Recent evidence by Bilicka (2019), using UK data, shows that multinational firms tend to report zero profits for tax purposes but positive accounting profits. Thus, there is likely to be some systematic differences in tax expenses in firms' book accounts and tax returns.

One should also exercise cautions with our measure of the effective tax burden. As pointed out earlier, the historical Orbis database include only the total tax expense from the consolidated income statement. Total tax expense is the sum of the current and deferred portion of a firms' tax liabilities. Commonly used tax avoidance practices, such as accelerating depreciation and other practices of deferring income for tax purposes, reduces current while increases deferred tax expenses, and will therefore not be captured by our measure of the tax burden (Dyreg et al., 2008). In using the total tax expense, we will capture tax avoidance practices related to a firms' permanent book-tax differences. An example of a permanent book-tax difference relevant for our study are foreign source income. Taxable income reported in a low-tax jurisdiction, such as tax havens, will reduce total tax expense at the consolidated level (numerator) while pre-tax income (denominator) remains unchanged. Thus, our measure of the effective tax burden should provide a valid proxy for tax avoidance activities by multinational firms.

To avoid potential mis-classification of multinational or tax haven status I 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. I also remove observations one year before and after the shift as there might be lags in reporting and because firms might undertake investments during this period that will cause endogeneity concerns.

4 Data and Descriptive Statistics

In this section I 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 historical Orbis database. Orbis is an administrative micro-level dataset compiled by Bureau van Dijk (BvD). The historical 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 (Kalemli-Ozcan et al. (2015)). See Appendix A for more information on how I processed the data from BvD.

It is important to note that the coverage in Orbis is incomplete, both in terms of financial statements and ownership structures. This is due to a number of reasons. First, although most countries require limited liability firms to register once they are formed, requirements in terms of who reports (due to e.g., firm size or legal form), and what items to report from the financial statements vary across countries. Second, Orbis does not cover some countries since they do not keep business registries (Kalemli-Ozcan et al., 2015; Fuest et al., 2021)

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, I have 524,414 (parent) firm-year observations covering the period from 2007 to 2016.²⁷ Second, I restrict attention to parent firms or affiliates that are limited liability. Third, I keep only parent firms that are classified as either industrial or financial by BvD.²⁸ Fourth, I also remove certain 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, I remove parent firms resident in tax havens. Sixth, I remove parent firms with multiple entrances into tax havens or shifts between domestic and multinational.²⁹ The reason is the desire to minimize measurement errors in MNC and tax haven status that is likely to bias our estimates.

²⁷There is 11,325,979 affiliate-year-parent observations.

²⁸Industrial 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.

²⁹In addition, I 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.

Furthermore, Orbis is well-known to suffer from a significant number of outliers. As an seventh restriction, firms with a ratio of total liabilities to total assets (Leverage) outside a [0,1] interval is removed; eight, I 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). Ninth, I omit countries with less than 300 firm-year observations. Tenth, I remove firm-year observations with missing values for any of the key variables listed in Table 3.³⁰ Finally, I consider two variations in our working sample. For the sample using the ratio of tax expenses to pre-tax income (ETR), I remove observations with either negative or zero pre-tax income or tax expenses. I 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), I remove the top and bottom 1 percent of observations in terms of the Tax-asset ratio. As a result, I end up with a sample of 205,105 (285,138) firm-year observations using the ETR (Tax-asset ratio).

I further consider one additional variation in the two samples discussed above. To make our analysis comparable to the previous literature following Markle and Shackelford (2009, 2012a,b, 2014), I consider static versions of the samples using the year 2016 as the reference for ownership relations. The static versions simply assume that the ownership structures remain constant throughout the sample period. The choice of 2016 is based on the last available year of ownership data. The static versions of Amadeus/Orbis relies on constant ownership data at the latest available year. Here, I also need to remove all firms that were either established or liquidated between 2007 and 2016.³¹ Thus, I refer to these variations as static and historical versions of two samples.

³⁰The large decline in the number of observations is due to the variable on the number of employees. This is a scarce variable in the Orbis database. The inclusion of this variable does not qualitatively affect our results.

³¹In addition, most adaptations of the Amadeus/Orbis data usually relies on a company size restriction. For instance, Markle and Shackelford (2012b) and Maffini (2009) excludes both small parent firms and affiliates. As many affiliates in tax havens are expected to be small and/or medium sized companies, I do not make such a restriction.

Table 2: Sample Selection

	No. of (parent) observations
(1) All observations between 2007 to 2016	524,414
(2) Exclude firms that are not limited liability	483,649
(3) Exclude parent firms that are not industrial or financial	479,186
(4) Exclude sectors for parent firms	478,675
(5) Exclude parent firms resident in tax havens	458,323
(6) Exclude firms with multiple shifts in multinational or tax haven status	456,410
(7) Exclude firms if Leverage is outside [0,1] interval	428,628
(8) Exclude firms with outliers in Fixed asset ratio or Profitability	411,747
(9) Remove countries with firm-year observations less than 300	407,420
(10) Exclude firms with missing values in any of the variables in Table 2	290,958
(11) Exclude firms with outliers in effective tax rates (Tax-asset ratio)	205,105 (285,138)
ETR (Tax-asset ratio) sample	205,105 (285,138)

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 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 (historical) ETR sample represents 205,105 observations covering the 10 years between 2007 and 2016, with firms from 45 different countries. The majority of the sample constitutes purely domestic firms, and we observe 7,219 firms with activities in tax havens and 20,508 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 with the average being 13. 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, having one or two tax haven affiliate constitutes 63% of the observations. In Appendix B.1, Table 14, I provide some summary statistics by country. In most countries, the ETRs are slightly lower than the statutory corporate tax rate.³² However, in some countries, such as Italy and Greece, the ETR is much greater than the statutory tax rate.³³ These figures are somewhat consistent with previous research (e.g., Lee and Swenson

³²I gather statutory corporate tax rates from the Tax Foundation (2020) and KPMG Corporate Tax Rates Table (2020). Where Tax Foundation and KPMG provides different tax rates, I supply with data from Trading Economics (2020).

³³In robustness test, I omit countries where the ETR is outside a five percentage point interval of the statutory corporate tax rate. With the exception of India, none of the 15 countries analyzed in Markle and Shackelford (2012a) have a greater ETR than the statutory tax rate. These authors consider the current tax expense and not the

(2012)).

Descriptive statistics of the main variables are provided in Table 3. In Appendix B.2, Table 15, I 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 overall. MNCs with tax haven activities have on average 30% of their foreign affiliates in tax havens. However, as shown in Figure 4 in Appendix B.3, this is a "lumpy" variable with large densities at zero and one. This is due to the fact that, on the one side, many firms will enter into tax haven activities, therefore creating a spike around zero tax haven affiliates. On the other side, many MNCs in our sample consists of only one foreign affiliate, and thus, will have a ratio equal to one.³⁴ A crucial aspect behind the fixed effects framework exploited in this paper is having adequate within-firm variation in tax haven activities over time. With no such variation, the fixed effects estimator is no longer valid. In Table 16 in the Appendix, I show that, after controlling for firm fixed effects, there is considerable within-group variation in both the tax haven variables in Table 3. Roughly 13% of the sample capture firms with presence in tax havens. This is due to most of the sample consisting of domestic firms, with 37% of the sample consisting of multinational firms. Figure 5 in Appendix B.5 shows that the number of firms with activities in tax havens are increasing over time.

We see little variation in Profitability, however, MNCs appears to be more profitable than domestic firms. Multinational firms with tax havens seems to rely more on fixed assets than other firms. However, this masks an important difference. Domestic firms rely more on 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-ordinary 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.³⁵ MNCs are also,

total tax expense employed in this paper.

³⁴I correct for such lumpiness in robustness analysis.

³⁵Roughly 38 percent of the firms incurs losses during the sample period.

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 and the number of affiliates overall. 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.

Table 3: Descriptive Statistics: ETR Sample

	Full Sample	Domestic	Multinationals		
	Mean/(SD)	Mean/(SD)	Without tax	With tax	Total
			haven affiliates	haven affiliates	
			Mean/(SD)	Mean/(SD)	Mean/(SD)
Effective tax rate	0.276 (0.126)	0.268 (0.123)	0.293 (0.132)	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)	0.301 (0.061)
Share of tax haven affiliates	0.041 (0.154)	0.000 (0.000)	0.000 (0.000)	0.309 (0.312)	0.110 (0.238)
At least 1 tax haven affiliate	0.133 (0.339)	0.000 (0.000)	0.000 (0.000)	1.000 (0.000)	0.358 (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 (0.063)	0.093 (0.065)
Fixed asset ratio	0.429 (0.245)	0.430 (0.260)	0.404 (0.217)	0.467 (0.210)	0.427 (0.217)
Leverage	0.556 (0.215)	0.564 (0.222)	0.544 (0.204)	0.535 (0.192)	0.541 (0.200)
Loss carryforward	0.007 (0.081)	0.005 (0.069)	0.009 (0.095)	0.010 (0.100)	0.010 (0.097)
No. of employees	3336.075 (23285.230)	909.415 (5597.643)	2214.730 (9839.057)	16847.899 (59581.307)	7449.738 (37166.251)
Total Assets (in mill.)	1151.682 (8851.404)	271.884 (2034.316)	725.207 (4299.942)	6086.234 (22563.658)	2643.111 (14163.724)
Big 4 Auditor	0.158 (0.365)	0.099 (0.299)	0.196 (0.397)	0.369 (0.482)	0.258 (0.438)
No. of affiliates	13.282 (45.260)	4.822 (10.178)	11.666 (23.562)	56.271 (108.413)	27.623 (70.840)
Observations	205,355	129,162	48,935	27,258	76,193

