

Godar, Sarah

Working Paper

Tax haven investors and corporate profitability: Evidence of profit shifting by German-based affiliates of multinational firms

IES Working Paper, No. 36/2018

Provided in Cooperation with:

Charles University, Institute of Economic Studies (IES)

Suggested Citation: Godar, Sarah (2018) : Tax haven investors and corporate profitability: Evidence of profit shifting by German-based affiliates of multinational firms, IES Working Paper, No. 36/2018, Charles University in Prague, Institute of Economic Studies (IES), Prague

This Version is available at:

<https://hdl.handle.net/10419/203215>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Tax Haven Investors and Corporate Profitability - Evidence of Profit Shifting by German-Based Affiliates of Multinational Firms

Sarah Godar

IES Working Paper: 36/2018



Institute of Economic Studies,
Faculty of Social Sciences,
Charles University in Prague

[UK FSV – IES]

Opletalova 26
CZ-110 00, Prague
E-mail : ies@fsv.cuni.cz
<http://ies.fsv.cuni.cz>

Institut ekonomických studií
Fakulta sociálních věd
Univerzita Karlova v Praze

Opletalova 26
110 00 Praha 1

E-mail : ies@fsv.cuni.cz
<http://ies.fsv.cuni.cz>

Disclaimer: The IES Working Papers is an online paper series for works by the faculty and students of the Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague, Czech Republic. The papers are peer reviewed. The views expressed in documents served by this site do not reflect the views of the IES or any other Charles University Department. They are the sole property of the respective authors. Additional info at: ies@fsv.cuni.cz

Copyright Notice: Although all documents published by the IES are provided without charge, they are licensed for personal, academic or educational use. All rights are reserved by the authors.

Citations: All references to documents served by this site must be appropriately cited.

Bibliographic information:

Godar S. (2018): "Tax Haven Investors and Corporate Profitability - Evidence of Profit Shifting by German-Based Affiliates of Multinational Firms". IES Working Papers 36/2018, IES FSV, Charles University.

This paper can be downloaded at: <http://ies.fsv.cuni.cz>

Tax Haven Investors and Corporate Profitability - Evidence of Profit Shifting by German-Based Affiliates of Multinational Firms

Sarah Godar^{a,b}

^aInstitute of Economic Studies, Faculty of Social Sciences, Charles University
Opletalova 21, 110 00, Prague, Czech Republic

^bBerlin School of Economics and Law

Email (corresponding author): sarah.godar@hwr-berlin.de

December 2018

Abstract:

This paper uses confidential firm-level panel data to provide new estimates on the extent of corporate profit shifting by German-based affiliates of multinational corporations. The estimated semi-elasticity of reported profits with regard to statutory foreign tax rates is 3.6, or 4.8 when allowing for a non-linear relationship. This is higher than most of the previous estimates of around 1. The case for a non-linear relationship is even stronger when average effective tax rates are used instead of statutory rates. In addition, the paper develops an alternative identification strategy suggesting that the first-time appearance of a tax-haven investor in the ownership chain reduces the reported profits of German-based affiliates by 61 percent if a majority of the affiliate is held by a single investor. The estimated effects are used to extrapolate the amount of shifted profits and associated revenue losses for all German-based foreign affiliates. The results suggest moderate but non-negligible revenue losses between 2.9 and 10.7 percent of corporate income tax revenues (or EUR 1.5-5.6 bn in 2015).

Acknowledgements: The author acknowledges support from the Grant Agency of the Czech Republic (P403/18-21011S), the Charles University Grant Agency, the Berlin Equal Opportunity Program (BCP) and the Berlin School of Economics and Law.

1. Introduction

A growing academic literature provides evidence that multinational enterprises (MNEs) manipulate profits to reduce their share of profits in high-tax countries and increase it in low-tax jurisdictions in order to minimize their overall global tax payments. However, there is no consensus on the scale of corporate profit shifting and even less on the relative importance of revenue losses associated with this phenomenon. Numerous international tax scandals revealing the minimal tax payments of individual MNEs have attracted considerable media attention and caused public outrage also in Germany. Politicians across political parties have criticized aggressive corporate tax planning and announced counter measures.

Several studies indicate that profit shifting activities of MNEs affect taxable profits in Germany. In some studies this result occurs as a by-product of estimating corporate profit shifting at a European or global scale (Huizinga and Laeven 2008, Clausing 2016). Others, such as Weichenrieder (2009) and Gumpert et al. (2015) focus explicitly on profit shifting activities by German multinationals. Still, little is known about the actual revenue cost of corporate profit shifting in Germany. Studies assessing the revenue losses due to profit shifting for Germany, suggest a wide range of different estimates. These range from about USD 1.2 bn in 1999 (Huizinga and Laeven 2008) to EUR 30-35 bn in 2013 (Dover et al. 2015). These would correspond to about 3.4 percent or 43 percent of corporate income tax revenues¹ in the respective years. Intermediate estimates include USD 17.2 bn in 2012 (Clausing 2016), and USD 10-16 bn for 2015 (Tørsløv et al. 2018b) which would correspond to about 18 percent and 18-28 percent of corporate income tax revenues in the respective years. Based on this wide range of estimates corporate profit shifting could either be judged a negligible phenomenon or a serious threat to the future of corporate taxation.²

This paper adds to the growing literature on corporate profit shifting in three ways. Based on firm-level data from the 'Microdatabase Direct Investment' (MiDi) provided by Deutsche Bundesbank (2017)³, it first provides new estimates of the semi-elasticity of German-based foreign affiliates' profits with respect to foreign statutory and effective tax rates and underlines findings of a significant non-linear relationship previously documented for other countries than Germany. Second, it develops an alternative identification strategy suggesting that the first-time appearance of a tax-haven investor or ultimate owner company reduces the reported profits of German-based affiliates. Third, as the first such paper with this data, it uses the estimated effects to extrapolate the amount of shifted profits and associated revenue losses.

¹Including local business tax (Gewerbesteuer)

²A general problem with this relative measure is that the corporate income tax revenues as reported by the OECD revenue statistics do not include tax revenues from partnerships which are taxed under the personal income tax. Those make up a considerable share of business taxation in Germany. For this reason, using corporate income tax revenues as a reference might make the relative importance of profit shifting seem overly dramatic. See Bach (2013) for a more comprehensive overview of revenues from business taxation in Germany.

³Deutsche Bundesbank (2017): Microdatabase Direct Investment. Version: 3.0. Deutsche Bundesbank. Dataset. <https://doi.org/10.12757/Bbk.MiDi.9915.03.04>

The paper proceeds as follows: Section 2 discusses different strategies used in the literature to identify the extent of profit shifting in Germany and summarizes some advantages and short-comings of the respective approaches. Section 3 introduces the MiDi database and the sample of firms used in the econometric analysis. Section 4 describes the methodology used to estimate the sensitivity of profits with regard to tax rates and the appearance of tax haven investors. Section 5 summarizes and discusses econometric results and derives tentative estimates of the amount of shifted profits and the resulting revenue losses.

2. Related Literature

Several studies have produced estimates on how much revenue is lost due to profit shifting in Germany. Approaches differ with respect to the potential of data sources and identification strategies but also with regard to their research interest. Top-down approaches analyze the gap between corporate profits derived from the national accounts and the corporate tax base or payments from the national tax statistics (Bach 2013, Dover et al. 2015). Alternatively, international investment positions and national accounts can be used to explore inconsistencies in the distribution of profits and corporate activity across countries and derive estimates of corporate profit shifting (Tørsløv et al. 2018). However, the most common approach in the economic literature is to compare foreign affiliates' profits in low and high tax jurisdictions based on firm-level data and derive semi-elasticities of profits with respect to the tax rate differentials. Few researchers in this strand of literature have extrapolated the amount of profit shifting associated with their estimates. This extrapolation from firm-level data to country-level aggregates is subject to many uncertainties but it would be an important step in order to bridge the gap between the micro and macro level. In the following, I review key aspects of different identification strategies used to provide evidence of profit shifting in Germany and discuss potential short-comings of using tax rates as identifying variable. A comprehensive review of international studies is provided by Riedel (forthcoming).

