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Working Paper

Do multinational companies shift profits out of developing countries? How data availability may hide the evidence

WIDER Working Paper, No. 2018/52

Provided in Cooperation with:

United Nations University (UNU), World Institute for Development Economics Research (WIDER)

Suggested Citation: Schimanski, Caroline (2018) : Do multinational companies shift profits out of developing countries? How data availability may hide the evidence, WIDER Working Paper, No. 2018/52, ISBN 978-92-9256-494-0, The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki, <https://doi.org/10.35188/UNU-WIDER/2018/494-0>

This Version is available at:

<https://hdl.handle.net/10419/190101>

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WIDER Working Paper 2018/52

Do multinational companies shift profits out of developing countries?

How data availability may hide the evidence

Caroline Schimanski*

May 2018

Abstract: This study aims at providing causal evidence for tax-motivated profit-shifting out of developing countries, which, while often claimed to be the most affected, have been largely neglected in the literature. It uses global firm-level panel data from 2006–2015 and identifies profit-shifting through earnings shocks relative to comparable firms’ profitability that are passed on to affiliates within multinational corporations located in lower taxed countries. Unlike previous studies on profit-shifting, the present study is thereby able to control for country-pair-year fixed effects. Moreover, it contributes to the literature in terms of its geographic scope, multi-dimensional shifting patterns, the use of effective tax rates, and additional profit-shifting incentivizing factors not previously considered. However, despite rising anecdotal concerns and limited initial mostly non-causal evidence, this study cannot provide robust significant causal evidence for systematic tax-motivated profit-shifting out of developing countries. Nor do affiliates in better credit-rated, less corrupt, more developed countries or tax havens seem to be profit-shifting destinations. This inconsistency highlights the need for better data and the potential complexity of profit-shifting schemes.

Keywords: tax avoidance, profit-shifting, developing countries, government tax revenue, effective tax rate, multinational firms

JEL classification: H26, H71, F63, H87, O10

Acknowledgements: This paper forms part of the UNU-WIDER work programme ‘The economics and politics of taxation and social protection’ and I would like to thank the Nordic Tax Research Council and the Academy of Finland (grant number 268082), for their additional funding to work on this study. For their suggestions and/or comments on this and earlier versions, I would like to thank Jukka Pirttilä, Niels Johannesen, Tulio Cravo, Benjamin Faber, Augustin Fosu, Constanze Pettersson, Emmanuel Saez, Rune Stenbacka, Naveen Sunder, and Gabriel Zucman and the participants of the UNU-WIDER Internal Seminar, FDPE PhD Labour and Public Economics workshop, 1st Visiting Student Researcher Conference at UC Berkeley Economics Department, UNU-WIDER Public Economics for Development Conference, 73rd International Institute for Public Finance (IIPF) annual meeting, 8th Bolivian Conference on Development Economics, and 22nd Latin American and Caribbean Economic Association (LACEA) Annual Meeting. Access to the Orbis, Bureau van Dijk database was provided via the Hanken School of Economics University Library network. All remaining errors are mine.

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This study has been prepared within the UNU-WIDER project on ‘The economics and politics of taxation and social protection’.

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ISSN 1798-7237 ISBN 978-92-9256-494-0

Typescript prepared by Joseph Laredo.

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The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland, Sweden, and the United Kingdom as well as earmarked contributions for specific projects from a variety of donors.

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The views expressed in this paper are those of the author(s), and do not necessarily reflect the views of the Institute or the United Nations University, nor the programme/project donors.

1 Introduction

News reports on multinational companies (MNCs) reducing their tax burden by shifting profits out of developing countries, such as Glencore's dispute with Colombia over royalties, Nokia's dispute with India over unpaid royalty taxes, and Sabmiller's disputes in Africa over profit-shifting to tax havens, have remained for a long time merely anecdotal. In spite of a concern that developing countries in particular are losing potential tax revenue that could make them less reliant on aid, there is a general scarcity of (causal) empirical evidence on profit-shifting out of developing countries.

However, more general news of firms such as Starbucks and Apple paying in 2011 a 1 per cent effective tax rate in the Netherlands and Ireland, respectively, and Apple facing only a 9.8 per cent global effective tax rate, widely raised concerns that MNCs are engaging in systematic tax-motivated profit-shifting activities (Bloomberg 2015; Bowers 2014; Crabtree 2014; Duhigg and Kocieniewski 2012; Hearson and Brooks 2010). Besides, scandals such as the recent 'Paradise Papers' (November 2017), 'Panama Papers' (March 2016), and 'Luxembourg Leaks' (November 2014) have drawn public attention to MNCs' use of tax havens as destinations for profits and initiated policy debates aimed at combating these activities worldwide.

Using a 10-year worldwide firm-level panel dataset from 2006–2015, including firms from 117¹ countries, this study estimates (i) the existence and (ii) the extent of worldwide tax-motivated profit-shifting and profit-shifting that is incentivized by other means, in particular out of developing countries. It also investigates whether the extent differs by development status of the country, region, or industry or according to other moderating factors. The hypothesis that profit-shifting exists is based on a theoretical model that firms are profit-maximizers. To maximize their worldwide net profits, MNCs aim at minimizing their overall tax burden and therefore shift their profits to affiliates facing lower tax rates. Methodology-wise this study relies on a difference-in-difference panel data fixed effects model. It uses variations in profit rather than taxes to identify profit-shifting and is thereby, unlike previous studies, able to control for country-pair-year fixed effects.

While descriptive findings suggest a negative correlation between the average effective tax rate and the average profitability of MNC affiliates in a respective country and some model specifications provide evidence for the existence of profit-shifting, these results are not robust to country-pair-fixed effects and/or different levels of panel fixed effects or clustering of standard errors. Therefore, contrary to general expectations, this study cannot provide any robust causal evidence for the existence of profit-shifting out of developing countries. Nor can it provide evidence of profit-shifting from any affiliate to another affiliate that is located in a lower taxed, more developed, better credit rated, less corrupt, or less transparent country or tax haven. These results should, however, be treated with caution and not necessarily be interpreted as evidence of a lower than expected extent of profit-shifting. Rather than being evidence of the absence of large-scale, widespread, systematic profit-shifting, the results point to the difficulty of uncovering profit-shifting and the complexity of profit-shifting structures. The study also raises concerns about the quality of the firm-level data currently available and the limitations they set to any investigation of profit-shifting.

¹ Due to sample size restrictions by country and the exclusion of firms with consolidated information, the estimations are based on a lower number of countries (see Table A1 in Appendix A).

This study relates to a scarce but growing literature on profit-shifting involving developing countries. In addition to figures provided in news reports, Africa is, according to a recent report published by the United Nations Economics Commission for Africa (UNECA), losing over US\$50 billion annually as a result of illegal financial flows, of which profit-shifting is one part (UNECA, n.d.).² More generally, a Global Financial Integrity report estimates the combined value of illicit trade flows leaving developing countries untaxed at US\$800 billion, creating a 10:1 ratio of illicit trade outflows to Official Development Assistance inflows (Kar and Spanjers 2015). Due to developing countries' limited ability to draw on individual income taxes, developing countries are much more dependent on corporate tax revenues than developed countries. Hence, lost corporate tax revenues have a much higher impact on overall government tax revenues (Schjelderup 2016). Moreover, developing countries' fiscal capacity is considered to be lower than that of developed countries (Besley and Persson 2013). Consistent with this, developing countries are, according to the current public view, the ones suffering the most from the MNCs' profit-shifting behaviour, as media articles and NGO reports point out (The Economist 2013; Visser 2014). Apart from anecdotal evidence and the few recent reports mentioned above, there exists some recent academic evidence of profit-shifting involving developing countries (e.g. Cobham and Janský 2017; Crivelli et al. 2016; Fuest and Riedel 2010; Johannesen et al. 2017). However, generally still very little is known about the existence, extent, and causality of profit-shifting related to developing countries. Moreover, it is unclear whether the determinants and extent differ across developed versus developing countries or across regions and industries. Therefore, more and especially causal evidence is urgently needed, which this study aims to provide.

Generally, the literature defines profit-shifting as the systematic movement of profits between affiliates of an MNC to reduce global tax payments. Opportunities for profit-shifting may also arise through extensive 'treaty shopping', as discussed in Zucman (2014), by strategically choosing the location of holding companies, affiliates, and headquarters; manipulation of transfer prices; inter-company loans; and royalty payments, as MNCs increasingly exploit the large grey zones between tax evasion and tax avoidance. While views on the optimal corporate tax level may differ and profit-shifting may not necessarily be illegal, as a result of firms exploiting gaps in the fiscal regulations, the avoidance of tax payments by MNCs in developing countries is currently on the agenda of many international organizations, such as the OECD, IMF, World Bank, and UNU-WIDER, as well as developed and developing country governments. These organizations are addressing in particular the concern of rising transfer mispricing and the need for fiscal reform (Cooper et al. 2017). Moreover, the reduction of profit-shifting falls under the UN Sustainable Development Goals 16.4 and 17.1, to significantly reduce illicit financial flows and increase domestic revenue mobilization, and is hence a highly relevant research area.³

This study focuses only on the first channel of profit-shifting—the systematic movement of profits between affiliates of an MNC—and defines affiliates as comprising the parent firm and all of its subsidiaries of which it holds majority ownership. Studies that provide causal evidence of tax-motivated profit-shifting out of developing countries and explore the relative extent of profit-shifting out of developed versus developing countries are thus highly relevant and could inform the policy makers of national governments and international organizations about gaps in the

² The value of illicit financial flows is based on research that relies on national accounts and trade flow data.