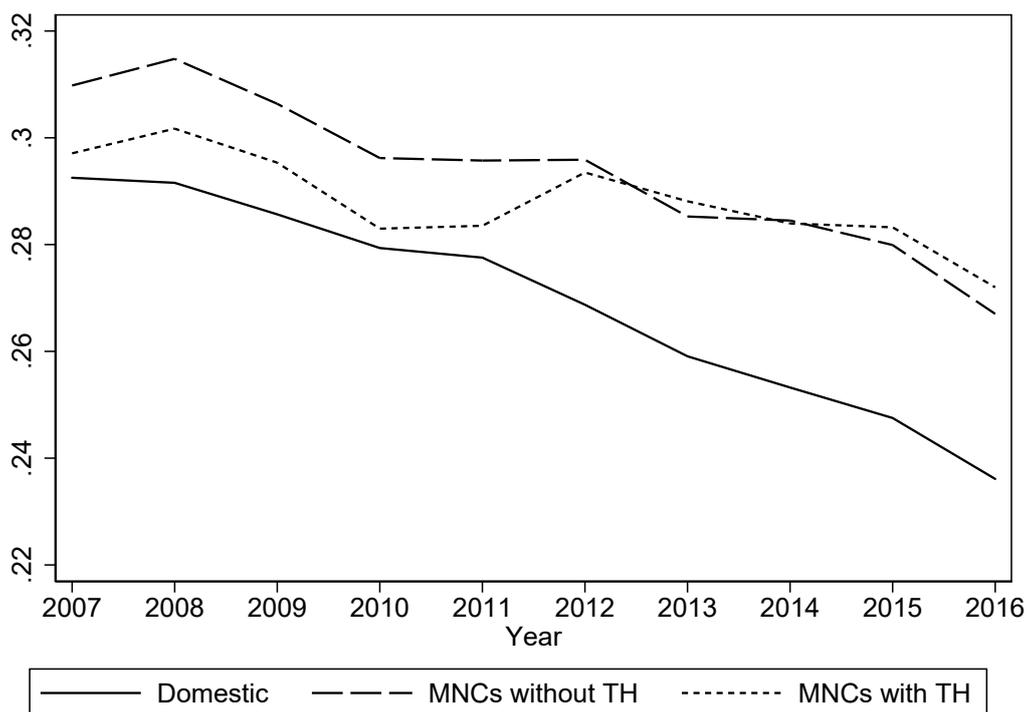
The table gives descriptive statistics for all dependent and independent variables used in our analysis. The dependent variable is the tax-asset ratio constructed as the ratio between tax expenses and total assets. Corporate tax rate is the statutory corporate tax rate in the countries where a parent 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. I 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 is measured as the ratio of fixed assets to total assets; (4) Leverage is measured as the ratio of current and non-current liabilities to total assets; (5) Loss carryforward is a dummy variable that equals one if the company has losses to be carried forward; (6) No. of employees is the total number of employees; (7) Total assets (in mill.) is the total assets in millions; (8) Big 4 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) No. of affiliates is the total number of (majority-owned) affiliates.

In Figure 1 I show the development in the ETR (panel a) and the Tax-asset ratio (panel b) over time, where I 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. The decline in the Tax-asset ratio is due to the number of loss-making firms following the financial crisis, and thus highlights an important sample selection issue when using effective tax rates.

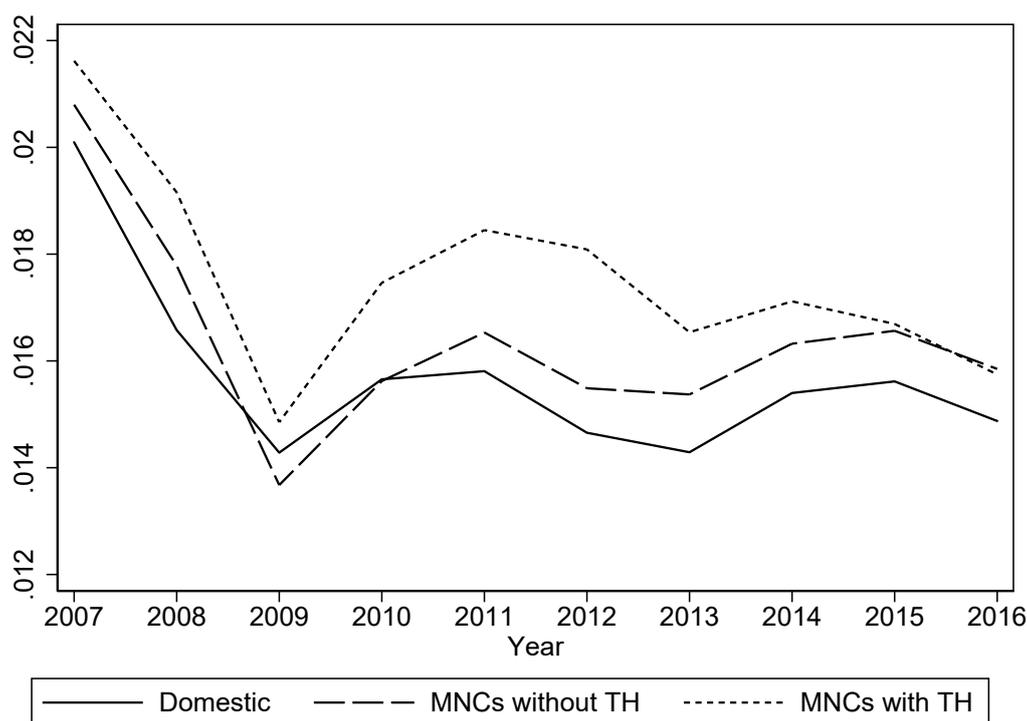
Figure 1: Effective tax burden

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 I 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 I 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 static ownership records and only observe firms that are active in the period between 2007 and 2016. Finally, the remaining columns utilizes all the historical information found in Orbis.

Column (1) is similar to the one reported in the baseline specification by Markle and Shackelford (2012b). The tax haven coefficient shows that a one percentage point increase in the share of tax haven affiliates (relative to foreign affiliates) decreases the ETR by 2.29 percentage points, and is much larger in magnitude than in 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), I correct for such misclassification of affiliate-parent relationships and also include firms that either incorporates or liquidates during the sample period. The results shows a slight decrease in the tax haven coefficient, from 2.29 to 2.35 percentage points reduction in the ETR. The estimator in column

(2) is still biased as we have not controlled for unobserved firm-specific characteristics. 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 using a within-group transformation. The result shows that the tax haven variable decreases to 0.30 percentage points but is no longer significant at any reasonable level. The result is quite remarkable given the lack of firm fixed effects in the prior literature. One explanation behind this result 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 (2013) 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 coefficient, which reduces the Tax-asset ratio between 0.11 and 0.07 percentage points. When controlling for firm fixed effects in column (6), the tax haven coefficient 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 specification. This is similar to Markle and Shackelford (2012a) who also find similar ETRs among multinational and domestic firms. Controlling for MNC status is important as MNCs will still face tax differentials that gives rise to profit shifting opportunities. This effect has to some extent been neglected in the previous literature (e.g., Maffini (2009)). An increase in profitability reduces both the ETR and Tax-asset ratio. An increase in the Fixed asset ratio increases the ETR but decreases the Tax-asset ratio. Also increasing the use of debt relative to equity increases the ETR but decreases the Tax-asset ratio. Incurring losses, increases the ETR and decreases 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, decreases both the ETR and the Tax-asset ratio. The impact of employing a Big 4 auditor has no significant effect on the effective tax burden under firm fixed effects. Finally, an increase in the number of affiliates increases the ETR. The two different proxies for firm size has opposite effect on the ETR, which is likely due to non-linearities in firm size. I explore this further in robustness analysis.

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	-0.0229*** (0.0057)	-0.0235*** (0.0030)	-0.0030 (0.0047)	-0.0011* (0.0005)	-0.0007** (0.0003)	-0.0000 (0.0005)
MNC	0.0067*** (0.0017)	0.0060*** (0.0010)	0.0009 (0.0018)	0.0009*** (0.0002)	0.0011*** (0.0001)	-0.0000 (0.0002)
Profitability	-0.0802*** (0.0079)	-0.0890*** (0.0050)	-0.2630*** (0.0072)	0.1625*** (0.0016)	0.1342*** (0.0011)	0.1185*** (0.0013)
Fixed asset ratio	-0.0177*** (0.0026)	-0.0128*** (0.0018)	0.0001 (0.0045)	-0.0082*** (0.0003)	-0.0088*** (0.0002)	-0.0116*** (0.0005)
Leverage	0.0419*** (0.0028)	0.0546*** (0.0019)	0.0755*** (0.0043)	-0.0111*** (0.0003)	-0.0110*** (0.0002)	-0.0011** (0.0004)
Loss carryforward	0.0202*** (0.0074)	0.0181*** (0.0051)	0.0323*** (0.0056)	0.0020*** (0.0002)	-0.0001 (0.0001)	-0.0008*** (0.0001)
Log(No. of Employees)	0.0098*** (0.0006)	0.0085*** (0.0004)	0.0055*** (0.0007)	0.0009*** (0.0000)	0.0008*** (0.0000)	0.0005*** (0.0001)
Log(Total assets)	-0.0079*** (0.0006)	-0.0077*** (0.0004)	-0.0050*** (0.0015)	-0.0008*** (0.0001)	-0.0012*** (0.0000)	-0.0029*** (0.0002)
Big 4 Auditor	0.0038** (0.0018)	0.0037*** (0.0013)	-0.0011 (0.0019)	0.0009*** (0.0002)	0.0012*** (0.0001)	-0.0000 (0.0002)
Log(No. of affiliates)	-0.0044*** (0.0009)	-0.0021*** (0.0006)	0.0037*** (0.0010)	-0.0003*** (0.0001)	-0.0001 (0.0001)	0.0000 (0.0001)
Observations	106,462	202,865	185,122	142,274	282,074	263,662
Adj. R-squared	0.177	0.191	0.475	0.573	0.520	0.704
No. of firms	20,713	57,532	39,792	22,991	69,432	51,023
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 I 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) I 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 having a tax haven affiliate decreases the ETR by 0.95 percentage points, and is of a smaller magnitude compared to Jaafar and Thornton (2015) coefficient. In column (2) I control for firm fixed effects and as previously, the coefficient on the tax haven variable is no longer significant. In column (3) I distinguish presence in tax havens into several dummy variables to capture the extent of tax haven activities. We see a near monotonous reduction in the ETR as the firms increase their presence in tax havens. However, with fixed effects, no dummy variable returns significant. In Column (6) I repeat the specification for the Tax-asset ratio. We see a more monotonous decrease 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 0.11 percentage points lower Tax-asset

ratio. Firms with more than 15 tax haven affiliates has on average a 0.22 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	-0.0095*** (0.0015)	-0.0004 (0.0021)		0.0006*** (0.0002)	-0.0000 (0.0002)	
Between 1 and 4 tax haven aff.			-0.0003 (0.0021)			0.0000 (0.0002)
Between 5 and 9 tax haven aff.			-0.0031 (0.0038)			-0.0011*** (0.0004)
Between 10 and 15 tax haven aff.			-0.0080 (0.0056)			-0.0015** (0.0006)
More than 15 tax haven aff.			-0.0078 (0.0082)			-0.0022*** (0.0007)
MNC	0.0053*** (0.0010)	0.0007 (0.0017)	0.0006 (0.0017)	0.0009*** (0.0001)	-0.0000 (0.0002)	-0.0000 (0.0002)
Observations	202,865	185,122	185,122	282,074	263,662	263,662
Adj. R-squared	0.190	0.475	0.475	0.520	0.704	0.704
No. of firms	57,532	39,792	39,792	69,432	51,023	51,023
Firm-level covariates	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes

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. In the remainder of the paper I will use the ETR as the measure of the effective tax burden and the share of tax haven affiliates as the measure of tax haven activities. The result in Table 4, column (3), is referred to as the baseline specification.