2.a. Identification strategies and estimates for Germany

The upper bound of estimates for Germany is the corporate tax gap of EUR 90 bn found by Bach (2013) for the year of 2008.⁴ It refers to the discrepancy between corporate profits as derived from the national accounts and the actual corporate tax base from the national tax revenue statistics. Part of the identified corporate tax gap might be explained by conceptual divergences in national accounts and financial or tax accounting.⁵ Adjustments can be made to correct for some of the divergences and others should cancel out in the long-run (Ibid.). However, profit shifting can only be identified as

⁴Note that this refers to total German business taxation including partnerships and should thus not be seen into relation to the CIT Revenues only.

⁵For example, in the national accounts, the cost of depreciation is calculated in a different way, national accounts neglect special depreciation allowances for SME, or do not account for capital gains and losses or for provisions for pension schemes (Bach 2013).

the unexplained residual. Another challenge is that an important share of profits in Germany accrues to unincorporated enterprises. These are taxed under the personal income tax and the resulting revenues have to be added to the corporate income tax revenues. At the same time, a lack of bottom-up data on entrepreneurial activity limits the reliability of income aggregates of German national accounts (Ibid.). Because of these short-comings, the identified corporate tax gap might be only a blunt measure of corporate profit shifting. Approximating its true level thus requires additional estimates based on alternative data.

A more common approach to identify profit shifting exploits inconsistencies between the location of multinationals' declared profits and their economic activities across countries. This can be done on the basis of macro as well as micro data. For example, Cobham and Janský (forthcoming) find that the share of German-based affiliates of U.S. corporations in the total group's profits is too low with respect to their share in the group's activities in terms of assets, employment and turnover and derive an approximate amount of revenues lost due to profit shifting (USD 7.1 bn for 2012; 15 percent of CIT revenues). However, a country's below-average share of a group's profits may also be explained by other (unobserved) country-specific factors and not only be attributed to profit shifting. One way to control for this is to compare the profitability of local and foreign-owned firms by country. Tørsløv et al. (2018) find that in relation to their wage cost, foreign-owned firms make significantly less profits than local firms in most of the countries. Only in tax havens, it is the other way around. Exploiting this information, the authors make sure that a country's below-world-average profitability is only attributed to tax avoidance to the extent that multinationals' profitability deviates from that of local firms.

Most econometric approaches are driven by the wish to isolate a tax effect from other country-specific or firm-specific factors and an unexplained residual. A common research design is to estimate the (semi-)elasticity of pre-tax income of multinationals' affiliates to a tax incentive variable. As noted by Dharmapala (2014), the most influential approach ("Hines-Rice approach" following Hines and Rice (1994)) is to regress the observed pre-tax income of multinationals' affiliates on measures of their capital and labour inputs, a measure of a tax incentive (such as the tax rate difference between the parent and the affiliate) and country-level (or affiliate-level) controls. As in the previously mentioned studies, the idea is that in the absence of tax planning, capital and labour inputs should be able to explain the variation in the affiliates' taxable profits. However, additional control variables at country or firm level can explain differences in the profits across countries or firms. In addition, fixed effects control for unobserved heterogeneity across countries or firms. The tax incentive variable should capture the degree to which profits are actually sensitive to tax-related differences between countries. Variations of this approach are used in Huizinga and Laeven (2008), Weichenrieder 2009, and Clausing 2016. As noted by Tørsløv et al. (2018), studies based on firm-level data tend to underestimate the extent of profit shifting as the international databases often do not include sufficient information on affiliates in tax havens. This might be an explanation for the comparably low estimates by Huizinga and Laeven (2008) of USD 1.2 bn in 1999. Clausing (2016) in contrast, who relies on the more comprehensive BEA dataset,

derives significantly higher estimates of revenue losses (USD 17.2 bn in 2012). In this study I contribute to closing the gap between the macro and micro level by estimating the amount of profit shifting based on firm-level data from the MiDi database. This data has been used before to provide evidence of profit shifting by Weichenrieder (2009). However, the estimated semi-elasticities refer to revenue on assets and were not extrapolated in order to derive the amount of profit shifted and associated revenue losses.

2.b. Why (statutory) tax rates capture only part of the story

There are potential short-comings with the use of tax rates as a tax incentive variable for the identification of profit shifting. First, recent state aid investigations by the European Commission (EC 2015, EC 2016, EC 2017) have shed doubt on the meaningfulness of statutory tax rates as operationalization of the tax incentive variable because countries such as Luxembourg, Netherlands, and Ireland attract corporate profits not necessarily with extremely low statutory tax rates but also with favourable deals regarding the tax base definitions. These so-called “sweet-heart deals” as well as other generally favourable tax schemes such as patent boxes are not captured when using the statutory tax rate as the tax incentive variable. Some studies thus use average effective tax rates (AETR) derived from companies’ actual tax payments in relation to their profits (Clausing 2016, Dowd et al. 2016). AETR might reflect the corporate tax burden more accurately but come with disadvantages. First, AETR are sensitive to the economic cycle and thus do not only reflect changes in tax law. Using them as a tax incentive might thus add white noise to the regression. Second, as corporate profits enter into the calculation of AETR, they might not be exogenous to the dependent variable.

Another short-coming of using tax rates as the identificatory variable is related to the fixed effects that should control for unobserved firm or country heterogeneity. Fixed effects panel regressions with the tax rate as explanatory variable capture only effects of changes in tax differentials between countries on the location of profits because the identification builds on the variance of the explanatory variable over time (Dharmapala 2014). Notably, several notorious tax havens have had zero statutory tax rates for at least 15 years (e.g. Bahamas, Bermuda, Cayman Islands, and Guernsey). A fixed effects specification does not capture any profit shifting diverted to these jurisdictions because of a lack of variation in the explanatory variable. Still, the inclusion of firm fixed effects makes sense because of firm-specific unobserved factors that influence profitability such as management quality or product popularity (Dischinger 2010, p.3).

The use of statutory tax rates as identifying variable but also the use of effective tax rates in a fixed-effects panel estimation might thus lead to an underestimation of the true level of profit shifting. The variation in (statutory) tax rates might not capture a jurisdiction’s attractiveness in a satisfactory way. For this reason, this paper provides estimates both for statutory and effective tax rates and develops an alternative strategy to avoid the discussed short-comings of using a tax rate variable.

3. Data

This study relies on firm-level data on inward foreign direct investment from the “Microdatabase Direct Investment” (MiDi)⁶ as provided by the Research Data and Service Centre of the Deutsche Bundesbank. Reporting is obligatory so the database covers all firms with a balance sheet total of more than 3 million EUR and above certain foreign participation thresholds.⁷ Key variables include net-of-tax profits, turnover, the number of employees, fixed and intangible assets, total assets, and financial liabilities for German-based affiliates as well as information on the location of direct or indirect foreign investor companies.

I adjusted the sample to account for changes in reporting requirements in 2002.⁸ In 2007 the reporting requirements changed again relating to the participation thresholds of the immediate German owner and the indirect foreign owner. As the structure of the data do not allow for a systematic adjustment of the sample to this change in reporting requirements, this gives rise to a little inconsistency. However, it seems that relatively few firms were affected by this change, because the number of drop outs and new entrants in relation to firms staying in the panel between 2006 and 2007 increased only slightly in comparison to the years before and after.⁹ In addition, the means of the key variables do not indicate any structural break in and after that year so I assume that this change in reporting requirements does not distort the estimation results.

Following Weichenrieder (2009), I exclude firms that were unprofitable on average over the sample period. Also, firms from the banking and insurance industries, holding companies as well as firms from the government sector are excluded from the sample. The data contains information on affiliates whose immediate owner is a foreign company (“direct affiliates”) and affiliates whose immediate owner is a German company owned by a foreign company (“indirect affiliates”). It also includes mixed cases which I attribute to the group of indirect affiliates. Weichenrieder (2009) excludes indirect affiliates from the regression because he finds indication that, contrary to the reporting requirements, some report profits after distributions to the upper-tier corporation. This might explain the much lower average profitability of indirect affiliates found in the sample and would justify exclusion. But anecdotal evidence suggests, that profit shifting schemes tend to involve many different members of the corporate group in complex ownership networks. Multinational enterprises have an interest not to make their profit shifting

⁶Deutsche Bundesbank (2017): Microdatabase Direct Investment. Version: 3.0. Deutsche Bundesbank. Dataset. <https://doi.org/10.12757/Bbk.MiDi.9915.03.04>

⁷At least 10 percent of shares or voting rights owned by foreign investors in case of direct participation and at least 50 percent of shares or voting rights in case of indirect foreign participation (Schild and Walter 2017).