³ United Nations Sustainable Development Goals 16.4: 'By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime' (<https://sustainabledevelopment.un.org/sdg16>); and 17.1: 'Strengthen domestic resource mobilization, including through international support to developing countries to improve domestic capacity for tax and other revenue collection' (<https://sustainabledevelopment.un.org/sdg17>).

existing international tax agreements that currently allow the profit-shifting behaviour of MNCs and help them to build functioning tax systems that safeguard the tax revenues of developing countries. Such research could also provide the OECD's Base Erosion and Profit-shifting (BEPS) project, which is working on a 'coordinated approach to combat tax avoidance of multinational companies' (OECD n.d., b), with more specific evidence of profit-shifting and details of its complexity. While it may be argued that profit-shifting origin countries also benefit from foreign direct investment (FDI), jobs, and knowledge spillovers resulting from MNCs' strategic location decisions, a welfare analysis—whether these inputs outweigh the welfare costs of lost tax revenue through profit outflows—is beyond the scope of this study.

Whereas the previous literature has investigated only tax-motivated profit-shifting, there might be other factors that incentivize firms to shift profits out of an affiliate located in a particular country. A country's poor credit rating, which might be associated with a higher risk of inflation and expropriation, might, especially in developing countries, incentivize firms to shift their profits away from affiliates in these locations. As an example, discussed by Suoninen and Georgiopoulos (2011), a fall in the credit rating even in a developed country, Greece, led to a large drop in corporate savings. Moreover, developing countries' low fiscal capacity may create an even larger discrepancy between corporate statutory tax rates and effective tax rates than the gap between the two rates presented in Schimanski (2017) for a sample of developed and developing countries. The fact that developing countries might be differently and potentially more affected by profit-shifting than developed countries due to their lower fiscal capacity can be supported by reports such as those of Tax Justice Network-Africa & Action Aid (2015), which show that some developing countries keep only manual and unsystematic records on tax obligations and collection. This argument is reinforced by the distinctly higher perceived levels of corruption⁴, lower control over corruption, and weaker government effectiveness⁵ in developing as opposed to developed countries, as illustrated in Figures A1a–c in Appendix A. The strong distinction between developing and developed countries in terms of all three measures supports the hypothesis that profit-shifting might be more prevalent out of developing countries, as it might be easier for firms to find and exploit loopholes in the tax system without being detected. This would be in line with Johannesen et al.'s (2017) findings on institutional development and increased tax avoidance. On the other hand, a higher degree of perceived corruption may also undermine the assumption that countries will collect taxes on profits according to a certain rate, as it may ease the potential for silent agreements on tax holidays and non-collection for particular firms. Hence, it is highly relevant to analyse, as will be done in the remainder of this paper, whether the weaker fiscal capacity of developing countries increases (reduces) the level of profit-shifting to the extent that it decreases the costs of profit-shifting or makes profit-shifting redundant. Such an analysis could provide insights into the mechanisms that reduce the tax revenues of developing countries' governments.

The contribution of this study to the literature is fivefold. First, this study relaxes most previous researchers' assumption that profits are shifted only in one direction—from parent to subsidiary or vice versa (e.g. Dharmapala and Riedel 2013; Johannesen et al. 2017). In particular, this study extends the literature by additionally examining profit-shifting between any firm in an MNC group, irrespective of whether the source and destination firms of the profits being shifted are a subsidiary and a parent firm or are both subsidiaries. Second, this paper estimates tax-motivated profit-

⁴ Perceived Corruption is measured by the Corruption Perception Index published by Transparency International (<https://www.transparency.org/research/cpi/overview>).

⁵ Average of Government Control over Corruption Estimate and Average of Government Effectiveness for the sample period of this study, published by the World Bank as part of the World Governance Indicators (<http://info.worldbank.org/governance/wgi/#home>).

shifting not only on the basis of corporate statutory tax rates, but also on the basis of various estimated average effective rates, which may provide a more realistic motivation for profit-shifting. Third, it extends the literature by testing for heterogeneity in the extent of profit-shifting by considering motivating factors other than tax rate differentials and development status. Specifically, it tests whether profit-shifting might be partly or solely incentivized by other reasons, such as a desire to reduce the risk of expropriation and or inflation. Fourth, methodology-wise this study exhibits numerous merits compared with previous studies. It extends a promising, often cited new identification strategy, developed by Dharmapala and Riedel (2013), based on a model by Bertrand et al. (2002), which identifies profit-shifting based on earnings shocks, rather than, as is more common, on variation in corporate tax rates. Earnings shocks are calculated as a proxy for the unobserved and unreported pre-shifting pre-tax profit, based on comparable firms in the same industry, according to the four-digit NACE (Revision 2) industry code⁶, and located in the same economic region. Subsequently, it is analysed whether such proxied positive earnings shocks to affiliates lead to significantly larger reported profits in their lower taxed destination country affiliates, but not in their higher taxed counterparts. This methodology has the advantages of being able to control for country-pair-year fixed effects and of not relying on infrequent and potentially endogenous variations in tax rate. Fifth, this paper expands the literature in terms of the geographical scope and sample size, by using a very recent 10-year panel, from 2006 to 2015, from the Orbis, Bureau van Dijk database, with firm-level data on around 100,000 multinational affiliates from 117 countries and about 2.7 million comparison firms worldwide, including from developing countries and tax havens.^{7,8}

The remainder of this paper will commence with a more extensive elaboration on the existing literature. Section 3 introduces the methodology and Section 4 the data. Section 5 presents the descriptive statistics, Section 6 presents the results and discusses the findings in the light of earlier research, and Section 7 concludes with a discussion on policy implications and an outline of potential areas for future research.

2 Literature

While worldwide profit-shifting by MNCs is not a recent phenomenon, it has for a long time, primarily due to a lack of good data, been neglected by academic research and merely been addressed in policy reports and attracted attention through news and NGO reports in the media. Previous academic research on profit-shifting is mostly very recent and has, due to even worse data availability, largely neglected developing countries and tax havens. The lack of good data in particular for developing countries is extensively discussed in chapter 1 of OECD (2015). Most of the existing literature concentrates on the extent, channels, and accounting practices of profit-shifting within the EU, Europe, and the USA or towards or out of specific countries with good

⁶ The Nomenclature statistique des activités économiques dans la Communauté européenne (NACE), developed by EUROSTAT and aligned with the United Nations' International Standard Industrial Classification of all Economic Activities, classifies industries at different levels of detail according to the number of digits used. For example, the four-digit NACE (Revision 2) code 1711 can be disentangled as follows: 17 Manufacture of paper and paper products; 1 Manufacture of pulp, paper, and paperboard; 1 Manufacture of pulp (see <http://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF>).

⁷ For instance, Dharmapala and Riedel (2013) is based on 18,000 observations from 22 countries and panel data from 1996–2005; Davies et al. (2017) has data from firms in 45 countries; and Møen et al. (2011) use a sample of firms from 68 countries.

⁸ A similar-size sample has previously been used by only Schimanski (2017).

data availability, such as Germany and France (Davies et al. 2017; De Simone 2016; Dharmapala and Riedel 2013; Fuest et al. 2011; Heckemeyer and Overesch 2013; Hope et al. 2013; Huizinga and Laeven 2008; Møen et al. 2011; Weichenrieder 2009). Over the past 10–15 years a relatively large literature on these regions has been established, with a consensus on the existence of profit-shifting, controlling for various channels through which profit-shifting takes place. The most often used data are taken from the Europe-wide firm-level dataset Amadeus, as well as national datasets, such as the MiDi firm-level dataset, covering firms based in Germany and customs datasets from France. While studies using US data frequently analyse profit-shifting to tax havens, studies on European data are likely to underestimate the extent of profit-shifting in that respect by only considering shifting among affiliates located in other European countries, excluding tax havens. Others consider shifting from or out of one particular European country while also neglecting tax havens, even though MNCs operating in Europe are also likely to have affiliates in tax havens. Amongst others, Zucman (2014) finds that a non-negligible share of MNCs’ profits—in this case 20 per cent—are appearing in tax havens, leading to a drop in the effective tax rates of up to 30 per cent over the past 35 years. This points to the need for studies with a wider geographical coverage, representative of the regions where MNCs actually operate.