6.1 Selected samples

Table 6 explore selected samples. In column (1), I exclude small multinational firms. These are firms wit, on average, less than 2 foreign affiliates. As previously noted, the sample constitutes a number of small firms which creates an identification issue. As seen from Figure 4 in Appendix B.3, the share of tax haven affiliates variable is a lumpy variable with large densities at zero and one. This is due to a majority of multinational firms being relatively small with only one or two foreign affiliates. This selection returns a negative and significant tax haven coefficient. In column (2), I exclude domestic firms from the sample. This has negligible impact on the tax haven coefficient. In column (3), I include only firms from the manufacturing sector.

The manufacturing sector relies more heavily on tangible assets and have therefore lesser scope for sophisticated tax avoidance due to arm's length pricing is easier to establish than for intangible assets. Column (4) omit firms in various sectors. These include: Mining and quarrying; Real estate; Agriculture, forestry and fishing; Electricity, gas and water supplies. Column (5) exclude countries where the effective tax rate is not within a five percentage points interval of the statutory corporate tax rate. The idea here is to deal with potential measurement errors in the firm-level data, or eliminate countries with particularly preferential tax regimes that creates a wedge between the statutory corporate tax rate. In columns (4) and (5), 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).

Table 6: Effect of tax haven activities on the ETR: Variations in sample and covariates

	(1) Excl. small MNCs	(2) Exc. domestic firms	(3) Manufacturing sector	(4) Selected sectors	(5) ETRs \neq stat. tax rate
Share of tax haven affiliates	-0.0157** (0.0072)	-0.0021 (0.0047)	0.0073 (0.0074)	-0.0030 (0.0047)	-0.0067 (0.0062)
MNC	0.0158* (0.0088)	-0.0003 (0.0018)	-0.0057 (0.0036)	0.0011 (0.0018)	0.0022 (0.0020)
Profitability	-0.3494*** (0.0236)	-0.3051*** (0.0124)	-0.2438*** (0.0150)	-0.2647*** (0.0073)	-0.2672*** (0.0077)
Fixed asset ratio	-0.0349*** (0.0134)	-0.0058 (0.0073)	-0.0074 (0.0098)	0.0014 (0.0046)	0.0173*** (0.0048)
Leverage	0.0922*** (0.0115)	0.0815*** (0.0069)	0.0495*** (0.0086)	0.0731*** (0.0044)	0.0815*** (0.0048)
Loss carryforward	0.0414*** (0.0114)	0.0354*** (0.0070)	0.0442*** (0.0108)	0.0338*** (0.0058)	0.0311*** (0.0073)
Log(No. of Employees)	0.0055*** (0.0014)	0.0050*** (0.0009)	0.0010 (0.0016)	0.0056*** (0.0007)	0.0042*** (0.0008)
Log(Total assets)	-0.0180*** (0.0042)	-0.0089*** (0.0022)	-0.0020 (0.0031)	-0.0054*** (0.0015)	-0.0098*** (0.0017)
Big 4 Auditor	-0.0032 (0.0036)	-0.0021 (0.0024)	-0.0001 (0.0036)	-0.0018 (0.0020)	-0.0011 (0.0021)
Log(No. of affiliates)	0.0043** (0.0020)	0.0043*** (0.0013)	0.0063*** (0.0019)	0.0039*** (0.0010)	0.0041*** (0.0012)
Observations	28,621	80,870	45,867	177,024	145,980
Adj. R-squared	0.444	0.471	0.475	0.472	0.415
No. of firms	4,858	15,741	9,218	38,187	31,337

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. In column (1), I exclude firms with less than 2 foreign affiliates on average. In column (2), I exclude domestic firms. In column (3), I include only firms operating in the manufacturing sector. In column (4), I omit firms in the following sectors: Mining and quarrying; Real estate; Agriculture, forestry and fishing; Electricity, gas and water supplies. Column (5) excludes countries where the ETR is not within a 5 percentage point interval of the statutory corporate tax rate. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The regressions are estimated by ordinary least squares, and include firm, year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

6.2 Selected Covariates

Table 7 explore variations in the firm-level covariates included. In column (1), I 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 to 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), I include dummy variables equal to one if the group have operations in different continents. North America is left in the reference category (dummy variables are omitted from the table). However, this has only a negligible effect on the ETR. In column (2), I exclude Profitability as a covariate. In column (3), I include the one-year lag of Profitability as an additional firm-level variable. We are concerned that profits in prior years are driving the incentive to demand tax haven activities. In column (4), I include the one-year lag of Loss carryforward. In using the ETR as the dependent variable, we are not considering years with firm losses. Demand for tax haven activities is likely correlated with previous losses and the possibility of loss carryforwards. Column (5) replaces Log(Employees) as a covariate with the logarithm of wage costs. Wage costs are thought to be a better measure for the tax deductible costs related to labor. In column (6), I include the ratio of research and development (R&D) expenses to total assets. As argued by Gupta and Newberry (1997), R&D expenses provide an investment-tax shield because they are immediately deductible, while expected to have long-term benefits. Several industries also provide certain tax credits related to R&D expenses which is likely to affect the effective tax burden. However, the majority of firms in Orbis do not report R&D expenses. In column (7), include a dummy variable to control for the use of an auditor which is not a big 4 accountancy firm. The intuition here is that firms with an auditor might be more tax aggressive than firms without an auditor. The results seems to confirm this hypothesis. In Column (8), I include a dummy variable, Listed, which equals one if the company is publicly listed. Although private and public firms generally face similar financial reporting and tax regulations, they differ substantially due to capital market pressure and institutional factors that are likely correlated with both the tax burden and the demand for tax haven operations (e.g., Burgstahler et al. (2006), Ball and Shivakumar (2005) and Jaafar and Thornton (2015)). In column (9), I include a dummy variable equal to one for countries characterized as conduit countries. As previously noted, MNCs can utilize treaty shopping to reduce withholding taxes on intra-firm transactions by channeling transfers of goods through intermediate countries with favorable bilateral tax treaties. To capture conduit countries, we use the top 6 ranked conduit countries

found by Van't Riet and Lejour (2018): UK, Luxembourg, Netherlands, Estonia, Hungary and Singapore. Finally, in column (10), I use quintiles for total assets and the number of affiliates as a proxies for firm size. 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.

Table 7: Effect of tax haven activities on the ETR: Variations in sample and covariates

	(1) Regional dummies	(2) Excl. Profitability	(3) Lag on Profitability	(4) Lag on Loss carryforward	(5) Log(wage costs)	(6) R&D expenses	(7) Non Big 4 Auditor	(8) Listed status	(9) Conduit dummy	(10) Size quintiles
Share of tax haven affiliates	-0.0031 (0.0047)	-0.0030 (0.0047)	-0.0037 (0.0055)	-0.0038 (0.0055)	-0.0061 (0.0061)	-0.0006 (0.0074)	-0.0031 (0.0047)	-0.0030 (0.0047)	-0.0032 (0.0047)	-0.0030 (0.0047)
MNC	0.0010 (0.0018)	0.0013 (0.0018)	0.0007 (0.0021)	0.0007 (0.0021)	0.0009 (0.0020)	-0.0046 (0.0042)	0.0009 (0.0018)	0.0009 (0.0018)	0.0009 (0.0018)	0.0007 (0.0018)
Profitability	-0.2630*** (0.0072)		-0.2776*** (0.0092)	-0.2682*** (0.0091)	-0.2802*** (0.0079)	-0.1610*** (0.0198)	-0.2630*** (0.0072)	-0.2630*** (0.0072)	-0.2630*** (0.0072)	-0.2627*** (0.0072)
Fixed asset ratio	0.0001 (0.0045)	0.0260*** (0.0044)	-0.0088 (0.0057)	-0.0102* (0.0057)	0.0100* (0.0051)	-0.0192* (0.0103)	0.0000 (0.0045)	0.0001 (0.0045)	0.0001 (0.0045)	-0.0010 (0.0045)
Leverage	0.0755*** (0.0043)	0.0927*** (0.0043)	0.0911*** (0.0055)	0.0878*** (0.0055)	0.0828*** (0.0048)	0.0531*** (0.0100)	0.0755*** (0.0043)	0.0755*** (0.0043)	0.0755*** (0.0043)	0.0734*** (0.0043)
Loss carryforward	0.0323*** (0.0056)	0.0368*** (0.0056)	0.0314*** (0.0081)	0.0308*** (0.0082)	0.0378*** (0.0066)	0.0471*** (0.0115)	0.0323*** (0.0056)	0.0323*** (0.0056)	0.0323*** (0.0056)	0.0325*** (0.0056)
Log(No. of Employees)	0.0055*** (0.0007)	0.0049*** (0.0007)	0.0069*** (0.0010)	0.0069*** (0.0010)		-0.0000 (0.0011)	0.0055*** (0.0007)	0.0055*** (0.0007)	0.0055*** (0.0007)	0.0048*** (0.0007)
Log(Total assets)	-0.0050*** (0.0015)	-0.0047*** (0.0015)	-0.0123*** (0.0021)	-0.0117*** (0.0021)	-0.0159*** (0.0019)	0.0042 (0.0031)	-0.0050*** (0.0015)	-0.0050*** (0.0015)	-0.0050*** (0.0015)	
Big 4 Auditor	-0.0011 (0.0019)	-0.0012 (0.0019)	0.0017 (0.0023)	0.0017 (0.0023)	-0.0018 (0.0022)	-0.0011 (0.0037)	-0.0014 (0.0019)	-0.0011 (0.0019)	-0.0011 (0.0019)	-0.0011 (0.0019)
Log(No. of affiliates)	0.0037*** (0.0010)	0.0046*** (0.0010)	0.0056*** (0.0012)	0.0055*** (0.0012)	0.0033*** (0.0012)	0.0010 (0.0018)	0.0037*** (0.0010)	0.0037*** (0.0010)	0.0037*** (0.0010)	0.0017 (0.0016)
Lag Profitability			0.0510*** (0.0074)							
Lag Loss carryforward				-0.0047 (0.0062)						
Log(wage costs)					0.0187*** (0.0015)					
R&D						-0.0217 (0.0496)				
Non-Big 4 auditor							-0.0016 (0.0015)			
Listed								-0.0002 (0.0052)		
Conduit									0.0004 (0.0022)	
Total assets quintile 2										-0.0022 (0.0019)
Total assets quintile 3										-0.0029 (0.0027)
Total assets quintile 4										-0.0019 (0.0034)
Total assets quintile 5										-0.0024 (0.0042)
No. of affiliates quintile 2										0.0015 (0.0013)
No. of affiliates quintile 3										0.0031 (0.0020)
No. of affiliates quintile 4										0.0040 (0.0026)
No. of affiliates quintile 5										0.0036 (0.0036)
Observations	185,122	185,122	114,482	114,482	146,375	34,725	185,122	185,122	185,122	185,122
Adj. R-squared	0.475	0.467	0.512	0.511	0.465	0.497	0.475	0.475	0.475	0.475
No. of firms	39,792	39,792	26,047	26,047	32,549	8,588	39,792	39,792	39,792	39,792