⁸I drop firms with a balance sheet total of less than 3 million for the years 1999-2001 because afterwards these did not report to MiDi, anymore. Firms with a foreign minority interest and a balance sheet total of below 5 million EUR were included only after 2002 so I drop them to obtain a more consistent sample.

⁹The number of drop outs in relation to firms staying in the sample increased by 2 percentage points and the number of new entrants in relation to firms staying by 4 percentage points between 2006 and 2007 in comparison to the change in the sample between 2005 and 2006 and 2007 and 2008.

activities fully transparent. For this reason, I suppose that profits are not necessarily shifted to the immediate owner but follow more complicated patterns. I might thus forgo relevant information by excluding indirect affiliates. In order to deal with the suspected misreporting by indirect affiliates, I construct two auxiliary dummy variables indicating when an affiliate switches from a direct ownership relation to an indirect and vice-versa. The assumption here is that the indirect affiliates' tendency to misreport is constant over time and should therefore not affect our estimation results. A measurable effect on reported profits should only occur if an affiliate changes ownership status during the sample period and subsequently changes its way of reporting.¹⁰ The final sample thus consists of an unbalanced panel of 3000-6000 firms for the time period of 1999-2015 [table 1].

I use statutory foreign tax rates provided by KPMG and average effective tax rates (AETR) as operationalisation of the tax incentive variable. The AETR are computed by Cobham and Janský (2018), based on ORBIS data used by Cobham and Loretz (2014). These are available only for a shorter period of 2003-2011. AETR1 are based on the averages of companies and AETR2 are estimated as the total of taxes reported divided by the total of profits reported in a given country. As the AETR stem from Orbis data they do not reflect the actual tax payments of the investor companies from the MiDi database. However, they might still act as a better proxy for the tax burden companies face in the respective countries than statutory rates. I adjust the AETR2 for improbable outliers in the crisis years 2008-2010. As in Weichenrieder (2009), I compute the weighted average of tax rates when affiliates report foreign investors from several countries. The average foreign tax rates faced by investors have declined significantly over the sample period, regardless if measured as statutory or effective tax rates. The German tax rate has declined even more which reduces the difference between the domestic and the average foreign tax rate over time. In some more recent years, the German effective tax rates are even lower than the average foreign tax rates. This indicates that nowadays Germany might be less of a high-tax country than expected. However, when comparing the domestic tax rates to the average foreign tax rates of affiliates with tax haven investors, the difference is still more pronounced. This indicates that incentives to shift profits out of Germany persist, despite the reductions of the domestic corporate tax rates [table 3].

4. Methodology

In 1999, about 39 per cent of German-based affiliates had at least one investor or ultimate owner company based in a tax haven jurisdiction. This share has risen to 45 per cent in 2015. On average the firms with tax haven investors had a slightly lower revenue on assets than the full sample in most of the years (table 2). I use a Hines-Rice-type econometric approach to test whether part of that below-average profitability can be

¹⁰In the robustness section I report results for direct affiliates, only, as a matter of consistency with Weichenrieder's results and also to exclude potential distortions due to the change in reporting requirements.

explained by profit shifting activities. I regress the observed income of multinationals' affiliates on measures of their capital and labour inputs, a measure of a tax incentive and country-level or affiliate-level controls. In a first step, I use statutory and effective average tax rates as a tax incentive variable. Due to the described short-comings of the tax rate data, I also test an alternative identification strategy. In addition to estimating corporate profits' sensitivity with respect to foreign tax rates, I also test whether profits decrease after a tax haven investor has appeared for the first time.

4.a. A Hines-Rice adjusted specification

For my analysis, I start with a Hines-Rice adjusted specification similar to the one suggested by Weichenrieder (2009):

$$\ln \pi_{it} = \beta_1 \tau_{it} + \beta_2 \ln L_{it} + \beta_3 \ln K_{it} + \gamma X_{it} + \mu_i + \delta_t + \epsilon_{it} \quad (1)$$

where π_{it} is the (net-of-tax) profit/loss of the German affiliate, τ_{it} is the average tax rate in the home countries of foreign investors, L_{it} and K_{it} are number of employees and non-financial assets of the German affiliate, X_{it} are affiliate-level controls (ln turnover, liability ratio, and the dummy indicating a switch of ownership type (direct/indirect)), μ_i are affiliate fixed effects, and δ_t are time fixed effects. The dependent variable are the affiliate's total profits instead of revenue on assets as suggested by Weichenrieder. This is because the key interest here lies in deriving revenue estimates which is easier when the estimated semi-elasticities refer to total profits. In contrast to studies using an international data set, it is not necessary to insert the tax differential with respect to the domestic tax rates, as the domestic tax rate is the same for all affiliates in the sample. I thus expect a positive coefficient for the tax variable, as a lower foreign tax rate should c. p. result in lower profits of the German-based affiliate as part of the profits are shifted to the lower-tax jurisdiction.

I repeat the analysis for sub-groups of investor countries (tax havens¹¹ and non-havens). This is because profit shifting is more probable to occur between high-tax and low-tax countries rather than between two high-tax countries with only minor differences in tax-rates. For example, Dowd et al. (2016) have shown for the U.S. that the assumption of a linear tax effect across all countries leads to an underestimation of profit shifting activities.

4.b. An alternative identification strategy

Based on the MiDi data, it is possible to identify the year in which a company reported a tax haven investor or ultimate owner company for the first time. The panel data thus allows me to compare reported profits before and after the occurrence of such a tax haven investor and to firms without tax haven investors. This strategy has the advantage that it does not rely on tax rate changes as a means of identification. Instead, I use a

¹¹Based on Gravelle's list (Gravelle 2015) plus the Netherlands which are a key conduit jurisdiction for investments in Germany (Bernardo-Garcia et al. 2017, Hebous and Weichenrieder 2014) and were found to offer preferential tax treatment to multinational companies (EC 2015).

treatment variable switching to one in the year in which the tax haven investor occurs. I thus obtain a “treatment group” of roughly 500 firms, compared to the total number of firms in the sample of about 3000-6000. This approach allows me to capture effects even if there is no tax rate change in the investor country or even if the statutory tax rate is not what makes this country an attractive profit shifting destination. Still, the identifying variable varies over time so I can use fixed effects to control for unobserved firm characteristics which might otherwise distort the estimated effect.

Descriptive evidence suggests that the profitability of firms declines in the years after the tax haven investor has occurred (figure 1). For my estimation, I use the same specification as before but plug in a treatment dummy instead of the tax rate:

$$\ln D_{it} = \beta_1 D_{it} + \beta_2 \ln L_{it} + \beta_3 \ln K_{it} + \gamma X_{it} + \mu_i + \delta_t + \epsilon_{it} \quad (2)$$

where π_{it} is the (net-of-tax) profit/loss of the German affiliate, D_{it} is a Dummy equal to 1 when the investor’s location switches to tax haven and afterwards, L_{it} and K_{it} are number of employees and non-financial assets of the German affiliate, X_{it} are affiliate-level controls (ln turnover, liability ratio, and the dummy indicating a switch of ownership type (direct/indirect)), μ_i are affiliate fixed effects, and δ_t are time fixed effects. I expect a negative coefficient of the treatment dummy, as the first-time appearance of a tax haven investor should reduce the affiliate’s profits because the affiliate engages in profit shifting for the first time. I repeat the estimation only for affiliates of which a majority is owned by a single investor. The OECD (2018b) has pointed out that their concept of MNE is based “on the concept of control and refers to 50 percent or more of the ordinary shares or voting power” in contrast to the concept of FDI which builds on the lasting interest which already starts at 10 percent. Accordingly, the 50-percent ownership threshold might be more appropriate to examine MNE’s behavior.