Other regions of the world, especially developing countries, have, however, been completely neglected in such studies, mostly due to even sparser data availability, as discussed in the OECD’s 2015 BEPS report (OECD 2015). Only very recently, with the surge of interest in this topic from a developing country’s perspective in the media, among individual countries’ governments and from international organizations such as the UN, World Bank, and IMF, as well as from the OECD’s BEPS project, with developing countries hypothesized to be even more negatively affected by MNCs’ profit-shifting behaviour, has the situation begun to change. Moreover, increasing coverage of firms located in developing countries by the Orbis firm-level database now makes such studies possible. With rising attention also from academics there is now a limited but emerging literature on profit-shifting involving developing countries. These studies, based on macroeconomic as well as firm-level data, find suggestive evidence that developing countries are at least as much or more affected by profit-shifting than developed countries (Cobham and Janský 2017; Crivelli et al. 2016; Fuest and Riedel 2010; Johannesen et al. 2017).






The scale at which profit-shifting takes place, however, remains less clear, and findings vary not only across the channels analysed, but also across studies looking at the same channel. Determining the extent of profit-shifting is hence an area for further research, as Heckemeyer and Overesch (2013) conclude in a review of the existing literature. In addition, a recent report by the OECD (2015), as well as findings by Dharmapala (2014), suggest that recent studies have not been able to find evidence of such extensive profit-shifting as earlier ones. Re-estimating the results of Crivelli et al. (2016) using different data, Cobham and Janský (2017) come to the same conclusion that low- and lower-middle-income countries lose relatively more tax revenue, but they find overall global revenue losses to be somewhat smaller. The study by Johannesen et al. (2017) improves on the methodology of the earlier literature by analysing specifically profit-shifting involving those firms that were dropped out of the samples of earlier papers due to the logarithmic transformation of profits.⁹ Johannesen et al. (2017) include a broader set of countries but focus on low-income former Soviet Union countries, rather than low-income countries in Latin-America, Africa, and Asia that are more generally referred to as ‘developing countries’ and are more frequently cited as the losers from profit-shifting. Their findings suggest the higher likelihood of MNCs systematically

⁹ Firms with profits approaching zero from the negative side are excluded from earlier studies, as only logarithms of positive numbers can be calculated.

reporting zero-profits in lower income countries, but they also conclude that more research is needed regarding the causal mechanism.

Except for Dharmapala and Riedel (2013) and Schimanski (2017), who tried to provide causal evidence using an alternative identification strategy for profit-shifting based on earnings shocks, almost all studies analyse profit-shifting on the basis of variations in tax rate between affiliates and over time. The drawback of this approach is that such variation is infrequent and potentially endogenous and cannot be controlled for using country-pair-year fixed effects. Revisiting Dharmapala and Riedel's (2013) study on profit-shifting from European parent firms to their European subsidiaries and using a worldwide sample, Schimanski (2017) was able provide evidence on profit-shifting *only* when accounting for average effective rather than statutory tax rates. This suggests that, when estimating tax-motivated profit-shifting, it matters which tax rate is considered. Last, most studies have focused on (a) shifting out of a particular developed country, (b) shifting from parent firms to subsidiaries mainly in Europe, or (c) shifting from US parent firms to subsidiaries in tax havens (Figure 1).

Figure 1: Potential profit-shifting flows

Origin of profits		Destination of profits
<i>Existing literature</i>		
Parent firm in Europe		Subsidiaries in Europe
Parent firm in USA		Subsidiaries in tax havens
Subsidiaries		Parent firm (in a particular country)
<i>This study</i>		
Subsidiaries (in any (developing) country)		Parent firm (in any country)
Any affiliate of an MNC		Any affiliate of the same MNC

Source: Author's own overview.

A few other studies have concentrated on flows from subsidiaries to firms located in a particular country, such as Janský and Prats (2015). A brief analysis of profit-shifting from parent firms anywhere in the world to their subsidiaries anywhere in the world can be found in Schimanski (2017); this expands on Dharmapala and Riedel's (2013) findings, which looked only at European parents shifting to their European subsidiaries, neglecting potential shifting to non-European subsidiaries. Similarly, the repatriation of profits by subsidiaries located in any country to parent firms located in any country and flows between all affiliates (as depicted by the bottom two arrows in Figure 1) have so far received only limited or no attention in the literature. In sum, such a spider's web of potential profit-shifting flows among affiliates within a particular MNC group, irrespective of its parent or subsidiary firm status and its geographical location, has not been analysed by any previous studies and will therefore be the main contribution of the present study.

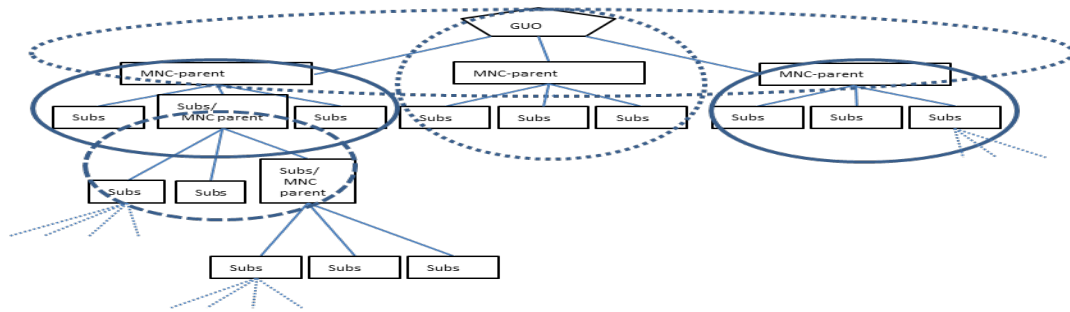
3 Methodology

This methodology section is tripartite. First, it provides some terminology. Second, it presents the theoretical motivation and conceptual framework of this study. Third, it provides the actual estimation model.

3.1 Terminology

This study takes a firm-level perspective and distinguishes between the global ultimate owner (GUO), the MNC parent firm, and various levels of subsidiaries (Figure 2). The parent firm is likely¹⁰ the GUO and has a stake of different sizes in one or multiple other domestic or foreign firms that are considered subsidiaries, which in turn also have stakes of different sizes in other firms. Hence a subsidiary can act as a parent firm of a subsequent layer of subsidiaries. As this study's focus is on cross-border profit-shifting, only foreign subsidiaries of a parent firm are considered. In practice it is possible that a parent firm has a majority stake in a foreign subsidiary, which itself also holds a majority stake in another firm. This is then a second-level subsidiary to the parent firm, and so on. The parent firm and its subsidiaries together constitute an MNC group. Firms in an MNC group, irrespective of their parent firm or subsidiary status, are termed affiliates. Given the large extent of missing data on ownership stakes for more than the first level of subsidiaries, this study considers each disaggregated MNC group separately (see Figure 2). Thus, the GUO can be the parent firm (dotted line), but a firm at the first subsidiary level of the GUO (solid line) or a subsidiary at a subsequent level (dashed line) can be a parent of further subsidiaries. This allows controlling for ownership stakes of at least 90 per cent.¹¹

Figure 2: Multinational company group



Source: Author's own construction.

Regarding tax rates, this study distinguishes between corporate statutory and effective tax rates. The former are the corporate income tax rates set by the relevant tax authorities. The latter are estimated rates based on the actual amount of taxes firms pay in a country. An affiliate is considered 'lower taxed' if it faces a lower tax rate than the reference affiliate in its MNC group. For instance, in an MNC group with affiliates in Brazil, Tanzania, Cayman Islands, and the Netherlands, the Dutch affiliate, facing a corporate statutory tax rate of 20 per cent, is considered lower taxed than both the Brazilian affiliate, which faces a 34 per cent tax rate, and the Tanzanian affiliate, with a 30 per cent tax rate. The same Dutch subsidiary is, however, regarded as higher taxed than the affiliate in the Cayman Islands, with a 0 per cent tax rate, whereas the Tanzanian affiliate is lower taxed than the Brazilian. Given tax rate changes, these relationships may change over time.

¹⁰ In the case of state-owned firms, the GUO is a government. Hence, various MNCs may be linked to a conglomerate MNC through the common government owner. The same applies where the GUO is a holding company with a majority stake in multiple parent firms. However, for many GUOs no financial information and no information on subsidiaries and ownership stakes is available.

¹¹ As a robustness check one could link all firms with the same GUO to form one aggregate MNC. A drawback of this approach is that it can only assume that the GUO holds a >50 per cent direct or indirect stake in any of the other firms, and cannot control for stronger links between subsidiaries, because part of the ownership chain is unknown.

Furthermore, this study distinguishes between two types of profit: pre-tax profit, as reported in the financial accounts of the annual reports; and pre-shifting pre-tax profit, which is the total actual profit before a firm potentially moved part of its profit to other affiliates in the MNC group—a figure that is not publicly reported anywhere. In the absence of profit-shifting, both types of profit are equal. As this pre-shifting pre-tax profit is not publicly known, Section 3.3 discusses the estimation of a proxy for this.