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. In column (1), I include dummies to capture firm activities in different regions of the world. North America is left in the reference category. In column (2), I exclude Profitability. In column (3), I include the one-year lag of Profitability. In column (4), I include the one-year lag of Loss carryforward. In column (5), I use the logarithm of wage expenses instead of the number of employees. In column (6), I include the ratio of research and development expenses to total assets. In column (7), I include the use of a non-Big 4 auditor. In column (8), I include a dummy variable equal to one for firms that are publicly listed. In column (9), I include a dummy variable equal to one for firms with affiliates in either of the top 6 countries characterized as conduit countries in Van't Riet and Lejour (2018). These are: UK, Luxembourg, Netherlands, Estonia, Hungary and Singapore. In Column (10), I use quintiles for total assets and the number of affiliates as a proxies for firm size. * p<0.05, ** p<0.01, *** p<0.001. The regressions are estimated by ordinary least squares, and include firm, 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.³⁶ In column (1) and (2), I follow Johansson et al. (2017) and divide the sample into two five-year periods. The result in column (1) remain

³⁶We provide further tests in the next section on the possible measurement errors and the resulting bias in the tax haven coefficient.

largely unaffected compared to the baseline specification. However, in column (2) we see that the tax haven coefficient changes sign. In column (3) we follow the selection in Janský (2019). Here we restrict attention to the five-year period between 2011 and 2015 but now for all firms that have at least three years of observations during this period. Surprisingly, the coefficient, compared to column (2), once again changes sign. This is due to the impact of excluding 2016. Finally, in column (4) we remove 2007 and 2016.

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 2011 and 2015 Min. 3 years	Between 2008 and 2015
Share of tax haven affiliates	-0.0114 (0.0102)	0.0040 (0.0074)	-0.0041 (0.0081)	-0.0002 (0.0056)
MNC	0.0049 (0.0030)	0.0039 (0.0027)	0.0048* (0.0027)	0.0042** (0.0020)
Profitability	-0.2641*** (0.0109)	-0.3076*** (0.0112)	-0.3072*** (0.0115)	-0.2875*** (0.0083)
Fixed asset ratio	0.0245*** (0.0078)	-0.0191*** (0.0072)	-0.0262*** (0.0075)	-0.0072 (0.0053)
Leverage	0.0934*** (0.0076)	0.0905*** (0.0071)	0.0904*** (0.0075)	0.0782*** (0.0051)
Loss carryforward	0.0261*** (0.0086)	0.0331*** (0.0093)	0.0348*** (0.0087)	0.0343*** (0.0063)
Log(Employees)	0.0036*** (0.0011)	0.0074*** (0.0012)	0.0072*** (0.0012)	0.0062*** (0.0009)
Log(Total assets)	-0.0061** (0.0026)	-0.0067*** (0.0025)	-0.0076*** (0.0028)	-0.0044** (0.0018)
Big 4 Auditor	-0.0084** (0.0036)	0.0001 (0.0033)	-0.0047 (0.0030)	-0.0013 (0.0022)
TTS	-0.0467* (0.0272)	0.0000 (.)	0.0000 (.)	-0.0337 (0.0296)
Observations	93,313	109,319	92,637	163,225
Adj. R-squared	0.038	0.056	0.059	0.059
No. of firms	38,049	41,980	27,553	49,873

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. In column (1), I focus on the sample period between 2007 and 2011. In column (2), I focus on the sample period between 2012 and 2016. In column (3), I focus on the sample period between 2011 and 2015, and firms with at least three years of observations. In column (4), I 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 firm, 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 versus small MNCs

In Table 9 we restrict the sample to investigate whether the effective tax rate and tax haven operations 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 MNCs. In columns (1) and (2), we split according to the number of foreign affiliates. The relationship between the effective tax rate and tax haven activities is negative and insignificant in both samples. The result in column (1) is different to comparable column in Table 6. This suggest that the definition of small versus large firms is of importance to capture non-linearities in tax haven responses.

Columns (3) to (7) splits the sample according to the total assets (measured in millions (mln) of euros). In column (3), I include firms with less than 226.99 mln euros in total assets (50th percentile). In column (4), I include firms with more or equal to 226.99 mln euros in total assets. In column (5), I include firms with more or equal to 1,236.57 mln euros in total assets (the 75th percentile). In column (7), I include firms with more or equal to 178,294.20 mln euros in total assets (the 99th percentile). The results are similar to the one where we split on the number of foreign affiliates. There appears to be some heterogeneity among the firms in the upper 50th percentile for the tax haven coefficient.

Table 9: Effect of tax haven activities on the ETR: Sample periods

	(1) Small MNCs	(2) Large MNCs	(3) Small MNCs	(4) Large MNCs	(5) Very Large MNCs	(6) Very Large MNCs	(7) Very Large MNCs
Share of tax haven affiliates	-0.01183 (0.00952)	-0.00025 (0.00573)	-0.01006 (0.01117)	-0.00199 (0.00513)	0.00217 (0.00642)	-0.00496 (0.00996)	-0.05741 (0.04681)
Observations	81,605	118,049	87,024	98,054	49,260	19,796	1,925
Adj. R-squared	0.511	0.462	0.416	0.512	0.522	0.524	0.523
No. of firms	20,976	25,356	22,329	17,448	7,920	2,844	233
Firm-level covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. This table splits data sample into large and small MNCs according to the number of foreign affiliates (columns (1) and (2)), and according to the total assets (in millions) (columns (3)-(7)). The median number of foreign affiliates is 3, while the median value of total assets is 226.99 million (mln) of euros. In column (1), I include firms with less than 3 foreign affiliates, and in column (2), I include firms with more or equal to 3 foreign affiliates. In column (3), I include firms with less than 226.99 mln euros in total assets. In column (4), I include firms with more or equal to 226.99 mln euros in total assets. In column (5), I include firms with more or equal to 1,236.57 mln euros in total assets (75th percentile). In column (7), I include firms with more or equal to 178,294.20 mln euros in total assets (99th percentile). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The regressions are estimated by ordinary least squares, and include firm, year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

7 Extensions

The empirical results, and robustness analysis, suggests that controlling for unobserved time-invariant firm characteristics eliminate the negative relationship between the effective tax burden and tax haven activities previously established in the literature. However, there are important aspects in the sample and the empirical methodology that potentially biases the tax haven coefficient, and thus deserves further attention.

7.1 Various tax haven lists

Table 10 explores various lists to identify jurisdictions as tax havens. As noted earlier, 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. One concern is that many large tax havens, the "Big 7" countries such as Ireland and Switzerland, are developed economies with

local markets and thus MNCs are therefore likely to have foreign activities unrelated to tax avoidance practices. On the other hand, smaller countries, the "Dot" tax havens such as Cyprus and Cayman Islands, are less developed economies with smaller markets and therefore MNCs are unlikely to establish real activities in these countries. In column (1), I use the tax haven list provided in Hines and Rice (1994). In column (2), I focus on the small economies referred to as Dot-havens by Hines and Rice. By focusing on Dot-havens we are likely to capture profit shifting activities to a larger extent compared to lists including larger tax havens. Interestingly, focusing on Dot-havens, we see that the tax haven variable is significant at the 10% level. In column (3) we use the list in Dyreng and Lindsey (2009), which is rather similar to that in Hines (2010). Again, the results are negative and significant at the 10% level. In columns (4) and (5) we exploit the 1998 and 2000 OECD lists of tax havens. The 2000 report identified 38 jurisdictions that met certain criteria for harmful tax practices described in the 1998 report, and were classified as being "uncooperative tax havens".³⁷ The 2000 report noted that a group of five tax havens had made advanced political commitments in eliminating their harmful tax practices, and was removed from the published list. Among these were well known tax havens such as the Cayman Island and Cyprus.³⁸ By 2009 all 38 jurisdictions had been removed from the list of uncooperative tax havens, due to their efforts in increasing transparency and exchange of information. The results from columns (4) and (5) are interesting. By including small and well known tax havens in column (4), we see a negative and highly significant effect from tax haven activities on the effective tax rate. The tax haven coefficient is no longer significant when using the the original 2000-list. Column (6) exploit the top 10 countries on the 2021 Corporate Tax Haven Index (CTHI) published by Tax Justice Network (TJN). Column (7) uses the Hines (2010) list but remove all tax havens located in the EU/EEA. In both the latter two columns, the results remain similar to the baseline specification.

³⁷These criteria were: no or low effective tax rates, lack of information exchange and transparency and the absence of substantial local activities.

³⁸The five countries were: Bermuda, Cayman Islands, Cyprus, Malta, Mauritius, and San Marino.