5. Results

The estimation results indicate that foreign affiliates’ profits are indeed sensitive to changes in foreign tax rates. A reduction of the average foreign tax rate faced by the investors of an affiliate leads to a reduction of profits reported in Germany. Also, the appearance of a tax haven investor reduces reported profits. Sections 5.a. and 5.b. report the estimation results. Section 5.c. extrapolates the results to all foreign affiliates in order to obtain estimates of the amount of profit shifting and the resulting revenue losses.

5.a. Foreign tax rates and domestic profitability

As expected, the coefficient of the average statutory foreign tax rate is positive and significant (table 4). The coefficient is 0.036 which implies that the decline of foreign tax rates by 1 percentage point is associated with a decline of an affiliate’s profit by 3.6 percent. The other variables also show the expected signs: Increase in an affiliate’s

employees, turnover, and assets have a positive effect on its reported after-tax profits. An increase in the liability ratio has a dampening effect on profits. The dummy variables capturing whether an investment relation switches from direct to indirect or vice-versa confirm that affiliates report significantly lower profits on average after switching from a direct foreign investor to an indirect investment relationship. As pointed out by Weichenrieder (2009) indirect affiliates might mistakenly report profits after distribution to their upper-tier German parent. The large significant coefficients suggest that a control of this potential change-in-reporting effect on profits is warranted.

Repeating the estimations for two groups of affiliates, one with tax haven investors, and one without, provides indication of the non-linearity of the relationship between foreign tax rates and domestic profits. For the group of affiliates with tax haven investors, the coefficient of the tax rate increases to 0.048. This would imply that a tax reduction in the investor country by 1 percentage point would lower domestic profits by 4.8 percent. In contrast, the coefficient is not significant for affiliates without tax haven investors. This would confirm the view that profit shifting does not occur between high-tax countries with only minor differences in tax rates.

The same pattern can be observed when using average effective tax rates instead of statutory tax rates. The coefficient of AETR1 is 0.026 for all affiliates and 0.068 for affiliates with tax haven investors. In contrast, it is not significant for affiliates without tax haven investor. The effect of AETR2 turns out significant only at the 10 percent level and only when the regression is estimated separately for affiliates with tax haven investor (table 5). In order to derive estimates of the amount of shifted profits, I transform the affiliate's after-tax profits into profits before tax¹² and then multiply these by their individual foreign tax differential with respect to the German tax rate. $(\tau_t^D - \tau_{it})$ and by the estimation coefficient b_1 .

$$Shifted\ profits_t = \sum_{i=1}^n \frac{\pi_{it}}{(1 - \tau_t^D)} * (\tau_t^D - \tau_{it}) * b_1 \quad (3)$$

Based on regression (2), this gives an amount of shifted profits of about EUR 2.8 billion. This amounts to about 12.8 percent of the total profits of the sample for 2015.¹³ Based on regression (4) I obtain an amount of shifted profits of EUR 3.5 bn shifted by those affiliates with tax haven investors. As a share of the total profits, this amounts to 16 percent.¹⁴

When based on the overall estimate for AETR1 (regression (8), table 5), the amount of shifted profits is negative because of the negative average tax differential between Germany's and the average of investor countries' AETR. This would suggest that Germany has attracted profits from higher-tax countries and as thus benefitted from profit

¹²I use the AETR1 of 21.6 percent for calculating the before-tax profits as it is improbable that the firms' tax burden corresponds to the statutory rate.

¹³Using the winsorized profits, the respective numbers are EUR 1.6 bn or 12 percent.

¹⁴Total profits of the sample are EUR 21 bn and EUR 10 bn for the sub-sample of firms with tax-haven investors. Winsorized sample: 2 bn or 14 percent.

shifting in 2011. However, this result is improbable which is also confirmed by the fact that the coefficient is not significant when I estimate the regression for affiliates without tax haven investors. In contrast, the differential between Germany's AETR1 and the average foreign AETR1 for affiliates with tax haven investors is positive. Accordingly, the amount of profits shifted out of Germany would be positive and amount to 1.5 bn or 5.8 per cent of the total profits of the sample.¹⁵

5.b. New tax haven investors and domestic profitability

Regressions 14-15 (table 6) indicate a negative effect of the appearance of a tax haven investor on the affiliates' profits. When an affiliate reports an investor or ultimate owner company based in a tax haven, its after-tax profits in Germany decline by 36.5 percent $((e^{-0.45} - 1) * 100)$ on average. With cluster-robust standard errors (at affiliate level), the coefficient of the identifying dummy variable is significant at the 10 percent level. As in the previous regressions, the coefficients of the other variables have the expected signs. However, the estimated coefficient is not robust for other time intervals. When running the estimation only for those affiliates of which a majority share is owned by a single investor (regression 16), the estimated effect is higher $((e^{-0.95} - 1) * 100 = -61.3\%)$ and also robust for the years 2000-2014, to clustering at country-level and to the use of non-winsorized profits. As the latter estimate is more robust, I use it for the following extrapolations.

In order to derive an estimate of the amount of shifted profits, I assume that the effect holds for all affiliates which have had a tax haven investor over the whole sample period and of which a majority share is owned by a single investor. This leads to an estimated amount of shifted profits of EUR 5.7 bn or 21.4 percent of the sample's total profits in 2015.¹⁶ This estimate is somewhat higher than those building on the tax rate differential as explanatory variable. This is not surprising, as the identification approach allows capturing also profits shifted to jurisdictions with constantly low tax rates. In addition, the previous identification strategy tends to produce lower estimates for the recent years as the tax differential between Germany and the tax havens decreased over the sample period. However, it is not very likely that firms stop profit shifting because Germany lowered the corporate tax from 53 to 30 percent if they can still pay zero tax on part of their profits elsewhere.

5.c. Revenue estimates

For the calculation of revenue losses, I assume that the shifted profits would have been taxed at the AETR1 of 21.6 percent. The amount of profits shifted derived from the different regressions lies between EUR 0.5 bn and EUR 5.7 bn. These estimates are based on a limited sample of firms which only account for a fraction of multinationals'

¹⁵Total profits of the sample are EUR 21 bn and EUR 10 bn for the sub-sample of firms with tax-haven investors. Shifted profits for winsorized sample: 0.5 bn or 3.8 percent.

¹⁶Total sample's profits amount to EUR 21 bn (incl. affiliates with minority participations). Shifted profits for non-winsorized sample: EUR 3 bn or 22 percent.

total profits in Germany. The largest sample covers 6373 with a total of 21.022 bn net-of-tax profits in 2015. According to the Foreign Affiliate Statistics by Eurostat (2018), the number of foreign-controlled affiliates in Germany actually amounted to 27698 in 2015. Those made a total gross-operating surplus of EUR 121.9 bn.

Assuming that the estimated tax base reductions of 13.1 percent (based on regression (5)) applies to all of these profits, the total tax base reduction would amount to EUR 16 bn of shifted profits or EUR 3.5 bn revenue loss, i.e. 6.6 percent of total corporate tax revenues (52.7 bn according to OECD 2018a). Assuming that multinationals shift 21.4 percent of their profits as derived from regression (9), the derived amount of shifted profits would be EUR 26 bn, which would lead to a revenue loss of EUR 5.6 bn or 10.7 percent of corporate tax revenues.

These revenue estimates range among the lower to intermediate estimates for Germany cited in the introduction. It is probable that they underestimate the extent of corporate profit shifting for two reasons: A general short-coming of bottom-up estimations relying on firm-level data is that micro databases usually cover only part of a corporate group. My estimation approach covers only profit shifting opportunities between affiliates and their investor companies. However, it is possible that affiliates without tax haven investor shift profits to other affiliates of the group which might be based in tax havens but not included in the database. Another short-coming is, that the estimates refer only to German-based affiliates of foreign MNE. According to the OECD (2018b), production by foreign affiliates and domestic multinationals accounts for 33 percent of global output in 2014. The share of foreign affiliates amounts to only 12 percent. If this relation also holds for Germany, the revenue estimates derived here thus refer to less than 40 percent of multinational activity in Germany.