3.2 Conceptual framework for empirical analysis

Requiring a credible methodology to prove a causal effect of profit-shifting from affiliates in developing countries to lower taxed affiliates in the MNC group, this study uses the variation in profits to identify profit-shifting. It thereby overcomes the limitations of earlier research, which identified profit-shifting on the basis of potentially endogenous and infrequent variations in corporate tax rates within and between countries. This study can control for such potential endogeneity by including shifting origin-destination-country-pair-year fixed effects in a fixed effects model on a large panel dataset. The model draws on a conceptual framework developed by Bertrand et al. (2002) to explain the tunnelling of shares to particular shareholders, which has previously been adapted to the case of profit-shifting by Dharmapala and Riedel (2013). The framework is based on the neoclassical assumption of profit-maximizing firms aiming at minimizing costs, such as tax obligations, given a certain profit level. An MNC's objective function can be described as follows:

$$\Pi = (1 - t_A)(1 - x)\pi_A + (1 - t_B)(\pi_B + x\pi_A) - C(x, x\pi_A, \delta_A) \quad (1)$$

where Π stands for the MNC's worldwide profit, which it seeks to maximize by this equation; t_A and t_B and π_A and π_B stand for the tax rate and the profit of the different affiliates A and B , respectively. For simplicity the MNC group consists of only two firms, A and B , of which A is located in a higher taxed country than B . Thus, $t_A > t_B$. MNCs are likely to incur costs to shift profits, e.g. for tax advisory services and the management of tax evasion accusations. Such costs, denoted by C , depend on a function of the share of profit being shifted from one affiliate to another, x , the total amount of profit being shifted, $y = x\pi_A$, to affiliate B , and the fiscal capacity δ of the country from which the shifted profits originate. Here the model has been adapted to include the countries' fiscal capacity in determining the cost of profit-shifting. Hence, the profit function can also be written as:

$$\Pi = (1 - t_A)\left(1 - \frac{y}{\pi_A}\right)\pi_A + (1 - t_B)(\pi_B + y) - C\left(\frac{y}{\pi_A}, y, \delta_A\right) \quad (2)$$

To establish the relationship between the MNC's total profit, the fraction shifted x , and the amount shifted y , the first order conditions (FOC) are derived with respect to the share x and the total amount shifted y (see equations (3)–(4)). Subsequently, comparative statistics are derived for both with respect to the tax rate differential (see equations (5)–(6)).

$$\text{FOC with respect to } x: (t_A - t_B)\pi_A - \frac{\partial C}{\partial x} - \frac{\partial C}{\partial y}\pi_A = 0 \quad (3)$$

$$\text{FOC with respect to } y: (t_A - t_B) - \frac{\partial C}{\partial x\pi_A} - \frac{\partial C}{\partial y} = 0 \quad (4)$$

Comparative statistics with respect to the tax difference between the countries where firms A and B are located ($t_A - t_B$):

$$\frac{\partial^2}{\partial x} \frac{\Pi}{\partial(t_A - t_B)} = \pi_a > 0 \quad (5)$$

$$\frac{\partial^2}{\partial y} \frac{\Pi}{\partial(t_A - t_B)} = 1 > 0 \quad (6)$$

The fact that the last two equations are both positive implies that the share of profit being shifted, as well as the total amount shifted, increases with the tax differential. Similarly, as can be seen in equations (7) and (8), deriving the comparative statistic with respect to the profit of the higher taxed firms leads to a term larger than zero.

Comparative statistics with respect to π_A :

$$\frac{\partial^2}{\partial x} \frac{\Pi}{\partial \pi_A} = (t_A - t_B) - \frac{\partial C}{\partial y} > 0 \quad (7)$$

$$\frac{\partial^2}{\partial y} \frac{\Pi}{\partial \pi_A} = \frac{\partial C}{\partial x \pi_A^2} > 0 \quad (8)$$

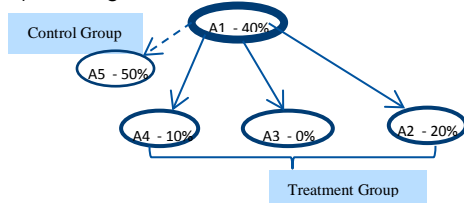
This implies that the optimal share and amount shifted increase with profit, if the cost of shifting is smaller than the tax differential.

3.3 Econometric model

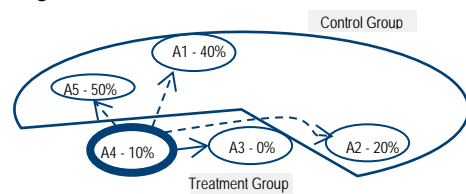
The methodology applied here takes Dharmapala and Riedel's (2013) models as a base and makes use of the findings of the simple theoretical model presented above, which assume that in the presence of this type of profit-shifting behaviour, a higher taxed firm will, in the event of an earnings shock, transfer part of its profits to a lower taxed affiliate, but not to a higher taxed affiliate. Therefore, the lower taxed affiliates can be regarded as the treatment group, while the higher taxed affiliates, which are expected to remain unaffected by a positive earnings shock of a lower taxed affiliate, can be considered the control group. Figures 3a and 3b model two such situations for MNC group A with five affiliates (A1, A2, A3, A4, and A5), assuming that profit-shifting decisions are solely made on the basis of tax differentials. In the event of an earnings shock at affiliate A1, which faces a 40 per cent tax rate, A1 has an incentive to shift part of its profit to affiliates A2, A3, or A4, but not to A5, as only the former three face a lower tax rate than A1. In this example, affiliates A2–A4 therefore form the treatment group and A5 the control group. However, if instead A4 faces an earnings shock, A4 only has an incentive to shift to A3, but not to A1, A2, or A5, as only shifting profits to A3 can reduce the tax burden and maximize worldwide profits. In this case, A3 is the treatment group and A1, A2, and A5 form the control group.

Figure 3: Profit-shifting incentive model

a) Earnings shock at affiliate A1



b) Earnings shock at affiliate A4



Source: Author's own creation.

Given that this methodology analyses the difference in impact of a change in the profits of one affiliate on two distinct groups of affiliates, namely lower- and higher taxed affiliates, the model can be regarded as a variation of a difference-in-difference model with fixed effects. As the

higher/lower taxed relationship differs, due to tax rate changes, in certain cases over time, a time-variant dummy variable¹² is being created, which takes the value 1 if an affiliate is lower taxed, and 0 otherwise. Alternative shifting incentives can be used interchangeably or be interacted with the lower tax incentive.

Earnings shock calculation

Earnings shocks are here defined as deviations in profitability from a set of comparable firms, such as through windfall profits. To identify whether a firm faces an earnings shock, which can be positive or negative, an earnings shock variable is calculated for each firm that potentially shifts profits. This earnings shock variable is in fact a proxy for the total profit of that firm if it had not shifted any of its profit. This proxy is based on the weighted profitability of a sample of comparable multinational and domestic firms, discussed in detail in the next section. While one may also consider using the first difference or deviation from the mean profit level as a potential option to determine a profit shock, such measures would be inferior, as they would be endogenous and would not allow one to measure the impact of the potential profit shock in full, as reported pre-tax profit figures represent the profits after the firms have already shifted (some of) those profits. Hence, the weighted mean of comparable multinational and domestic firms' profit is assumed to be a good instrument for the potentially shifting firm's pre-shifting pre-tax profit, because domestic firms do not have the option to shift their profits. Even though domestic firms may not be as profitable as multinational firms, the former have nevertheless been included in the main comparable firms sample to balance out the effect of potentially all multinationals shifting some or all of their profits to a more favourable location. Therefore, the estimation results will note on which type of comparable firms the results are based.

In spite of the divide in the literature between using pre-tax profits or earnings before interest and tax (EBIT) as a profit measure, this study uses pre-tax profits as a dependent variable, as its focus is on measuring the extent of profit-shifting rather than disentangling channels.¹³ For each of the comparable firms' data samples, a total weighted average pre-tax profitability measure p can be calculated as pre-tax profits π over total assets a using the formula $p_{jt} = \frac{\pi_{jt}}{a_{jt}}$, where t indicates the year and j the respective comparable firm. Therefore, the expected pre-tax pre-shifting profitability of a shifting affiliate in a given year is the total weighted average pre-tax profitability of all the other comparable firms, $\tilde{p}_i = \sum_j \frac{a_j}{\sum_j a_j} * p_j$, $i \neq j$.