Table 10: Effect of tax haven activities on the ETR: Various tax haven lists

	(1) Hines and Rice (1994) list	(2) Hines and Rice (1994) Dots-list	(3) Dyreg and Lindsey (2009) list	(4) OECD (1998) list	(5) OECD (2000) list	(6) Top 10 TJN' CTHI	(7) Non-EU havens
Share of tax haven affiliates	-0.0027 (0.0047)	-0.0199* (0.0111)	-0.0111* (0.0057)	-0.0310** (0.0129)	-0.0294 (0.0279)	-0.0007 (0.0041)	-0.0011 (0.0055)
MNC	0.0009 (0.0018)	0.0010 (0.0017)	0.0011 (0.0018)	0.0009 (0.0017)	0.0008 (0.0017)	0.0010 (0.0018)	0.0007 (0.0017)
Profitability	-0.2630*** (0.0072)	-0.2630*** (0.0072)	-0.2622*** (0.0072)	-0.2630*** (0.0072)	-0.2631*** (0.0072)	-0.2677*** (0.0074)	-0.2674*** (0.0072)
Fixed asset ratio	0.0001 (0.0045)	0.0001 (0.0045)	-0.0003 (0.0045)	0.0001 (0.0045)	0.0001 (0.0045)	-0.0002 (0.0047)	0.0001 (0.0044)
Leverage	0.0755*** (0.0043)	0.0754*** (0.0043)	0.0754*** (0.0043)	0.0754*** (0.0043)	0.0755*** (0.0043)	0.0768*** (0.0045)	0.0752*** (0.0042)
Loss carryforward	0.0323*** (0.0056)	0.0323*** (0.0056)	0.0324*** (0.0056)	0.0323*** (0.0056)	0.0323*** (0.0056)	0.0338*** (0.0059)	0.0312*** (0.0055)
Log(No. of Employees)	0.0055*** (0.0007)	0.0055*** (0.0007)	0.0055*** (0.0007)	0.0055*** (0.0007)	0.0055*** (0.0007)	0.0069*** (0.0009)	0.0054*** (0.0007)
Log(Total assets)	-0.0050*** (0.0015)	-0.0050*** (0.0015)	-0.0050*** (0.0015)	-0.0050*** (0.0015)	-0.0050*** (0.0015)	-0.0050*** (0.0016)	-0.0050*** (0.0015)
Big 4 Auditor	-0.0011 (0.0019)	-0.0011 (0.0019)	-0.0011 (0.0019)	-0.0011 (0.0019)	-0.0011 (0.0019)	-0.0008 (0.0021)	-0.0009 (0.0019)
Log(No. of affiliates)	0.0037*** (0.0010)	0.0037*** (0.0010)	0.0038*** (0.0010)	0.0038*** (0.0010)	0.0038*** (0.0010)	0.0037*** (0.0010)	0.0038*** (0.0010)
Observations	185,122	185,122	184,598	185,122	185,122	175,175	189,173
Adj. R-squared	0.475	0.475	0.474	0.475	0.475	0.478	0.477
No. of firms	39,792	39,792	39,655	39,792	39,792	37,367	40,537

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. In column (1), I use the Hines and Rice (1994) list. In Column (2), I use the tax havens referred to as Dots in Hines and Rice (1994). In Column (3), I use the list reported in Dyreg and Lindsey (2010). In Columns (4) and (5), I use the OECD (1998, 2000) reports. In column (6), I use the top 10 countries on the 2021 Corporate Tax Haven Index (CTHI) published by Tax Justice Network (TJN). In column (7), I use the Hines (2010) list but remove all tax havens located in the EU/EEA. 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 firm, year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

7.2 Heterogeneity in responses

Table 11 explore potential heterogeneous responses in the tax haven variable. Column (1) reproduces the baseline result from Table 4, column (3). In column (2), I include an interaction between the tax haven variable and a dummy variable, TH shift, which is equal to one for firms with shifts in tax haven status during the sample period. In this way, one can separate responses along the intensive margin (the "non TH-shifters") and the extensive margin (the "TH-shifters"). The intuition is that tax haven activities could entail considerable investment and transaction costs, and thus, given our short sample period, might bias our results. One could also expect that firms with a well-established presence in tax havens to behave differently than firms that either begins or close down activities in tax havens. The results seems to support this hypothesis. Firms that adjusts their tax haven activities along the intensive margin experience a highly significant and decreasing tax burden. Column (3) explore whether the regional residence of the parent company is of importance. European firms are left in the reference category. In column (4), I focus only on US firms. US-TH is a dummy variable equal to one if the US (parent) firm is incorporated in either Delaware, Nevada, Wyoming or South Dakota, and is interacted with the the tax haven variable. These are states that are frequently mentioned as domestic tax havens in the US (see e.g., Dyreg et al. (2013) or Bullough (2019)). The result finds an

interesting pattern in the tax haven variables depending on where the parent is incorporated, pointing towards tax avoidance activities by US firms incorporated in domestic tax havens.

Table 11: Effect of tax haven activities on the ETR: Heterogeneity in responses

	(1)	(2)	(3)	(4)
	Baseline	Tax haven status shift	Parent residency	US firms
Share of tax haven affiliates (TH)	-0.0030 (0.0047)	-0.0168** (0.0076)		0.0302* (0.0161)
Share of TH affiliates × TH shift		0.0221** (0.0097)		
TH × Asia			0.0010 (0.0083)	
TH × Africa			-0.0318 (0.0224)	
TH × Oceania			-0.0872** (0.0412)	
TH × South America			-0.0904 (0.0694)	
TH × North America			0.0146 (0.0117)	
TH × US-TH				-0.0347 (0.0225)
Observations	185,122	185,122	185,122	13,884
Adj. R-squared	0.475	0.475	0.475	0.532
No. of firms	39,792	39,792	39,792	2,472
Firm-level covariates	Yes	Yes	Yes	Yes

The dependent variable is the ETR. Detailed variable definitions are given in Table 3. Europe is a dummy variable equal to one if the parent is resident in Europe, and is zero otherwise. Africa is a dummy variable equal to one if the parent is resident in Africa. Oceania is a dummy variable equal to one if the parent is resident in Oceania. South America is a dummy variable equal to one if the parent is resident in South America. North America is a dummy variable equal to one if the parent is resident in North America. TH shift is a dummy variable equal to one for firms with both activities and no activities in tax havens during the sample period. In column (4), I focus only on US firms. US-TH is a dummy variable equal to one if the US firm is incorporated in either Delaware, Nevada, Wyoming or South Dakota. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The regressions are estimated by ordinary least squares, and include firm, year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

7.3 Dealing with measurement errors

A concern with the historical ownership data provided in Orbis is that the coverage of firms is increasing over time. Classical measurement error in an independent variable is known to attenuate the estimator towards zero. The attenuation occurs because part of the variation in tax haven activities is due to measurement error which has no effect on the effective tax burden. The problem with measurement error is more severe in a model with fixed effects

than a pooled OLS (see e.g., Griliches and Hausman (1986)). Thus, what might appear as the absence of a causal relationship between the effective tax burden and tax haven activities is incorrect due to the underlying measurement error in the Orbis database. A second concern is that the measurement error is unlikely to satisfy the classical assumptions, in the sense that the errors are serially correlated.

Columns (1) and (2) presents the baseline results from Table 4. The way the measurement error plays out in the data is that certain firms is observed, say for the first time in 2015 or 2016, but similarly observe that the firm was incorporated prior to this date. Thus, a hole exist in the data for the firm. In columns (3) and (4) I cope with this measurement error by focusing on firms where every affiliate is observed for all years in the sample, adjusted by their incorporation year.³⁹ The results provides evidence for substantial measurement errors in the ownership data. The cross-sectional (pooled OLS) estimator in column (3) is roughly 0.30 percentage points greater than in column (1). Interestingly, the fixed effects estimator provides a greater point estimate than the pooled OLS, and unlike column (2), also is statistically significant. The result suggests that controlling for unobserved firm fixed effects magnifies the relationship between the effective tax rate and tax haven activities.

As the measurement error is less severe in the later years, we are exacerbating the bias in the fixed effects model. To see this, fixed effects uses a within-group transformation, where we subtract the time-average from contemporaneous values. Thus, if the measurement error is more severe in the early years, later years are affected through time-demeaning. As a result, measurement error in one year therefore affects all years and the bias is magnified relative to the pooled OLS estimator. The first-difference estimator is expected to lie somewhere in between pooled OLS and fixed effects because the measurement error in the early years do not affect the later years. In column (5) we estimate Eq. 1 using first differences to eliminate unobserved firm fixed effects. The results confirms the previous discussion, yielding an estimator that is roughly in the middle of the OLS-FE models. Again, we see that measurement error is likely biasing the fixed effects estimator in column (2).

³⁹Due to potential lags in reporting, we keep all affiliates where, say, the affiliate is incorporated in 2007, but we observe the affiliate for the first time in 2008. In cases where we observe the affiliate for the first time in 2009 or later, we eliminate all the (parent) firms that had ownership of this affiliate.

Table 12: Effect of tax haven activities on the ETR: Measurement errors

	(1) Baseline: POLS	(2) Baseline: FEs	(3) Measurement errors POLS	(4) Measurement errors FEs	(5) Baseline: first diff.
Share of tax haven affiliates	-0.0235*** (0.0030)	-0.0030 (0.0047)	-0.0261** (0.0106)	-0.0280* (0.0154)	
MNC	0.0060*** (0.0010)	0.0009 (0.0018)	0.0065*** (0.0023)	0.0055 (0.0044)	
Δ Share of tax haven affiliates					-0.0158** (0.0079)
Δ MNC					0.0053* (0.0028)
Observations	202,865	185,122	71,270	60,752	114,482
Adj. R-squared	0.191	0.475	0.167	0.447	-0.089
No. of firms	57,532	39,792	23,791	13,278	26,047
Firm-level covariates	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	No	Yes	Yes

The dependent variable is the ETR. Columns (1) and (2) replicates columns (2) and (3) from Table 4, which is the baseline specification. Columns (3) and (4) removes firms with measurement error in the historical ownership series, and replicate the first two columns using this sample. In column (5), I estimate Eq. 1 using first differences. Δ refers to the variables in first differences. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The regressions are estimated by ordinary least squares, and include firm, year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

7.4 Instrumental variable approach

The previous discussion suggests that the increasing coverage of Orbis gives substantial measurement errors in the estimate of tax haven activities on the effective tax rate in the fixed effects framework. In order to deal with unobserved confounding factors in the cross-sectional framework (pooled OLS), we exploit an instrumental variable approach to isolate exogenous variation in the demand for tax haven activities. The instrument used is the 2014 Luxembourg Leaks (LuxLeaks) - a scandal reported by the International Consortium of Investigative Journalists (ICIJ).⁴⁰ ICIJ analyzed leaked confidential documents that revealed special tax deals granted by the government of Luxembourg to some of the world's largest MNCs. The documents contained detailed and complex tax-savings plans prepared by accountants at PricewaterhouseCoopers (PWC) (ICIJ, 2014). Even though the documents contained special tax-deals between 2002 and 2010, I argue that Luxembourg's reputation as a tax haven was negatively affected by the scandal and that MNCs reacted by lowering their tax haven activities in Luxembourg. I also expect publicly listed firms to be greater affected than privately held firms