6. Robustness checks

6.a. Higher-level clustering, non-winsorized variables and shorter time period

The relatively high statutory tax rate effect for the sub-group of affiliates with tax haven investors is robust to the use of non-winsorized profits and liability ratios and for the sub-period of 2000-2014. It is not robust for the smaller sub-periods of 1999-2007 or 2007-2015. Too little variation in the tax rate variable over time might explain the lack of significance for shorter time periods. The overall effect is cluster-robust both at the affiliate and the country level. The same holds for the sub-group of affiliates with tax haven investors. However, for this sub group, the number of country clusters is below 50 which might be considered too low to cluster standard errors also at country level (Cameron and Miller 2015). Anyway, the need for clustering also at the level of the main investor-country it is not very convincing. Arguably, profits of German-based affiliates depend more on the economic situation in Germany and can be considered independent of the home country of the main investor.

The tax rate effect of the AETR1 for the sub-group of affiliates with tax haven investors is also robust to clustering at the country-level and to the use of non-winsorized profits

and liability ratios. It is not robust for the shorter sub-period of 2004-2010. However, this is not very surprising given that the variation in the AETR1 over the years is low.

The alternative identification strategy of using a treatment dummy that indicates the periods in which a tax haven investor is present for the first time, turns out to be less robust. The effect holds for the use of non-winsorized but does not hold for clustering at country level or different time periods. However, the effect is very robust for affiliates with a foreign participation of over 50 percent. It holds for the use of non-winsorized profits, clustering at country level and the sub-period of 2000-2014.

6.b. Excluding indirect affiliates

As a robustness check, I repeat the regressions also for direct affiliates, only, for two reasons: First, the original sample used in Weichenrieder (2009) consisted of direct affiliates, only. Second, excluding the indirect affiliates, avoids potential problems related to the change in reporting requirements in 2007 discussed in the data section. The results underline even more, the non-linearity of tax effects. Grouping affiliates with and without tax haven investors together, the effect of the average foreign statutory tax rates is significant but a bit smaller (0.03). Again, there is an even stronger effect for the sub-groups of affiliates with tax haven investors (0.09) and no significant effect for the sub-group of affiliates without tax haven investors. The robustness check of using only direct affiliates does not hold, however, for the AETR1 as explanatory variable which is not significant, anymore. The exclusion of the indirect affiliates cuts the sample in half which might have a stronger impact on the significance of the AETR1 variable as the AETR cover fewer years and fewer countries than the statutory rates. The effect of the dummy variable indicating the periods in which a tax haven investor is present for the first time is robust to the exclusion of indirect affiliates also with clustering at country level.

6.c. Removing the Netherlands from the tax haven list

As the Netherlands are not included in Gravelle's tax haven list and not commonly added to the list of tax havens in the academic literature (for example Gumpert et al. 2015), I repeat the estimations for the sub-groups also with Gravelle's original list. Excluding the Netherlands from the tax haven group weakens the case for a non-linear relationship between average foreign tax rates and reported profits. The tax rate effect for the sub-group of tax haven investors is not higher, anymore, than the effect for the whole sample. In addition, it is only significant in the simple fixed effects model but not robust to clustered standard errors at affiliate level. The effect of the AETR1 is still higher for the sub-group of affiliates with tax haven investors than for the whole sample but not significant, anymore. This lack of significance might be explained by the fact that the sample of affiliates with tax haven investors is reduced dramatically as the Netherlands are by far the most important investor country among the group of tax havens. The effect of the first-time appearance of a tax haven investor is robust to removing the Netherlands from the tax haven list. The estimated effect remains robust

to clustering both at affiliate and country level. Adding the Netherlands to the group of non-havens would, however, blur the results. For this reason, I excluded affiliates with investors from Netherlands from the sample, altogether.

7. Conclusion

Based on different identification strategies the paper provides new evidence of profit shifting activities by German-based affiliates of MNEs. This includes new estimates of the semi-elasticity of affiliates' profits with respect to foreign tax rates. By running the regressions separately for affiliates with and without tax haven investors, I find evidence of a non-linear relationship between foreign tax rates and the sensitivity of profits. For those affiliates with tax haven investor, the estimated semi-elasticity with regard to the average foreign statutory tax rate is 4.8 as compared to 3.6 for the whole sample. This implies that a one-percentage point decrease in the average foreign tax rates faced by the investor reduces the reported profits by 4.8 percent. This result is higher than the consensual estimate of about 1 suggested in the international literature. However, the extrapolation of the amount of shifted profits and resulting revenue losses for Germany, produces a moderate estimate of EUR 3.5 bn or 6.6 percent of total corporate income tax revenue for 2015.

As statutory tax rates might not properly reflect the attractiveness of a country for profit shifting, I use AETR as a tax incentive variable. Here, the semi-elasticity for the sub-group of affiliates with tax haven investors is even higher (6.8). But the derived revenue estimates of EUR 1.5 bn or 2.9 percent of CIT revenues are surprisingly low. This goes back to the method of extrapolation which calculates the amount of profit shifted based on the tax differential between Germany and the investor countries. In terms of AETR, this tax differential has narrowed substantially over the last years so that the share of shifted profits captured by this approach has also narrowed over time.

To avoid short-comings related to tax rate differentials as the key identifying variable, I tested an alternative approach regressing the affiliates' profits on a dummy variable switching to one when a tax haven investor appears for the first time. The results suggest that the first-time appearance of a tax haven investor or ultimate owner company reduces reported profits by about 61 percent if the majority of the company is owned by a single investor. Extrapolating this result to all foreign affiliates in Germany, would suggest a revenue loss of EUR 5.6 bn or 10.7 percent of CIT revenues. This result suggests that identification based on tax rate differentials probably underestimates the true level of profit shifting. It thus seems worthwhile to explore alternative identification strategies.

The results contrast with the lower semi-elasticities of reported profits with regard to tax rate differentials found in the micro-econometric literature. This raises the question of whether the MiDi database has a better coverage of tax haven investors than other firm-level databases. The extrapolated revenue losses allow a comparison to the larger estimates obtained from macro data, which adds to closing the gap between micro and macro estimates for German-based companies.

8. References

- Bach, S. (2013): Has German Business Income Taxation Raised Too Little Revenue Over the Last Decades? DIW Discussion Papers 1303
- Cameron, A. C., D. Miller (2015): A Practitioner's Guide to Cluster-Robust Inference. *Journal of Human Resources* Spring 2015, 50(2): 317-372.
- Cobham, A., P. Janský (2018): Global distribution of revenue loss from corporate tax avoidance: re-estimation and country results. *Journal of International Development* 30(2): 206-232.
- Cobham, A., P. Janský (forthcoming): Measuring Misalignment: the Location of US Multinationals' Economic Activity versus the Location of their Profits. *Development Policy Review*.
- Cobham, A., S. Loretz (2014): International distribution of the corporate tax base: Implications of different apportionment factors under unitary taxation. ICTD Working Paper 27.
- Clausing, K. (2016): The effect of profit shifting on the corporate tax base in the United States and beyond. *National Tax Journal* 69(4): 905-934.
- Deutsche Bundesbank (2017): Microdatabase Direct Investment. Version: 3.0. Deutsche Bundesbank. Dataset. <https://doi.org/10.12757/Bbk.MiDi.9915.03.04>
- Dharmapala, D. (2014): What do we know about base erosion and profit shifting? A review of the empirical literature. *Fiscal Studies* 35(4): 0143-5671.
- Dischinger, M. (2007): Profit Shifting by Multinationals: Indirect Evidence from European Micro Data. Discussion Papers in Economics, University of Munich, Department of Economics.
- Dover, R., B. Ferret, D. Gravino et al. (2015): Bringing transparency, coordination and convergence to corporate tax policies in the European Union. European Parliament Research Service Study, September 2015
- Dowd, T. et al. (2016): Profit Shifting of U.S. Multinationals. Working Paper. Joint Committee On Taxation, Washington, DC.
- European Commission (2015): COMMISSION DECISION of 21.10.2015 ON STATE AID SA.38374 (2014/C ex 2014/NN) implemented by the Netherlands to Starbucks.
- European Commission (2016): COMMISSION DECISION of 30.8.2016 ON STATE AID

SA.38373 (2014/C) (ex 2014/NN) (ex 2014/CP) implemented by Ireland to Apple, Brussels, 30.8.2016, C(2016) 5605 final.