Based on this profitability measure the expected pre-shifting pre-tax profit of each potential shifting firm can then be calculated by multiplying the estimated profitability measure by the potential shifting firm's assets: $\tilde{\pi}_{it} = \tilde{p}_{it} * a_{it}$. Given that profits are highly skewed on account of the heterogeneous firm size, profits are used in logarithmic form, as is common in this literature. However, this means that firms with negative estimated profits and positive assets or positive estimated profits and negative or zero assets are dropped from the sample. To avoid the loss of such observations, an inverse hyperbolic sine transformation is used as a robustness check. Given potential further outliers in the reported assets, as a robustness check all models are tested using just the estimated profitability based on comparable firms without reweighting it by the assets.

¹² In models that evaluate average tax rates, a time invariant dummy replaces this dummy.

¹³ As discussed in Dharmapala and Riedel (2013), pre-tax profit can account for profit-shifting through transfer price manipulation and inter-company financing, whereas EBIT excludes the latter.

Comparable firms samples

Comparable firms samples are formed broadly following the original methodology. Generally, only those firms are included for which the expected pre-shifting pre-tax profit can be calculated in relation to at least 10 comparable firms, to ensure that the comparable firms' profitability is not driven by outliers in that respective industry and year. For the same reason, firms in the top and bottom 1 per cent of the overall comparable firms' profitability distribution are excluded. This study therefore aggregates all firms that are operating in the same 4-digit NACE industry and are located within the same larger geographic area or economic region.¹⁴ Examples of those regions are the Middle East and Northern Africa (MENA), East African Community (EAC), Economic Community of West African States (ECWAS), Association of South East Asian Nations (ASEAN), former UDSSR, and Latin America. A full list of economic regions is provided in Table A2 in the Appendix. Additionally, robustness checks are provided using a more aggregated sample of comparable firms operating in the same 2-digit NACE industry.

Estimation sample

The estimation sample in Dharmapala and Riedel (2013) includes parent companies in 22 EU countries and their foreign subsidiaries based in the same 22 EU countries with at least 5 employees in which they have at least a 90 per cent share and which are operating in a different 4-digit NACE industry. The authors apply the latter restriction to combat possible endogeneity problems of earnings shocks throughout a specific industry and so that they are able to strictly disentangle profit-shifting from regular business shifting. However, this may distort the actual extent and channel of profit-shifting. As most companies, despite being diversified, keep their operations within a single broad industry, such a restriction may bias the analysis to very diversified MNC groups. It thereby ignores profits shifted across affiliates in more closely related industries. In fact, the potential endogeneity problem of industry-wide shocks is already controlled for when using industry-year fixed effects. This restriction is therefore relaxed and applied only in robustness checks to provide a comparison with Dharmapala and Riedel's (2013) study. Besides, this study also considers in some specifications foreign subsidiaries that are at least 51 per cent owed by the parent company and compares the results with those that are at least 90 per cent owned, as one might expect that even lower level majority ownership could provide an incentive for profit-shifting. The employee restriction is also relaxed, as there is a concern that this restriction excludes too many observations for which data on number of employees is missing. Finally, to avoid bias from potential outliers in the profit levels among the destination firms, those affiliates in the top and bottom 1 per cent of the profitability distribution are, as in the comparable firm sample, excluded from the analysis.

Estimation models

This study estimates the existence, extent, and heterogeneity of profit-shifting based on three models. The first is a one-directional model, whereas the other two are multidirectional.

The first model reverses the profit-shifting direction applied in the original model based on the earnings shock methodology by Dharmapala and Riedel (2013) and revisited by Schimanski (2017).

¹⁴ Given the smaller number of MNCs operating in developing countries and the even smaller number of these included in the sample, as will be presented in the data section, one cannot keep the same level of disaggregation at the country level in a worldwide country sample, as in the original model by Dharmapala and Riedel (2013). Doing so would potentially lead to a large non-random amount of exclusions, because the Orbis database does not have sufficient information on firms in all developing countries, and small developing countries may not even have the minimum of 10 comparable firms in the same 4-digit-NACE industry for each MNC.

Instead of looking at profit-shifting from parent to subsidiaries, this study's first model, equation (9), investigates profit-shifting from subsidiaries located in developing countries to their parent firms in developed countries, as developing countries largely host subsidiaries rather than parent firms. Significant evidence for such reversed shifting, assuming that MNC groups aim at repatriating profits to their parent firms, has previously been provided in a purely European context by Dischinger et al. (2014). In terms of the difference-in-difference concept, higher taxed parent firms are considered the control group, while lower taxed parent firms represent the treatment group, as subsidiaries are assumed to have an incentive to shift to the parent firm only if it is lower taxed.

$$\log \pi_{pt} = \alpha_0 + \alpha_1 \log a_{st} + \alpha_2 \log \tilde{\pi}_{st} + \alpha_3 (D_{tax\ pt} * \log \tilde{\pi}_{st}) + \alpha_4 D_{tax\ pt} + \alpha_5 x_{pt} + \varphi_s + \rho_t + \varepsilon_{pt} \quad (9)$$

The dependent variable in this model, $\log \pi_{pt}$, represents the log of the parent firm's pre-tax profit in time t .¹⁵ This is explained by the main variable of interest, the subsidiary's proxied expected log pre-tax pre-shifting profit $\log \tilde{\pi}_{st}$, which represents the earnings shock interacted with a time-variant dummy variable $D_{tax\ pt}$. The latter takes the value 1 if the parent is located in a lower taxed country than the subsidiary, and 0 otherwise. Hence, a positive and significant coefficient α_3 would support the hypothesis of profits resulting from earnings shocks at the subsidiary firm being forwarded to lower taxed parents to minimize the worldwide tax bill and maximize worldwide profits. Additional explanatory variables are a_{st} , the log of the parent firm's assets, the subsidiary's log proxied expected pre-tax pre-shifting profit $\log \tilde{\pi}_{st}$, and the time dummy of the parent firm being lower taxed, $D_{tax\ pt}$, as well as an error term ε_{pt} . Given that time-invariant subsidiary and parent-specific factors are likely to be correlated with the time-variant independent variables, a panel data model with fixed effects is theoretically assumed to be the optimal specification.¹⁶

Variations of this model include a variety of control variables, such as the parent firm country's log GDP per capital and log of population, the parent firm's number of employees, and the tax rate difference between parent and subsidiary country. As profit-shifting might be time-, industry-, or region-specific and the location of the affiliates of an MNC group and their tax differential might be endogenous, the model includes year, country-year, country-pair-year, industry-year, MNC group, and MNC group-year fixed effects to demonstrate further robustness of the results. In addition, separate regressions are estimated on the basis of the development status, geographic region, and aggregate industry of the shifting affiliate. Assuming the existence of heteroscedasticity and autocorrelation¹⁷ in the panel, standard errors are clustered at the MNC group, destination country, shifting destination combination, or, as in Dharmapala and Riedel (2013), subsidiary level.

To test for heterogeneity of the results and potential profit-shifting other than solely tax-motivated shifting, other interaction variables can be included interchangeably for the dummy of the parent firm being lower taxed. These interactions inform in a similar manner whether subsidiaries are potentially responsive to other shifting incentives and more likely to shift their profits to parent firms located in tax havens, high financial secrecy countries, developed countries, or better credit-rated countries. Moreover, multiple interactions allow testing for potential intensified incentives, such as whether subsidiaries are more likely to shift their profits to parents located in lower taxed,

¹⁵ This is the publicly reported pre-tax profit and thus the amount after possible shifting has occurred.

¹⁶ This assumption is based on a Hausmann test, which provides support for the use of a fixed effect, rather than a random effect, model.

¹⁷ This is supported by the results of a Wald test and Wooldridge test.

better credit-rated countries, which are also developed countries. This would similarly be supported in the variation of the model by a positive significant coefficient α_3 in (9). The full set of model variations tested is provided in Table A4 in Appendix A.

However, MNC affiliates may have incentives to shift profits amongst themselves irrespective of parent or subsidiary status. The second model addresses this possibility and extends the first model by considering all affiliates of an MNC as potential shifting origin or destination, regardless of parent versus subsidiary status. In equation 10, the subscripts p and s for parent and subsidiary firms are replaced by d and s for destination and shifting origin firm.¹⁸

$$\log \pi_{dt} = \alpha_0 + \alpha_1 \log a_{dt} + \alpha_2 \log \tilde{\pi}_{st} + \alpha_3 (D_{\text{tax } dt} * \log \tilde{\pi}_{st}) + \alpha_4 D_{\text{tax } dt} + \alpha_5 x_{dt} + \varphi_s + \rho_t + \varepsilon_{dt} \quad (10)$$

Here any affiliate of an MNC group that is lower taxed than the shifting origin firm is considered the treatment group, whereas those affiliates facing a higher tax rate than the shifting origin firm are regarded as the control group. Similarly, a variety of combinations of control variables, fixed effects, and clustering levels are tested, based on the available variable variations listed in the overview Table A4. Other or additional potential profit-shifting incentives have interchangeably been added here as interaction variables. In this type of model, however, profit-shifting might be underestimated or biased towards zero due to the inclusion of all possible combinations, which are likely to contain a large number of unrealistic shifting pairs, inducing too much noise. Unrealistic shifting pairs are, for instance, shifts from affiliates in tax havens to affiliates in high-tax locations. Therefore, variations of this model restrict shifting firms to those located in developing countries that are not at the same time also considered tax havens, as the hypothesized profit-shifting stream is out of developing countries and towards tax havens, not out of tax havens.