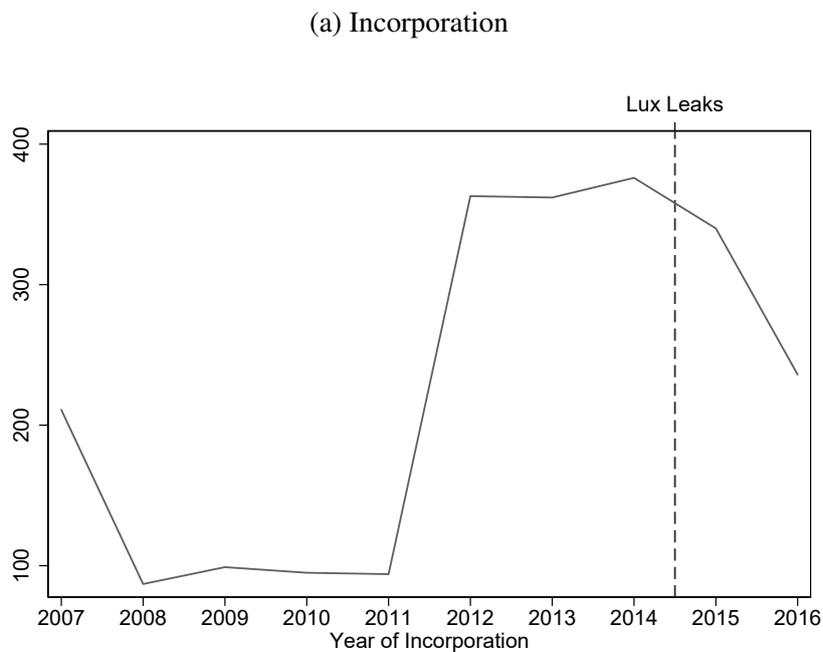
⁴⁰Whether the leaks in itself contributed to greater transparency is a relevant issue. However, Luxembourg is part of the EU and, as such, coverage is expected to be greater than in most tax havens. Also, the Luxleaks occurred at the end of 2014 when coverage already is large.

due to potential capital market pressure. The identifying assumption in this IV-setting is that the LuxLeaks only affected the effective tax burden through changes in tax haven activities. Whether the scandal had a direct impact on the effective tax burden itself is an open question, however, as the scandal revealed tax deals between 2002 and 2010, this is less likely.

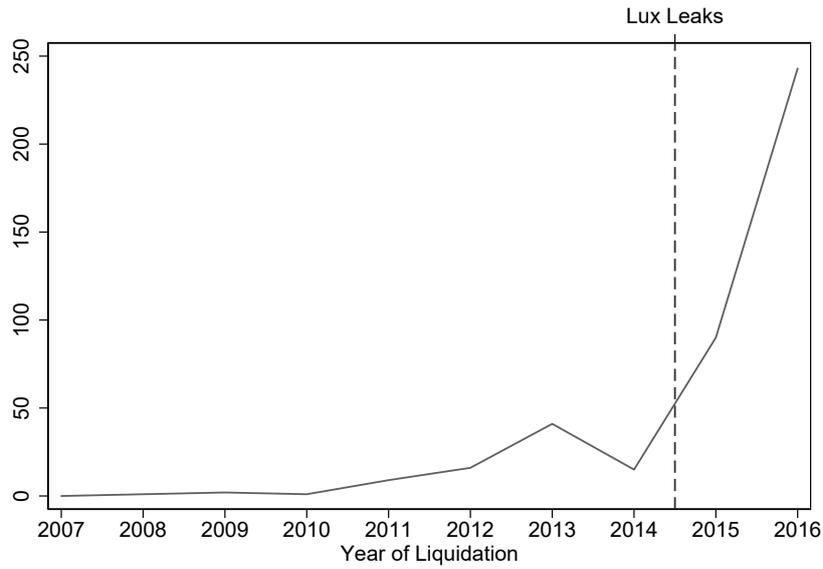
Figure 2 shows the development on the number of affiliates that was incorporated (panel a) and liquidated (panel b) in the years before and after the LuxLeaks. The figure clearly shows a decreasing trend in the number of affiliates incorporated and a similar increasing trend in the number of liquidations.

Figure 2: Incorporations and liquidations in Luxembourg

The figures shows the development in the number of incorporation (panel a) and liquidation (panel b) of affiliates among multinational firms in the years before and after the LuxLeaks which occurred in late 2014.



(b) Liquidation



To identify firms affected by the LuxLeaks (i.e., treatment group), we create a dummy variable equal to one for firms that had activities in Luxembourg prior to 2015, and equal to one in the post-LuxLeaks period (2015 and 2016). Table 13 provides a two-stage least squares estimate of the effect of tax haven activities on the effective tax rate, using the LuxLeaks as an instrument. The (pooled) OLS estimator shows that a one percentage point increase in tax haven activities decreases the ETR by 5.62 percentage points in the sub-sample of firms with activities in Luxembourg prior to 2015, which is significantly greater than the baseline OLS specification in Table 4, column (2). The first stage shows a significant increase in the share of tax haven affiliates due to the LuxLeaks in 2014. This exogenous variation in tax haven activities is subsequently used to identify the IV-estimator. The IV-estimator is negative and significant, and suggests that firms affected by the LuxLeaks experienced a 14.49 percentage point drop in the ETR. This is substantially higher than the baseline specification, and again suggests that the baseline estimator is significantly downward biased.

Table 13: Effect of tax haven activities on the ETR: Measurement errors

	POLS	First stage	IV
	ETR	Share of TH aff.	ETR
Share of tax haven affiliates	-0.0562*** (0.0188)		-0.1449* (0.0834)
LuxLeaks		0.0529*** (0.0061)	
Observations	4,017	4,017	4,017
Adj. R-squared	0.071	0.145	0.058
No. of firms	584	584	584
Firm-level covariates	Yes	Yes	Yes
Fixed effects	No	No	No
F-statistic		75.728	

The dependent variable is the ETR. LuxLeaks is a dummy variable equal to one for firms with activities in Luxembourg prior to 2015, and equals one in the post-LuxLeaks period (2015 and 2016). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The regressions are estimated by ordinary least squares, and include firm, year, country-year and industry-year fixed effects. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

8 Conclusion

This paper investigates the effect of tax haven activities on the effective tax burden of corporate groups in a cross-country setting. Using firm-level data from Orbis, I 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 by 2.37 percentage points. When using the ratio of tax expenses to total assets, the comparable result shows a 0.07 percentage point reduction. 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. Furthermore, using dummy variables to capture the extent of tax haven activities I find that firms benefit from a considerable presence in tax havens. When using the ratio of tax expenses to total assets (Tax-asset ratio), I 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 income (ETR).

In further analysis, I focus on different tax haven lists. Particular emphasis is given to smaller tax haven countries ("Dot"-havens), where the relationship between the ETR and tax haven activities is now both negative and significant. A concern in the data is that measurement errors, due to Orbis' increasing coverage over time, gives rise to a biased relationship between the effective tax burden and tax haven activities. When controlling for measurement errors in the ownership data, I obtain a significant and larger point estimator on the tax haven variable, both with and without, firm fixed effects. I also provide an instrumental variable estimate, utilizing the 2014 Luxembourg Leaks to isolate exogenous variation in the demand for tax haven activities, which also indicate that the tax haven effect is larger in magnitude than previously established.

Appendices

A Data Appendix for Orbis Files

This section 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, I 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, I make a number of assumptions to trim the data. I match the data on financial statements with ownership and various other time-invariant firm-level data sets provided in Orbis. I do this to reduce potential measurement errors. The data from Orbis encompasses not only industrial firms, but also different types of ownership relations such as Private Equity, Individual shareholders, state ownership etc. In the following subsections, I provide an overview of the data used.

A.1 Ownership Selection Criteria

The time period covered in the ownership data is between 2007 and 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 I apply the following selection criteria: I generate the variable "Global Ultimate Owner" (GUO), the parent firm, from the Orbis classifications (Priority is given to the majority-shareholder. If no majority owner is found, I then apply the minority owner).⁴¹ Where no GUO is determined by Orbis, the first-level shareholder is used to define the appropriate stakeholder as the GUO. The first-level shareholder is here defined as the stakeholder with the largest registered ownership stake. Due to size issues I eliminate the latter firms (roughly 50 million observations), and thus only keep firms where Orbis have a clear definition of a corporate group, where I rely on GUO's that are either of an industrial, bank, insurance or financial

⁴¹Minority ownership is defined as the largest owner, with ownership stake in the interval between 10% plus one share and 50%. The case of joint ownership entails an identification issue. However, since we are utilizing only majority-owned affiliates in the working sample, this is not relevant.

entity type.⁴² I only keep affiliates in which where the GUO is the majority shareholder, either directly or indirectly. Finally, I 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, I remove firm-year observations where (on selected items I 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 duplicate⁴³

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 I utilize Nace Rev. 2, 4 digits core codes. For data on industry classifications I drop duplicates of firm-Nace observations.

⁴²In section 7.3, I utilize the entire dataset.

⁴³This is not an innocuous assumption, and other methods, such as imputation, could be a more appropriate solution to dealing with firm-year duplicates.

A.2.2 Data on Legal Information

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

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, I merge the various firm-level data sets provided by BvD. In doing so, I 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. I do not remove firm-year observations where I found no match with data on auditors.