European Commission (2017): COMMISSION DECISION of 4.10.2017 ON STATE AID SA.38944 (2014/C) (ex 2014/NN) implemented by Luxembourg to Amazon, Brussels, 4.10.2017, C(2017) 6740 final.

Eurostat (2018): Foreign Affiliates Statistics. <https://ec.europa.eu/eurostat/de/data/database>

Garcia-Bernardo, J., J. Fichtner, F. Takes et al. (2017): Uncovering Offshore Financial Centers: Conduits and Sinks in the Global Corporate Ownership Network. *Scientific Reports* 7, 6246.

Gumpert, A., J. Hines Jr., M. Schnitzer (2015): Multinational firms and tax havens. *The Review of Economics and Statistics* 98(4): 713-727.

Gravelle, J. (2015): Tax havens: international tax avoidance and evasion. Congressional Research Service Report 7-5700.

Hebous, S., A. Weichenrieder, (2014): What do we know about the tax-planning of German-based multinational firms? CESifo DICE Report 4/2014.

Heckemeyer, J., M. Overesch (2017): Multinationals? profit response to tax differentials: effect size and shifting channels. *Canadian Journal of Economics* 50 (4): 965-994.

Hines, J., E. Rice (1994): Fiscal Paradise: foreign tax havens and American business. *Quarterly Journal of Economics* 109: 149-82.

Huizinga, H., L. Laeven (2008): International profit shifting within multinationals: A multi-country perspective. *Journal of Public Economics* 92: 1164-1182.

Jarass, L., G. Obermair (2004): Geheimnisse der Unternehmenssteuern. Marburg: Metropolis

OECD (2018a): Revenue Statistics. <https://stats.oecd.org/>

OECD (2018b): Multinational enterprises in the global economy. Policy Note May 2018. <https://www.oecd.org/industry/ind/MNEs-in-the-global-economy-policy-note.pdf>

Riedel, N. (forthcoming): "Quantifying International Tax Avoidance: A Review of the Academic Literature", *Review of Economics*

Schild, C.-J., F. Walter (2017): Microdatabase Direct Investment 1999-2015. Data Report 2017-01 - Metadata Version 4. Deutsche Bundesbank Research Data and Service

Centre.

Tørsløv, T., L. Wier, G. Zucman (2018): The missing profits of nations. <http://gabriel-zucman.eu/files/TWZ2018.pdf>

Tørsløv, T., L. Wier, G. Zucman (2018b): The Missing Profits of Nations: Online Appendix. <http://gabriel-zucman.eu/files/TWZ2018Appendix.pdf>

Weichenrieder, A. (2009): Profit shifting in the EU: evidence from Germany. *International Tax and Public Finance* (2009) 16: 281.

Table 1: Sample overview

Year	No. of affili- ates	Average rev- enue on as- sets	Average profit/loss	Average no. of employ- ees	Average non- financial assets	Average turnover
		%	million EUR		million EUR	million EUR
1999	3,397	5	3.6	302	20.2	109.7
2000	4,277	4.9	2.4	268	18.5	104.8
2001	4,436	4.5	2.4	261	18.5	105.5
2002	4,419	4.3	2.6	264	18.7	99.9
2003	4,441	4.7	2.5	269	18.0	109.0
2004	4,410	4.8	2.8	297	23.0	131.4
2005	4,592	5.5	3.3	273	22.4	128.2
2006	4,864	6.3	4.4	278	22.7	136.0
2007	5,213	5.9	3.9	276	24.4	136.5
2008	5,550	5.8	3.3	264	25.1	137.0
2009	5,718	4.3	2.4	243	23.0	116.2
2010	5,894	5.1	3.0	238	22.0	121.8
2011	6,015	5.6	3.5	247	23.1	135.9
2012	6,122	5.3	3.3	248	24.2	138.6
2013	6,336	5.1	2.9	242	23.3	132.5
2014	6,406	5.8	3.0	241	22.0	130.2
2015	6,373	5.6	3.3	243	22.5	126.8

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2015, own calculations

Table 2: Affiliates with tax haven investors

Year	Share of affiliates with tax haven investors	Average ROA of affiliates without tax haven investor	Average ROA of affiliates with tax haven investor
1999	39%	5.2%	4.8%
2000	39%	5.1%	4.5%
2001	40%	4.8%	4.0%
2002	41%	4.2%	4.4%
2003	41%	4.6%	4.8%
2004	42%	4.8%	4.7%
2005	42%	5.4%	5.5%
2006	42%	6.1%	6.4%
2007	44%	6.3%	5.5%
2008	44%	6.2%	5.1%
2009	43%	4.8%	3.7%
2010	43%	5.4%	4.8%
2011	44%	5.9%	5.1%
2012	45%	5.8%	4.6%
2013	45%	5.7%	4.5%
2014	45%	6.1%	5.3%
2015	45%	6.0%	5.2%

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2015, own calculations

Table 3: Average difference between German tax rate and (average) foreign tax rates faced by affiliates' investors abroad

Year	Statutory tax rates		AETR1		AETR2	
	All affili- ates	Affiliates with tax haven investors	All affili- ates	Affiliates with tax haven investors	All affili- ates	
1999	17.4	20.8				
2000	17.6	20.5				
2001	4.8	7.4				
2002	5.4	8.4				
2003	8.4	11.2	0.9	5.7	21.0	
2004	7.0	9.6	0.2	3.3	17.4	
2005	7.8	11.7	1.5	5.0	20.9	
2006	8.5	12.7	1.0	4.9	9.5	
2007	9.7	14.7	1.5	6.0	10.5	
2008	1.6	6.4	-2.2	1.7	-20.0	
2009	2.0	6.8	-1.6	2.3	10.0	
2010	2.2	7.0	-1.8	3.2	8.9	
2011	2.7	7.4	-2.9	1.3	-1.2	
2012	3.0	7.4				
2013	3.2	7.3				
2014	3.6	7.3				
2015	3.8	7.2				

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2015, own calculations

Table 4: Regression outputs - statutory tax rates

Depvar: ln_profit	All affiliates		Affiliates with tax haven in- vestors		Affiliates with- out tax haven investors	
	(1)	(2)	(4)	(5)	(6)	(7)
	Fixed	Robust	Fixed	Robust	Fixed	Robust
	effects	s.e.	effects	s.e.	effects	s.e.
	b/se	b/se	b/se	b/se	b/se	b/se
tax_rate	.036*** (-0.006)	.0363*** (-0.011)	.048*** (-0.014)	.048* (-0.024)	0.004 (-0.009)	0.004 (-0.016)
ln_employees	.046*** (-0.013)	.046* (-0.021)	.068*** (-0.019)	.068* (-0.032)	.057*** (-0.017)	.057* (-0.024)
ln_turnover	.038*** (-0.008)	.038** (-0.012)	.062*** (-0.013)	.062*** (-0.018)	0.012 (-0.011)	0.012 (-0.015)
ln_assets	.039*** (-0.009)	.039* (-0.016)	.027+ (-0.016)	0.027 (-0.024)	.046*** (-0.012)	.046* (-0.019)
liability_ratio	-.053*** (-0.001)	-.053*** (-0.002)	-.06*** (-0.002)	-.06*** (-0.004)	-.046*** (-0.001)	-.046*** (-0.003)
switch_01	4.751*** (-0.186)	4.751*** (-0.479)	4.091*** (-0.339)	4.091*** (-0.853)	4.595*** -0.259	4.595*** -0.673
switch_10	-7.195*** (-0.134)	-7.195*** (-0.318)	-7.189*** (-0.236)	-7.189*** (-0.547)	-8.027*** (-0.189)	-8.027*** (-0.442)
N	77365	77365	33147	33147	44218	44218

Notes: Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

All regressions include time and affiliate-level fixed effects, coefficients are not reported; tax rate is the average statutory tax rates in the home countries of an affiliate's investors. Profits and liability ratio have been winsorized. As suggested by Weichenrieder (2009, p. 293): "To avoid losing firms with zero employment, sales, or fixed assets in some year, a small constant was added before taking logs."