The third model, presented in (11), provides a more structured approach. It categorizes all affiliates other than the destination firm into two groups, one with affiliates that are likely and the other, unlikely to shift profits to the particular destination. Those likely to shift to a certain destination are those facing higher tax rates than the destination firm. This profit-shifting incentive is further enhanced if the destination affiliate faces a lower tax rate than the mean tax rate of all the affiliates of that MNC group. On the contrary, those affiliates of the MNC facing a lower tax rate than the destination affiliate have no incentive to shift there and represent the control group. Even if the destination affiliate faces a lower tax rate than the mean of all the affiliates of the MNC, these control group firms have no incentive to shift to the destination firm as they must be even lower taxed. Therefore, one expects a positive significant coefficient for α_4 but an insignificant coefficient for α_5 . A variation of this specification involves an additional interaction of the lower taxed destination firm dummy with a rank order variable. The rank order variable takes a higher value between 0 and 1 the lower the destination affiliate's tax rate is in comparison with that of other affiliates in the group. For instance, if there are four potential destination affiliates, the lowest taxed would have the value 1, the second-lowest taxed 0.75, the third lowest 0.5, and the one in the highest tax rate location 0.25. In this way it can be tested whether those affiliates facing the lowest tax rate of all affiliates in the group are most likely to be recipients of shifted profits.

$$\log \pi_{dt} = \alpha_0 + \alpha_1 \log a_{dt} + \alpha_2 \log \sum \tilde{\pi}_{SHTst} + \alpha_3 \log \sum \tilde{\pi}_{SLTst} + \alpha_4 (D_{\text{tax } d} * \log \sum \tilde{\pi}_{SHTst}) + \alpha_5 (D_{\text{tax } d} * \log \sum \tilde{\pi}_{SLTst}) + \alpha_6 x_{dt} + \varphi_{\text{group}} + \rho_t + \varepsilon_{dt} \quad (11)$$

¹⁸ Here each possible combination of affiliates of an MNC group, including reverse orders, is considered a potential shifting combination and is included as a separate observation in the dataset.

Here the subscripts *SHT* and *SLT* stand for, respectively, the sum of the affiliates' expected pre-tax pre-shifting profits that are higher taxed than the those of the destination firm and the sum of the affiliates' expected pre-tax pre-shifting profits that are lower taxed than those of the destination firm. φ_{group} is an MNC group fixed effect. Table A4 in Appendix A provides an overview of the control variables, fixed effects, and alternative interaction variables included in variations of the model.

4 Data

The empirical analysis rests on three types of data: firm-level data, tax rates, and complementary data for the control and interaction variables presented in Table A4.

4.1 Firm-level data

Worldwide firm-level panel data with annual financial account information spanning the period 2006–2015 was obtained from the Orbis database, provided by Bureau van Dijk¹⁹ between May 2015 and November 2015.²⁰ This database includes information on links between firms located in developing and developed countries as well as tax havens, and information on parent and subsidiary status. Thereby it allows the identification of firms forming an MNC group or operating solely as a domestic firm or domestic group. Henceforth, three separate search queries are applied to the sample download: one for the comparable firms including domestic firms and MNC affiliates, another for the MNC sample parent firms, and a third for the MNC sample foreign subsidiaries. The first consists of a Boolean search term within the Orbis database, for all still active firms (including governments and financial institutions) with unconsolidated data on pre-tax profit/loss, EBIT, total assets, and number of employees available for at least 1 of the 10 panel years. For 2,382,103 companies Orbis provides sufficient financial data to construct the comparable firm samples. The second search query includes additionally the restriction of parent firms with at least one foreign subsidiary. Subsidiaries in which the parent holds directly or indirectly²¹ a stake of less than 50.01 per cent are dropped, as these are assumed to be too loosely linked to be included in the MNC group's profit-shifting scheme. Local subsidiaries are dropped from the sample as well, as this study assumes that all domestic firms face the same tax rates and there is thus no profit-shifting incentive between domestic affiliates. The third search query retrieves the financial information of the remaining foreign subsidiaries. This leaves an unbalanced panel of a total of 26,551 parent firms and 83,264 foreign subsidiaries in 117 countries (see Figure A1 in Appendix A).

¹⁹ At the time of downloading from the Orbis database, access was allowed only to very large, large, and medium-sized companies' data, and not to small firms' data, i.e. to only around 10 per cent of the firms in the database. Firms are considered at least medium-sized if they fulfil any or all of the following criteria: (i) operating revenue of at least €1 million or US\$1.3 million; (ii) total assets of at least €2 million or US\$2.6 million; (iii) at least 15 employees. While this may create some bias, financial information reporting requirements are limited for small firms, which may create some selection bias. Besides, smaller firms are assumed to be less likely to shift profits given the transaction costs of shifting.

²⁰ The download was spread over half a year, as capacity restrictions for downloads limited the downloadable file size and speed, and the discovery of bugs within the profit variable required renewed download.

²¹ Direct and indirect ownership share refer to the first-level subsidiary and higher nth-level subsidiary of a firm, respectively.

Even though the Orbis database has recently been updated and now provides subsidiary linked information up to the 10th level of subsidiary, this study, like previous studies, considers mainly the first-level subsidiaries due to time and computing limitations.²² Firms may, however, consider higher level subsidiaries as potential shifting options, as discussed in Zucman (2014), who gives an example of a ‘double Irish–Dutch sandwich’ in which an Irish company holds a subsidiary in the Netherlands, which in turn holds another subsidiary in Ireland, with a subsidiary in Bermuda involved as well.

While the Orbis database is the best currently available firm-level database with worldwide coverage, and the data downloaded for this study included the latest updates, the Orbis database has numerous limitations. First, even though its coverage of firms in developing countries in Latin America and Asia is generally good, data on some African and Asian countries are limited. More generally, firm coverage in the Orbis database can be considered neither complete nor representative of a certain country or region.²³ Nevertheless, given the firm-level data coverage currently available, the inclusion of developing country affiliates from other parts of the world and at least some African countries provides the best possible indication of the profit-shifting behaviour of MNCs out of developing countries. Figure A2 in Appendix A presents the overall world coverage in detail. Given the methodological specifications of this study, additional firms had to be excluded from the sample if the limited data coverage resulted in insufficient comparable firms in the region and or industry. The lack of data on companies in some African countries may induce some bias in the results, as those countries are presented in recent non-academic publications as probably forgoing the largest share of tax revenue due to international profit-shifting (Anderson 2015; Steyn 2015; The Economist 2013; The Guardian 2015; Visser 2014). The extent of profit-shifting out of developing countries remains very uncertain, but in the absence of causal quantitative evidence, any evidence—even based on imperfect data—is crucial.

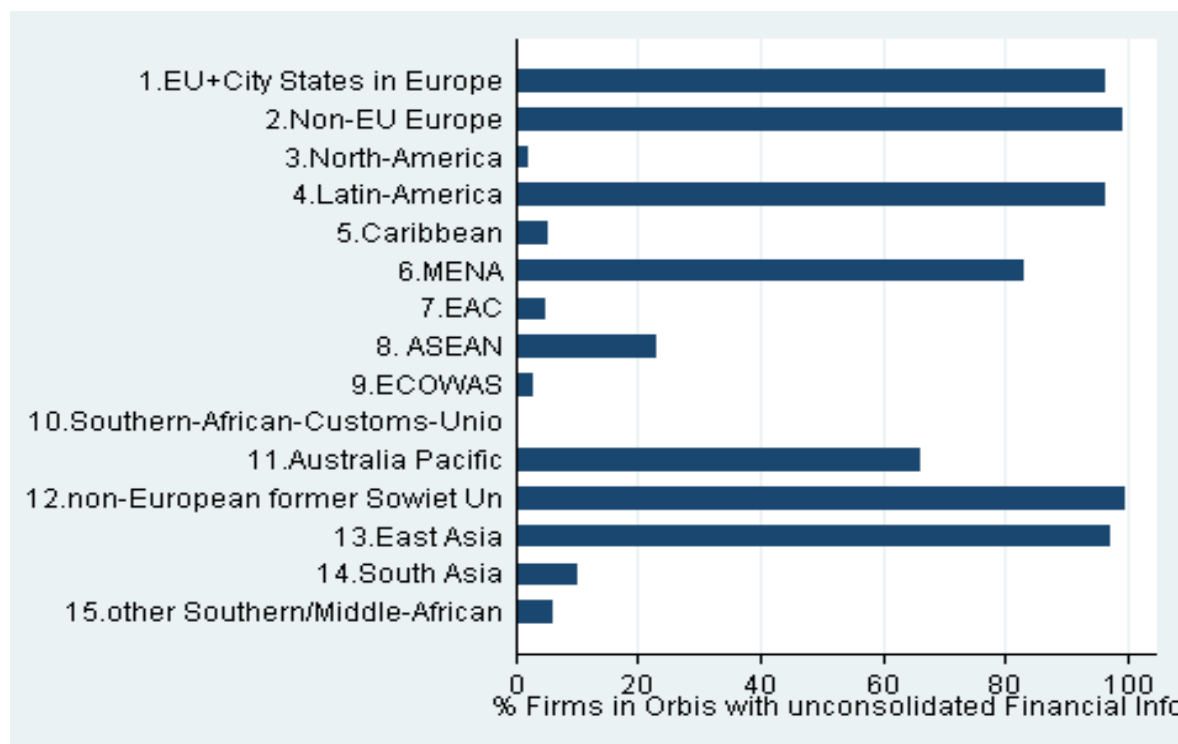
Second, a sizable number of particularly large firms provide only consolidated financial statements, which do not allow the analysis of within-MNC systematic variation in profits; therefore, these had to be excluded.²⁴ Among them were a large number of firms making the headlines of the ‘Panama and Paradise Papers’ affair, such as Nike and Apple. No support was found for the hypothesis that firms are strategically reporting consolidated information, which means that the share of firms in a country that report consolidated information is not related to the level of the tax rate in that country. In particular, no correlation was found between the tax rate and the likelihood of reporting consolidated information, as can be seen in Figure A5 in Appendix A. Nevertheless, Figure 4 shows that, of those firms listed in Orbis, the share of firms reporting unconsolidated financial information is very dispersed by region and particularly low for Africa, the Caribbean, and North America.