B Tables and Figures

B.1 Descriptive Statistics on Countries - ETR Sample

Table 14: List of countries - ETR sample

Country	No. of obs	ETR (in \%)	Tax rate (in \%)
Australia	907	27.12	30.00
Austria	456	23.99	25.00
Belgium	3,114	30.73	33.99
Brazil	287	27.47	34.00
Canada	183	24.45	28.08
Chile	91	19.55	19.52
China	8,498	20.09	25.53
Croatia	150	18.34	20.00
Denmark	5,268	25.24	24.47
Egypt	37	22.12	22.91
Finland	10,782	24.91	23.84
France	5,044	29.38	36.54
Germany	18,047	29.05	30.95
Greece	841	29.76	24.86
Hungary	317	14.45	19.23
Iceland	250	21.12	19.74
India	870	26.56	33.90
Israel	1,046	23.15	25.70
Italy	13,340	40.32	31.91
Japan	11,497	35.81	35.99
Kuwait	94	5.88	21.80
Latvia	588	19.21	15.00
Lithuania	534	18.28	15.23
Malayisa	638	24.87	25.22
Mexico	128	30.10	29.42
Netherlands	11,539	25.37	25.18
New Zealand	86	28.95	28.87
Norway	287	25.94	27.44
Pakistan	159	23.61	33.59
Philipines	298	23.42	30.54
Poland	804	20.15	19.00
Portugal	240	28.89	27.02
Russia	612	27.58	20.51
South Korea	495	24.39	24.22
Saudi Arabia	156	8.47	20.00
South Africa	801	28.76	31.83
Spain	9,134	26.58	29.53
Sri Lanka	221	22.82	28.79
Sweden	29,369	26.03	25.34
Thailand	113	24.39	29.50
Turkey	227	19.34	20.00
Ukraine	200	24.55	18.34
UK	52,431	25.45	24.22
US	14,767	30.55	39.13
Vietnam	409	19.49	22.74
Total	205,355	27.63	28.03

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

Table 15: Descriptive Statistics: Tax-asset ratio sample

	Full Sample	Domestic	Multinationals		Total
	Mean/(SD)	Mean/(SD)	Without tax haven affiliates	With tax haven affiliates	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 (0.059)	0.316 (0.062)	0.301 (0.061)
Share of tax haven affiliates	0.042 (0.157)	0.000 (0.000)	0.000 (0.000)	0.321 (0.316)	0.110 (0.239)
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)	1.000 (0.000)
Profitability	0.055 (0.095)	0.058 (0.092)	0.049 (0.103)	0.056 (0.092)	0.051 (0.100)
Fixed asset ratio	0.448 (0.249)	0.453 (0.264)	0.425 (0.225)	0.475 (0.215)	0.442 (0.223)
Leverage	0.575 (0.224)	0.583 (0.231)	0.566 (0.218)	0.553 (0.204)	0.562 (0.213)
Loss carryforward	0.212 (0.408)	0.198 (0.399)	0.245 (0.430)	0.209 (0.406)	0.233 (0.423)
No. of employees	2840.888 (20457.468)	828.016 (5104.215)	1860.322 (8446.930)	14361.193 (53027.973)	6125.258 (32271.943)
Total Assets (in mill.)	1002.415 (8069.008)	255.296 (1886.727)	624.899 (3800.579)	5304.600 (20877.444)	2221.478 (12772.692)
Big4 Auditor	0.152 (0.359)	0.098 (0.297)	0.188 (0.391)	0.342 (0.474)	0.240 (0.427)
No. of affiliates	12.510 (42.063)	4.949 (10.272)	11.220 (22.822)	51.163 (101.819)	24.847 (65.105)
Observations	285,514	177,023	71,477	37,014	108,491

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. Detailed variable definitions are given in Table 3.

B.3 Descriptive Statics: Share of tax haven affiliates

Figure 3: Density of the share of tax haven affiliates: Hines list

The figures shows the density of the share of tax haven affiliates (relative to the total number of foreign affiliates) using the Hines (2010) list, for the sub-sample of firms which at some point engages in tax haven activities.

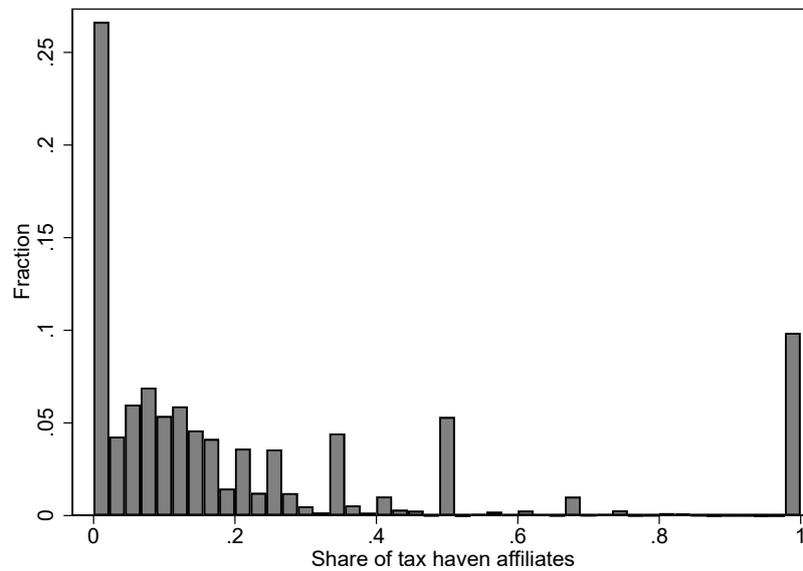
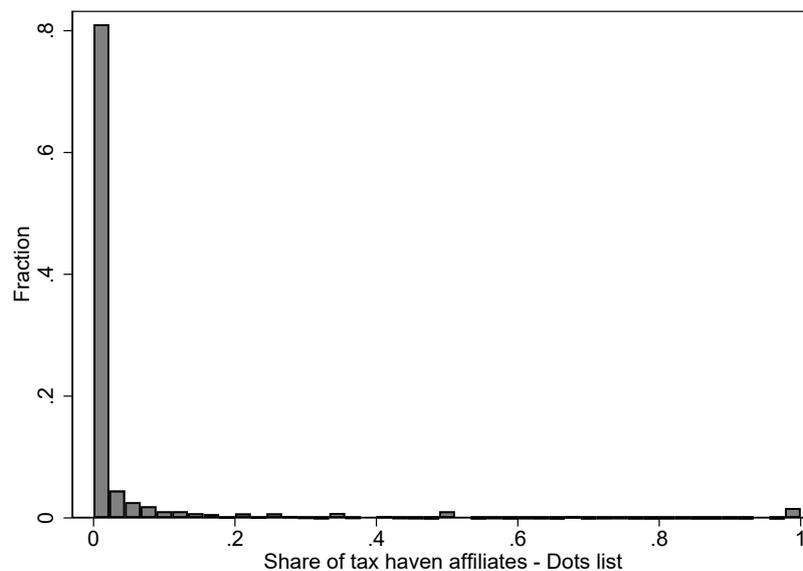


Figure 4: Density of the share of tax haven affiliates: Dots list

The figures shows the density of the share of tax haven affiliates (relative to the total number of foreign affiliates) using the Hines and Rice (1994) "Dots" list, for the sub-sample of firms which at some point engages in tax haven activities.



B.4 Descriptive Statics: Within-firm variation in tax haven activities

Table 16: Within-firm variation in tax haven activities

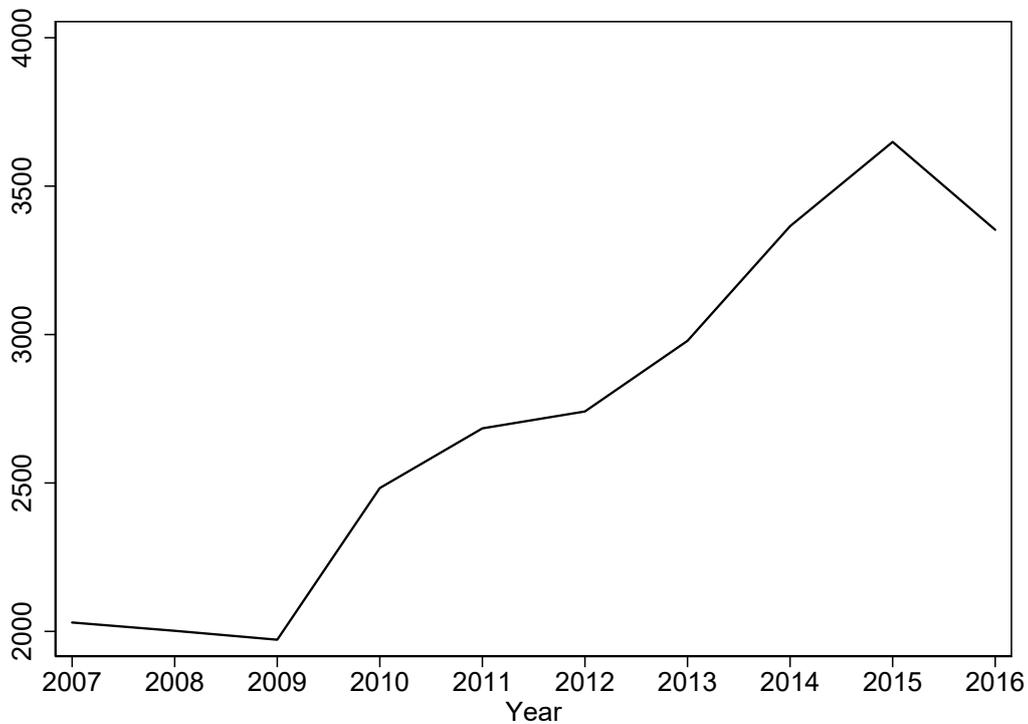
	Share of tax haven affiliates			At least 1 tax haven affiliate		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(No. of affiliates)			0.0066*** (0.0017)			0.1014*** (0.0034)
Observations	187,687	187,678	187,678	187,687	187,678	187,678
Adj. R-squared	0.703	0.716	0.748	0.801	0.817	0.836
No. of firms	40,087	40,085	40,085	40,087	40,085	40,085
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year; Country; Industry FEs	No	Yes	Yes	No	Yes	Yes
Covariates	No	No	Yes	No	No	Yes

ETR sample. Standard errors in parenthesis are robust to heteroscedasticity and clustered at the firm-level.

B.5 Descriptive Statics: Number of firms with tax haven activities over time

Figure 5: The number of firms with tax haven activities

The figures shows the number of firms with tax haven affiliates during the sample period. Tax havens are classified according to Hines (2010).