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2015, own calculations

Table 5: Regression outputs - average effective tax rates

depvar:	All af-	affiliates	affiliates	All af-	affiliates	affiliates
ln_profits	filiates	with tax	without	filiates	with tax	without
		haven	tax haven		haven	tax haven
		investor	investor		investor	investor
	(8)	(9)	(10)	(11)	(12)	(13)
	b/se	b/se	b/se	b/se	b/se	b/se
AETR1	.027*	.0686**	-0.016			
	(-0.013)	(-0.024)	(-0.018)			
AETR2				-0.000	.005+	-0.004
				(-0.002)	(-0.003)	(-0.003)
ln_employees	.082**	0.054	.114***	.082**	0.054	.114***
	(-0.027)	(-0.041)	(-0.034)	(-0.027)	(-0.041)	(-0.034)
ln_turnover	0.028	.073**	-0.019	0.028	.073**	-0.018
	(-0.019)	(-0.027)	(-0.024)	(-0.019)	(-0.03)	(-0.024)
ln_assets	0.009	0.001	0.025	0.010	0.003	0.025
	(-0.024)	(-0.04)	(-0.029)	(-0.024)	(-0.04)	(-0.029)
liability_ratio	-.055***	-.065***	-.045***	-.055***	-.065***	-.045***
	(-0.003)	(-0.005)	(-0.004)	(-0.003)	(-0.005)	(-0.004)
switch_01	-6.855***	-6.696***	-7.224***	-6.887***	-6.774***	-7.227***
	(-0.425)	(-0.705)	(-0.669)	(-0.425)	(-0.707)	(-0.667)
switch_10	4.905***	4.717***	4.791***	4.908***	4.639***	4.786***
	(-0.62)	(-1.141)	(-0.946)	(-0.62)	(-1.134)	(-0.945)
N	37066	15579	21487	37066	15579	21487

Notes: Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

All regressions include time and affiliate-level fixed effects, coefficients are not reported; cluster-robust s.e. at affiliate level. AETR are average effective tax rates in the home countries of an affiliate's investors. Profits and liability ratio have been winsorized. As suggested by Weichenrieder (2009, p. 293): "To avoid losing firms with zero employment, sales, or fixed assets in some year, a small constant was added before taking logs."

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi), 1999-2015, own calculations

Table 6: Regression outputs - first-time appearance of a tax haven investor

depvar ln_profits	Fixed effects	Robust s.e.	FE_vce_bg
	(14)	(15)	(16)
	b/se	b/se	b/se
treatment	-.454*** -0.122	-.454+ -0.262	-.951** -0.294
ln_employees	.040** -0.012	.040+ -0.021	.062** -0.023
ln_turnover	.0394*** -0.008	.039** -0.012	.031* -0.013
ln_assets	.0407*** -0.01	.0407** -0.015	.042* -0.016
liability_ratio	-.054*** -0.001	-.054*** -0.002	-.054*** -0.002
switch_01	-7.102*** -0.134	-7.102*** -0.317	-7.835*** -0.345
switch_10	4.691*** -0.184	4.691*** -0.474	7.216*** -0.595
N	78217	78217	66471

Notes: Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. treatment is a dummy which switches to 1 in the period in which a tax haven investor appears for the first time; all regressions include time and affiliate-level fixed effects, coefficients are not reported; Profits and liability ratio have been winsorized. As suggested by Weichenrieder (2009, p. 293): “To avoid losing firms with zero employment, sales, or fixed assets in some year, a small constant was added before taking logs.”

Table 7: Extrapolated amount of profit shifting and revenue loss

Tax incentive variable	Estimated effect	Share of profit shifting in sample's total profits	Amount of shifted profits (total profits*share obtained from the sample)	Revenue loss based on AETR1	Share in total corporate income tax revenues
	%	%	bn EUR	bn EUR	%
Statutory tax rate	3.6	10.5	12.8	2.8	5.3
Statutory tax rate, sub-sample of firms with tax haven investor	4.8	13.1	16	3.5	6.6
AETR1, sub-sample of firms with tax haven investor	6.8	5.8	7.1	1.5	2.9
Treatment dummy	-61	21.4	26	5.6	10.7

Source: Own calculations based on estimation results (tables 4-6), Eurostat (2018)

Table 8: Robustness checks, statutory tax rates

Depvar lnp32_w, sub-sample with tax haven investors	country_clusters	non_winsor	years19 2007	years20 2015	years20 2014
	b/se	b/se	b/se	b/se	b/se
tax rate	.048+	0.020	0.051	0.021	.046*
	-0.025	-0.013	-0.040	-0.030	-0.023
ln_employees	.068***	-.044*	0.004	-0.021	-0.003
	-0.012	-0.018	-0.049	-0.042	-0.031
Ln_turnover	.062*	.050***	.076*	.136***	.149***
	-0.024	-0.014	-0.033	-0.021	-0.016
Ln_assets	.027**	-0.027	-0.024	-.051+	-.061**
	-0.008	-0.017	-0.036	-0.030	-0.023
Liability ratio	-.059***	-.084***	-.111***	-.119***	
	-0.003	-0.006	-0.005	-0.007	
1.switch_01	4.091**	3.882***	4.571***	0.963	1.074+
	-1.437	-0.648	-1.252	-0.864	-0.642
1.switch_10	-7.19***	-6.784***	-5.387***	-2.759***	-2.361***
	-0.840	-0.427	-0.939	-0.684	-0.410
Liability ratio, non- winsorized	-.03***				
	-0.006				
N	32233	33147	12123	23447	33146

Notes: Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ All regressions include time and affiliate-level fixed effects, coefficients are not reported; tax rate is the average statutory tax rates in the home countries of an affiliate's investors. Profits and liability ratio have been winsorized. As suggested by Weichenrieder (2009, p. 293): "To avoid losing firms with zero employment, sales, or fixed assets in some year, a small constant was added before taking logs.", (3) adjusts robust s.e. for 86 country clusters

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi). 1999-2015, own calculations

Table 9: Robustness checks, AETR1

Depvar lnp32_w, sub-sample with tax haven in- vestors	country_c l s	non_winsor	years20 2010
	b/se	b/se	b/se
AETR1	.046* (.017)	.049** (.016)	.035 (.025)
ln_employees	.055 (.050)	-.047* (.02)	.043 (.044)
ln_turnover	.0702** (.02)	.065*** (.017)	.063* (.029)
ln_assets	.003 (.009)	-.028 (.019)	.040 (.047)
Liability ratio	-.065*** (.004)		-.066*** (.006)
switch_dummy01	4.562+ -2.323	3.47*** (.769)	3.549** -1.261
switch_dummy10	-6.859*** (.468)	-6.688*** (.529)	-6.207*** (.917)
liability ratio, non winsorized		-.028*** (.003)	
N	14804	15511	12081

Notes: Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. All regressions include time and affiliate-level fixed effects, coefficients are not reported; AETR are average effective tax rates in the home countries of an affiliate's investors. Profits and liability ratio have been winsorized. As suggested by Weichenrieder (2009, p. 293): "To avoid losing firms with zero employment, sales, or fixed assets in some year, a small constant was added before taking logs."