²² A study including up to the 10th level subsidiary, which is now possible, is work in progress by the same author.

²³ The latest update (2017) improved coverage but the database remains non-representative.

²⁴ One may think of three ways to exclude firms with consolidated financial information: (i) just the respective firm, (ii) all firms in the MNC, or (iii) all firms in MNCs having the same GUO may be dropped. In the light of the sample size, only the respective firms reporting consolidated information are excluded, given that the profit-shifting analysis in this study considers only shifts within the disaggregated MNC group rather than also accounting for shifts between affiliates of different MNCs that are linked through the same GUO, as there is often no financial information available for the GUO, especially if this consists of private persons or governments, rather than firms or holding companies.

Figure 4: Share of firms with unconsolidated financial data by region



Source: Author's own estimations.

A further limitation of the Orbis database is the provision of parent and ownership level information as time invariant variables based on the last period's status. Firms involved in mergers and acquisitions (M&As) or divestments are thus only included in their most recent status: the most recent parent of a subsidiary and the most recent ownership level of a subsidiary. Hence, a Swedish parent firm taken over by a Chinese firm in 2011 is listed in the database for the whole 10-year sample period as a Swedish subsidiary of a Chinese parent firm. This limitation may create distortions, as subsidiaries and parents listed in the database may not even have been part of the same MNC group over the whole panel period and may in reality thus not have been potential profit-shifting counterparts. This, however, is a bias that all studies based on Orbis, as well as earlier studies based on the solely European firm database Amadeus, must face. As M&As and divestments affect only a minority of firms every year and their rate does not display much variation over time, this bias, while a concern, is assumed not to drive the results in a particular direction nor to affect this sample differently than studies covering earlier periods. A more detailed analysis of M&A activities during this period is provided in Appendix B.

4.2 Tax rates

Yearly statutory tax rate information has been collected from the corporate tax rate overviews published by the 'Big Four', KPMG (n.d.), PwC (2013, 2015a, b), Deloitte (2012), and EY (2006–2015), as well as local tax authorities' websites, and is available for all sample countries. Despite mostly finding significant evidence of profit-shifting, more recent research has found relatively lower than expected magnitudes of profit-shifting (Dharmapala 2014; OECD 2015). A reason for a potential downward bias of more recent results might be the underlying assumption in the literature that the commonly used statutory corporate income tax rates provide a good indication of actual tax levels. In reality, however, the relation between statutory and effective tax rates might be very weak or non-existent, due to varying preferential tax treatments by industry, deductions, tax holidays, tax refunds, special economic zones, and individual companies' tax agreements. The

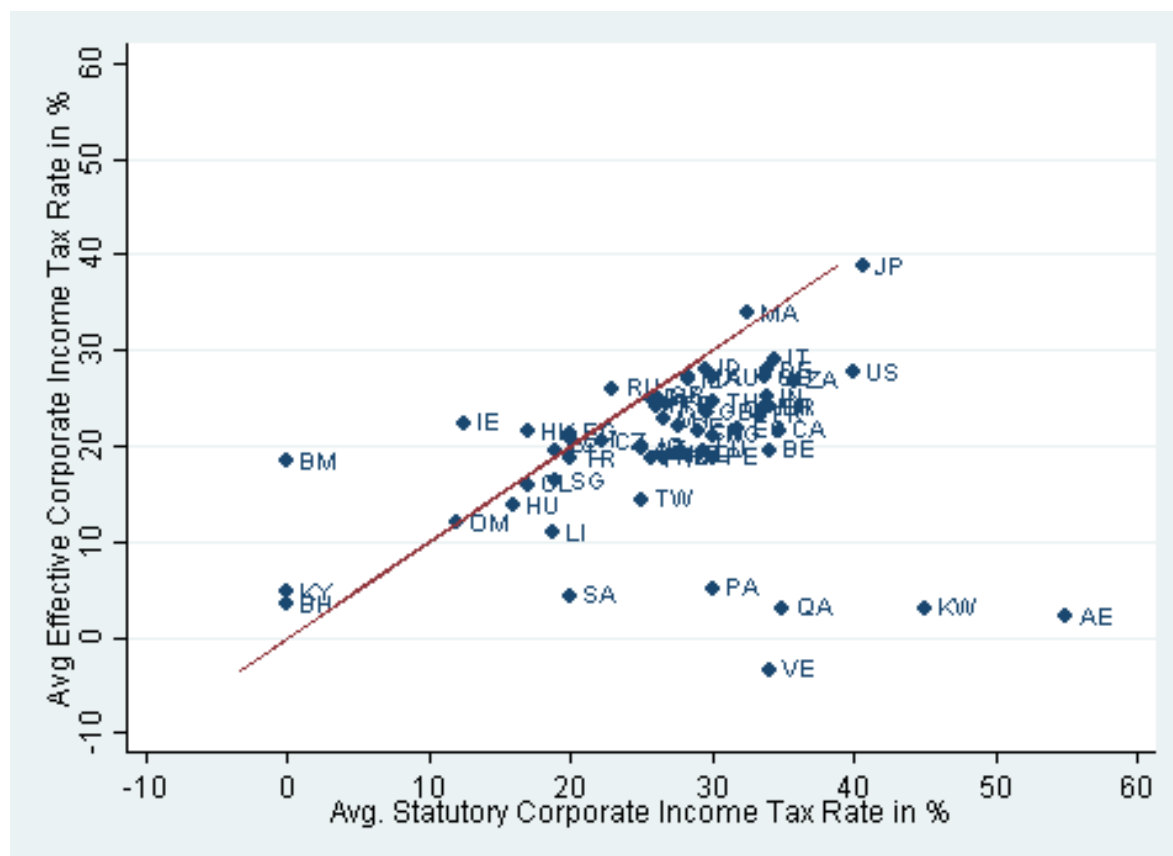
relationship may even have weakened over time. Schimanski (2017) was able to confirm significant evidence of profit-shifting found in Dharmapala and Riedel (2013) with more recent data only when using effective, but not statutory, tax rates. A simple plot of the average statutory tax rates over the period 2006–2009 against the average effective corporate tax rate during that period published by PwC & Business Round Table (2011)²⁵ shows that there is a generally positive correlation between the two rates but that this correlation is in many cases very weak or non-existent. Hardly any country's dot in Figure 5 lies on the red line, which it would if effective tax rates resembled statutory tax rates.²⁶ In further support, an alternative set of publicly available average effective tax rates, estimated by Dowd et al. (2017: table A.1), shows, while not necessarily matching in terms of rates with those of Figure 5, a similarly large-scale mismatch between statutory and effective tax rates. Aside from the formal comparison of statutory versus effective tax rates, it should be noted that certain countries commonly known as tax havens, such as Panama and Luxembourg, have surprisingly high statutory tax rates of around 30 per cent, making the use of statutory tax rates questionable. Moreover, if tax base decisions are made on average effective tax rates, rather than statutory tax rates, this can explain why tax revenue levels in developing and developed countries remained constant or even increased over the period under study, despite a plunge in statutory tax rates over the same period, as presented in an IMF blog by Keen and Brumby (2017).