References

- Akamah, H., Hope, O.-K., and Thomas, W. B. (2018). Tax havens and disclosure aggregation. *Journal of International Business Studies*, 49(1):49–69.
- Alstadsæter, A., Barrios, S., Nicodème, G., Skonieczna, A. M., and Vezzani, A. (2018). Patent boxes design, patents location, and local r&d. *Economic Policy*, 33(93):131–177.
- Ball, R. and Shivakumar, L. (2005). Earnings quality in uk private firms: comparative loss recognition timeliness. *Journal of accounting and economics*, 39(1):83–128.
- Beer, S., De Mooij, R., and Liu, L. (2020). International corporate tax avoidance: A review of the channels, magnitudes, and blind spots. *Journal of Economic Surveys*, 34(3):660–688.
- Bennedsen, M. and Zeume, S. (2018). Corporate tax havens and transparency. *The Review of Financial Studies*, 31(4):1221–1264.
- Bilicka, K. A. (2019). Comparing uk tax returns of foreign multinationals to matched domestic firms. *American Economic Review*, 109(8):2921–53.
- Boffey, D. (December 18, 2017). Eu investigates ikea after dutch deals reduce tax bill by €1bn. *The Guardian*.
- Bowers, S. (November 6, 2017a). How nike stays one step ahead of the regulators. *International Consortium of Investigative Journalists (ICIJ)*.
- Bowers, S. (November 6, 2017b). Leaked documents expose secret tale of apple’s offshore island hop. *International Consortium of Investigative Journalists (ICIJ)*.
- Bullough, O. (2019). *Moneyland: The Inside Story of the Crooks and Kleptocrats Who Rule the World*. St. Martin’s Press.
- Burgstahler, D. C., Hail, L., and Leuz, C. (2006). The importance of reporting incentives: Earnings management in european private and public firms. *The accounting review*, 81(5):983–1016.
- Clausing, K. A. (2003). Tax-motivated transfer pricing and us intrafirm trade prices. *Journal of Public Economics*, 87(9):2207–2223.
- Correia, S. (2016). A feasible estimator for linear models with multi-way fixed effects. Preprint at: <http://scorreia.com/research/hdfe.pdf>.

- Davies, R., Martin, J., Parenti, M., and Toubal, F. (2018). Knocking on tax haven's door: Multinational firms and transfer pricing. *Review of Economics and Statistics*, 100(1):120–134.
- Desai, M. A., Foley, C. F., and Hines Jr, J. R. (2006). The demand for tax haven operations. *Journal of Public economics*, 90(3):513–531.
- Dharmapala, D. (2008). What problems and opportunities are created by tax havens? *Oxford Review of Economic Policy*, 24(4):661–679.
- Dischinger, M. and Riedel, N. (2011). Corporate taxes and the location of intangible assets within multinational firms. *Journal of Public Economics*, 95(7-8):691–707.
- Dowd, T., Landefeld, P., and Moore, A. (2017). Profit shifting of us multinationals. *Journal of Public Economics*, 148:1–13.
- Durnev, A., Li, T., and Magnan, M. (2017). Beyond tax avoidance: Offshore firms' institutional environment and financial reporting quality. *Journal of Business Finance & Accounting*, 44(5-6):646–696.
- Dyreng, S. D., Hanlon, M., and Maydew, E. L. (2008). Long-run corporate tax avoidance. *The accounting review*, 83(1):61–82.
- Dyreng, S. D. and Lindsey, B. P. (2009). Using financial accounting data to examine the effect of foreign operations located in tax havens and other countries on us multinational firms' tax rates. *Journal of Accounting Research*, 47(5):1283–1316.
- Dyreng, S. D., Lindsey, B. P., and Thornock, J. R. (2013). Exploring the role delaware plays as a domestic tax haven. *Journal of Financial Economics*, 108(3):751–772.
- Egger, P., Eggert, W., Keuschnigg, C., and Winner, H. (2010). Corporate taxation, debt financing and foreign-plant ownership. *European Economic Review*, 54(1):96–107.
- Fuest, C., Hugger, F., and Neumeier, F. (2021). Corporate profit shifting and the role of tax havens: Evidence from german country-by-country reporting data.
- Griliches, Z. and Hausman, J. A. (1986). Errors in variables in panel data. *Journal of econometrics*, 31(1):93–118.

- Gupta, S. and Newberry, K. (1997). Determinants of the variability in corporate effective tax rates: Evidence from longitudinal data. *Journal of accounting and public policy*, 16(1):1–34.
- Hanlon, M. (2003). What can we infer about a firm’s taxable income from its financial statements? *National Tax Journal*, 56(4):831–863.
- Harris, D., Morck, R., Slemrod, J., and Yeung, B. (1991). Income shifting in u.s. multinational corporations. Working Paper 3924, National Bureau of Economic Research.
- Henry, E. and Sansing, R. (2018). Corporate tax avoidance: Data truncation and loss firms. *Review of Accounting Studies*, 23(3):1042–1070.
- Hines, J. R. (2010). Treasure islands. *Journal of Economic Perspectives*, 24(4):103–26.
- Hines, J. R. and Rice, E. M. (1994). Fiscal paradise: Foreign tax havens and american business. *The Quarterly Journal of Economics*, 109(1):149–182.
- Hopland, A. O., Lisowsky, P., Mardan, M., and Schindler, D. (2018). Flexibility in income shifting under losses. *The Accounting Review*, 93(3):163–183.
- Huizinga, H. and Laeven, L. (2008). International profit shifting within multinationals: A multi-country perspective. *Journal of Public Economics*, 92(5-6):1164–1182.
- Huizinga, H., Laeven, L., and Nicodeme, G. (2008). Capital structure and international debt shifting. *Journal of Financial Economics*, 88(1):80–118.
- ICIJ (November 5, 2014). About this project: Luxembourg leaks.
- Jaafar, A. and Thornton, J. (2015). Tax havens and effective tax rates: An analysis of private versus public european firms. *The International Journal of Accounting*, 50(4):435–457.
- Janský, P. (2019). Effective tax rates of multinational enterprises in the eu. *Brussels: The Greens/EFA Group in the European Parliament*.
- Janský, P. and Prats, A. (2015). International profit-shifting out of developing countries and the role of tax havens. *Development policy review*, 33(3):271–292.
- Janssen, B., Vandenbussche, H., and Crabbé, K. (2005). Corporate tax savings when hiring a big 4 auditor: Empirical evidence for belgium. *SSRN Discussion Paper, No. 876564*.

- Johansson, Å., Skeie, Ø. B., Sorbe, S., and Menon, C. (2017). Tax planning by multinational firms: Firm-level evidence from a cross-country database. *Working Paper No. 1355. OECD Economics Department, OECD Publishing, Paris.*
- Jones, C., Temouri, Y., and Cobham, A. (2018). Tax haven networks and the role of the big 4 accountancy firms. *Journal of world business*, 53(2):177–193.
- Kalemli-Ozcan, S., Sorensen, B., Villegas-Sanchez, C., Volosovych, V., and Yesiltas, S. (2015). How to construct nationally representative firm level data from the orbis global database. Working Paper 21558, Tinbergen Institute Discussion Paper.
- Karkinsky, T. and Riedel, N. (2012). Corporate taxation and the choice of patent location within multinational firms. *Journal of international Economics*, 88(1):176–185.
- Klinger, Scott and Anderson, Sarah and Rojas, Javier (2013). Corporate tax dodgers. 10 companies and their tax loopholes. *Institute for Policy Studies.*
- KPMG (2020). Corporate Tax Rates Table.
- Lawrence, L. and Griffiths, I. (November 6, 2007). Revealed: how multinational companies avoid the taxman. *The Guardian.*
- Lee, N. and Swenson, C. (2012). Are multinational corporate tax rules as important as tax rates? *The International Journal of Accounting*, 47(2):155–167.
- Maffini, G. (2009). Tax haven activities and the tax liabilities of multinational groups. *Centre for Business Taxation WP 09/25.*
- Manzon, G. B. and Plesko, G. A. (2001). The relation between financial and tax reporting measures of income. *Tax L. Rev.*, 55:175.
- Markle, K. S. and Shackelford, D. (2009). Do multinationals or domestic firms face higher effective tax rates? *National Bureau of Economic Research.*
- Markle, K. S. and Shackelford, D. A. (2012a). Cross-country comparisons of corporate income taxes. *National Tax Journal*, 65(3):493–527.
- Markle, K. S. and Shackelford, D. A. (2012b). Cross-country comparisons of the effects of leverage, intangible assets, and tax havens on corporate income taxes. *Tax L. Rev.*, 65:415.

- Markle, K. S. and Shackelford, D. A. (2014). The impact of headquarter and subsidiary locations on multinationals' effective tax rates. *Tax Policy and the Economy*, 28(1):33–62.
- Mills, L. F. (1998). Book-tax differences and internal revenue service adjustments. *Journal of Accounting research*, 36(2):343–356.
- OECD (2000). *Towards Global Tax Cooperation: Progress in Identifying and Eliminating Harmful Tax Practices*. OECD Paris.
- Palan, R., Murphy, R., and Chavagneux, C. (2013). *Tax havens: How globalization really works*. Cornell University Press.
- Rego, S. O. (2003). Tax-avoidance activities of US multinational corporations. *Contemporary Accounting Research*, 20(4):805–833.
- Rusina, A. (2020). Name and shame? evidence from the european union tax haven blacklist. *International Tax and Public Finance*, 27(6):1364–1424.
- Schjelderup, G. (2016). Secrecy jurisdictions. *International Tax and Public Finance*, 23(1):168–189.
- Sikka, P. and Hampton, M. P. (2005). The role of accountancy firms in tax avoidance: Some evidence and issues. In *Accounting Forum*, volume 29, pages 325–343. Taylor & Francis.
- Tax Foundation (2020). *Corporate Tax Rates around the World, 2020*.
- Tax Justice Network (2021). *Corporate Tax Haven Index - 2021 Results*.
- Tørsløv, T. R., Wier, L. S., and Zucman, G. (2018). The missing profits of nations. *NBER Working Papers, No. 24701*.
- Trading Economics (2020). *List of Countries by Corporate Tax Rate*.
- U.S. Government Accountability Office (2008). *Large U.S. Corporations and Federal Contractors with Subsidiaries in Jurisdictions Listed as Tax Havens or Financial Privacy Jurisdictions*. GAO-09-157. Washington, DC: U.S. Government Accountability Office.
- Van't Riet, M. and Lejour, A. (2018). Optimal tax routing: Network analysis of fdi diversion. *International Tax and Public Finance*, 25(5):1321–1371.
- Weyzig, F. (2013). Tax treaty shopping: structural determinants of foreign direct investment routed through the netherlands. *International Tax and Public Finance*, 20(6):910–937.

Wilson, R. J. (2009). An examination of corporate tax shelter participants. *The Accounting Review*, 84(3):969–999.