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi). 1999-2015, own calculations

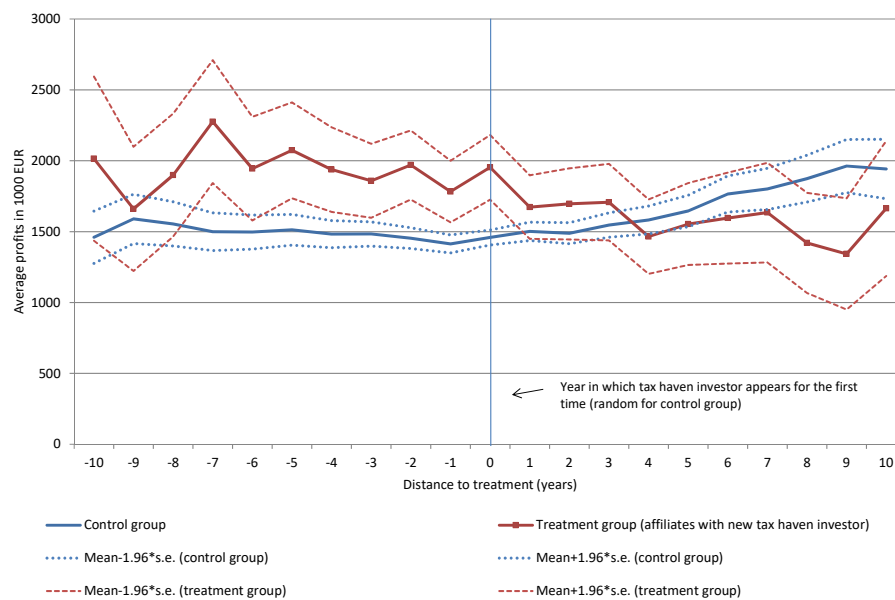
Table 10: Robustness checks - first-time appearance of tax haven investor

Depvar : lnp32_profits, sub-sample of firms of which majority is owned by a single investor	country_cl s	non_winsor	y1999_2007	y2007_2015	y2000_2014
	b/se	b/se	b/se	b/se	b/se
treatment	-.951* (-0.384)	-.997*** (-0.300)	-0.530 (-0.453)	-0.346 (-0.378)	-.891** (-0.304)
ln_employees	.062** (-0.019)	.061** (-0.023)	0.025 -0.039	.066* (-0.026)	.063** (-0.024)
ln_turnover	.031* (-0.012)	.032* (-0.013)	.051* (-0.024)	0.024 (-0.015)	.030* (-0.014)
ln_assets	.042** (-0.015)	.031+ (-0.018)	-0.019 (-0.028)	.052** (-0.02)	.036* (-0.017)
liability_ratio	-.054*** (-0.003)	-.071*** (-0.004)	-.046*** (-0.003)	-.049*** (-0.004)	
switch_01	-7.835*** (-0.358)	-7.962*** (-0.352)	-7.509*** (-0.571)	-7.295*** (-0.501)	-7.736*** (-0.366)
switch_10	7.216*** (-0.662)	7.415*** (-0.605)	7.826*** (-0.983)	5.492*** (-0.871)	7.074*** (-0.631)
liability_ratio, non- winsorized	-.041*** (-0.005)				
N	65011	66471	24359	42112	59121

Notes: Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$;
treatment is a dummy which swiches to 1 in the period in which a tax haven investor appears for the first time; all regressions include time and affiliate-level fixed effects, coefficients are not reported;
Profits and liability ratio have been winsorized. As suggested by Weichenrieder (2009, p. 293): “To avoid losing firms with zero employment, sales, or fixed assets in some year, a small constant was added before taking logs.”

Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi). 1999-2015, own calculations

Figure 1: Development of average profits after appearance of tax haven investor



Notes: Source: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, Microdatabase Direct investment (MiDi). 1999-2015, own calculations

IES Working Paper Series

2018

1. Karel Janda, Martin Strobl: *Smoking Czechs: Modeling Tobacco Consumption and Taxation*
2. Karel Janda, Michaela Koscova: *Photovoltaics and the Slovak Electricity Market*
3. Simona Malovana, Dominika Kolcunova, Vaclav Broz: *Does Monetary Policy Influence Banks' Perception of Risks?*
4. Karolina Vozkova: *Why Did EU Banks Change Their Business Models in Last Years and What Was the Impact of Net Fee and Commission Income on Their Performance?*
5. Jan Malek, Lukas Recka, Karel Janda: *Impact of German Energiewende on Transmission Lines in the Central European Region*
6. David Svacina: *Devaluation with Exchange rate Floor in a Small Open Economy*
7. Ladislav Kristoufek: *Are the Crude Oil Markets Really Becoming More Efficient over Time? Some New Evidence*
8. Karel Janda, Zuzana Lajksnerova, Jakub Mikolasek: *A General Equilibrium Model of Optimal Alcohol Taxation in the Czech Republic*
9. Nicholas Tyack, Milan Scasny: *Estimating the Value of Crop Diversity Conservation Services Provided by the Czech National Programme for Agrobiodiversity*
10. Laure de Batz: *Financial Impact of Regulatory Sanctions on French Listed Companies*
11. Matej Opatrny: *Extent of Irrationality of the Consumer: Combining the Critical Cost Efficiency and Houtman Maks Indices*
12. Mojmir Hampl, Tomas Havranek: *Foreign Capital and Domestic Productivity in the Czech Republic*
13. Miroslav Palansky: *The Value of Political Connections in the Post-Transition Period: Evidence from the Czech Republic*
14. Karel Janda: *Earnings Stability and Peer Selection for Indirect Valuation*
15. Ondrej Tobek, Martin Hronec: *Does the Source of Fundamental Data Matter?*
16. Stefan Schmelzer, Michael Miess, Milan Scasny, Vedunka Kopeckna: *Modelling Electric Vehicles as an Abatement Technology in a Hybrid CGE Model*
17. Barbora Malinska, Jozef Barunik: *Volatility Term Structure Modeling Using Nelson-Siegel Model*
18. Lubomir Cingl, Vaclav Korbel: *Underlying Motivations For Rule-Violation Among Juvenile Delinquents: A Lab-in-the-Field Experiment*
19. Petr Jansky, Marek Sedivy: *Estimating the Revenue Costs of Tax Treaties in Developing Countries*
20. Yao Wang, Zdenek Drabek, Zhengwei Wang: *The Predicting Power of Soft Information on Defaults in the Chinese P2P Lending Market*
21. Matej Kuc: *Cost Efficiency of European Cooperative Banks*

22. Dominika Kolcunova, Tomas Havranek: *Estimating the Effective Lower Bound for the Czech National Bank's Policy Rate*
23. Petr Jansky, Markus Meinzer, Miroslav Palansky: *Is Panama Really Your Tax Haven? Secrecy Jurisdictions and the Countries They Harm*
24. Petr Jansky, Marek Sedivy: *How Do Regional Price Levels Affect Income Inequality? Household-Level Evidence from 21 Countries*
25. Mojmir Hampl, Tomas Havranek: *Central Bank Capital as an Instrument of Monetary Policy*
26. Petr Pleticha: *Entrepreneurship in the Information Age: An Empirical Analysis of the European Regions*
27. Tereza Palanska: *Measurement of Volatility Spillovers and Asymmetric Connectedness on Commodity and Equity Markets*
28. Eva Hromadkova, Oldrich Koza, Petr Polak and Nikol Polakova: *The Bank Lending Survey*
29. Martin Gregor: *Electives Shopping, Grading Competition, and Grading Norms*
30. Lubos Hanus, Lukas Vacha: *Time-Frequency Response Analysis of Monetary Policy Transmission*
31. Matej Opatrny: *The Impact of Agricultural Subsidies on Farm Production: A Synthetic Control Method Approach*
32. Karel Janda, Ladislav Kristoufek: *The Relationship Between Fuel, Biofuel and Food Prices: Methods and Outcomes*
33. Karel Janda, Jakub Kourilek: *Residual Shape Risk on Czech Natural Gas Market*
34. Martin Stepanek, Kaveh Jahanshahi: *Structural Analysis of Influences on Workplace Productivity Loss*
35. Iftekhar Hasan, Roman Horvath, Jan Mares: *Finance and Wealth Inequality*
36. Sarah Godar: *Tax Haven Investors and Corporate Profitability - Evidence of Profit Shifting by German-Based Affiliates of Multinational Firms*

All papers can be downloaded at: <http://ies.fsv.cuni.cz>



Univerzita Karlova v Praze, Fakulta sociálních věd

Institut ekonomických studií [UK FSV – IES] Praha 1, Opletalova 26

E-mail : ies@fsv.cuni.cz

<http://ies.fsv.cuni.cz>