While effective tax rates potentially give a more realistic picture of which countries are really the low-tax countries, they probably still do not reflect the full reality of tax benefits. Many countries provide specific preferential tax treatments to firms operating in certain industries or geographic areas, such as China's special economic zones, which are not incorporated. Tax holidays and special deals with the local tax authorities or political leaders seem, however, to be a major concern in certain countries, being granted to 46 per cent of firms surveyed in Ghana, Nigeria, and Côte D'Ivoire, while 10 per cent of all surveyed firms received complete tax exemptions, according to a report by the Tax Justice Network – Africa and Action Aid (2015). News of an MNC in Nigeria receiving tax exemptions in return for building a road is another example of a potentially common method of tax reduction in developing countries that is not accounted for in the effective tax rates (Nda-Isaiah 2016). Furthermore, differing definitions of taxable income across countries are not accounted for in any type of tax rates. Certain countries, for example, levy turnover or sales taxes instead of or in addition to corporate income taxes based on profits. Hence, MNCs with affiliates falling under a sales tax regime may to a varying degree be incentivized to shift to destinations that levy lower taxes on corporate profit. Such alternative tax regimes are principally applicable to small firms, whose sales and profits fall below a certain threshold. However, they do not pose a threat to the methodology, as small firms are excluded from the sample, due to the database access restrictions.

²⁵ These average effective rates have been calculated on the basis of total pre-tax income and taxes reported by a sample of 1,820 firms in 59 countries. Acknowledging the bias created by industry-specific tax rates, the published effective tax rates have been calculated excluding oil and gas companies, as these often face higher tax rates.

²⁶ From Schimanski (2017: figure 1).

Figure 5: Average effective versus statutory corporate income tax rate, 2006–2009



Note: A similar figure is presented as figure 1 in Schimanski (2017).

Source: Author's own estimation based on statutory tax rate data from the Big Four accounting firms and local tax authorities' websites and effective tax rate data from PwC & Business Round Table (2011)

While still not perfect, the use of effective tax rates rather than statutory tax rates may nevertheless provide more realistic evidence of the existence and magnitude of profit-shifting and thereby add to the literature, as effective rates have only seldom been considered.²⁷ This study will therefore include average effective tax rates as well as statutory tax rates, so as to provide a comparison that may show the downward bias of profit-shifting reported in earlier studies to have been induced by the shortcomings of statutory tax rate data. Assuming that MNCs use average rather than yearly effective tax rates for long-term planning, the average effective tax rates in the period 2006–2009 from PwC & Business Round Table (2011) have been used for the whole 10-year period, as these are the best available proxy for the average effective tax rates for the most recent years of the panel (2010–2015). In the same manner the average effective tax rates from 2006–2012 estimated by Dowd et al. (2017) are taken as average effective rates for all years. However, the lack of average effective tax rates for certain countries, especially for the set of rates from PwC & Business Round Table (2011), reduce the sample, and thus the number of affiliates of a group for which shifting incentives can be determined. This may induce new biases.

²⁷ According to the overview in OECD (2015: table 3.1), effective tax rates have previously been considered in only 5 of 19 studies.

4.3 Interaction and control variable data

Data for the set of interaction and control variables listed in Table A4 have been obtained from various sources, as indicated in Table A3. Tax havens are classified as such using five distinct definitions. The first follows the OECD (n.d., a) list of previously non-cooperative tax jurisdictions, containing 38 countries. According to this, the sample includes 469 parent firms and 144 subsidiaries located in 17 different tax havens. As a result, 1,724 subsidiary year observations, or about 2 per cent of the subsidiaries' year observations in the sample, have a parent firm that is located in a tax haven. Alternatively, the list of tax havens mentioned in Gravelle (2015) is used. This list consists of countries that have in the literature frequently been categorized as tax havens and comprises the countries in the OECD list plus an additional 10 countries, including Switzerland, Singapore, and Ireland. Three further definitions rest on the financial secrecy index developed by the Tax Justice Network: the Financial Secrecy Index itself and its components; a Secrecy Score depending on the country's transparency; and a Global Scale Weight indicating the country's share of worldwide offshore financial transactions (Tax Justice Network, n.d.).

An MNC group may be disincentivized to keep profits in an affiliate located in a country with a bad credit rating, where the profit value may be at risk of devaluation, expropriation through potential bank defaults, or liquidity restrictions. Despite being a potentially important profit-shifting incentive mechanism, this aspect has been neglected in previous studies. According to a leading Greek newspaper, for instance, Greece is reported to have experienced a substantial rise in capital flight of corporate capital in 2012 (through both legal and illegal channels) as a result of its debt crisis, the consequent lowering of its credit rating, and the government's Grexit discussions (Manifava 2012). Similarly, other newspapers report a drop of 19 per cent in household and corporate bank deposits in Greece between 2009 and 2011 (Suoninen and Georgiopoulos 2011). In 2015 a Bloomberg article even reported that deposits corresponding to over a third of the size of Greece's past year's economic output had left the country, while Reuters reported a monthly move of US\$1.4 billion in corporate and household deposits abroad (Georgiopoulos 2015; Whitehouse 2015). Therefore, the Standard & Poor's (S&P) country credit ratings valid on 31 December 2015²⁸ have been collected from the Orbis database and will be used as an additional and alternative profit-shifting incentivizing measure.

Given that corruption levels are, as discussed earlier, hypothesized to potentially alter profit-shifting levels as well, three measures of corruption—the Corruption Perception Index developed by Transparency International and two measures of the World Bank's Governance Indicators: government effectiveness and government control over corruption—are also included as interaction variables. In particular, high levels of corruption may raise the fear of expropriation or, conversely, reduce profit-shifting by easing other channels of tax avoidance.

The development status of sample countries has been determined on the basis of the categorization of the Human Development Index (UNDP, n.d.). Overall, according to this classification, 4 per cent of parent firms and 15 per cent of subsidiaries are located in a developing country (see Table A1 in Appendix A). Of these, however, only a small share is located in the least developed countries. While European parent firms and subsidiaries may seem significantly overrepresented in this sample, this might in fact partly reflect the reality in the MNC business world. This over- and underrepresentation of firms in certain geographical areas is also discussed

²⁸ Due to lack of access to yearly S&P country credit ratings, the latest S&P credit rating is taken as a time-invariant dummy for the whole period.

in the OECD's BEPS report (OECD 2015). Population²⁹ and Gross Domestic Product (GDP)³⁰ data are taken from World Bank statistics.

5 Descriptive statistics

This section presents the standard descriptive statistics and descriptive results on (i) the mean tax rate levels in various sub-samples, (ii) the correlation between different tax rates and profitability, (iii) the coefficiential variation, and (iv) potential bias caused by the incompleteness of the database.

Table 1 provides a descriptive overview of the corporate statutory tax rates in the sample firms' locations, distinguishing between parent and subsidiary firms located in tax havens versus non-tax havens as well as developed versus developing countries. A simple comparison of the tax rates of parent countries versus subsidiary countries in the sample shows that the difference is rather small: around 3–4 per cent when weighted by the number of companies. While surprisingly few MNC groups (2 per cent) have their parent firm located in a tax haven, those located there, as expected, pay on average only 2.96 per cent tax, which is 10 per cent of what parent firms outside tax havens pay. Contradicting the observations regarding corporate statutory tax rates in parent firms' locations, as well as general expectations about tax rates in tax havens versus non-tax havens, the statutory tax rates in tax havens in which subsidiaries are located differ only slightly from the ones in non-tax havens.

Furthermore, the initial assumption that firms may shift profits out of developing countries to developed countries for tax reasons does not find support from the descriptive statistics presented here. The average tax rate in developed countries is higher than that in developing countries for both parent and subsidiary locations. This unexpected observation, which would give affiliates in developing countries no a priori reason to shift to developed countries to save on taxes, might be a result of several developed country tax havens having relatively high statutory corporate tax rates, but relatively lax exemption policies, as mentioned in the previous section in relation to Panama and Luxembourg. Others maintain varying tax rates per industry, as for instance in Curaçao.³¹ In addition, corporate tax rates differ within special economic zones from the general statutory rates in specific countries. Hence there is additional diversity of statutory tax rates within one country. Therefore, firm-specific corporate statutory and effective tax rates by industry and location within the country might be necessary to provide a more realistic picture of the tax rates that firms face.

²⁹ Total population from the World Bank World Development Indicators Database: <http://data.worldbank.org/indicator/SP.POP.TOTL>.

³⁰ GDP per capita in current US\$ from the World Bank World Development Indicators Database: <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>.

³¹ According to EY (2015: 326), Curaçao charges different corporate tax rates to e-zone and offshore firms.

Table 1: Descriptive statistics: statutory corporate tax rates in % (for 2015 data)

Variable	Observations	Mean	Std. Dev.	Min.	Max.
All countries					
All parent	26,551	26.62	7.04	0	55
Tax haven parent	469	2.96	8.01	0	35
Non-tax haven parent	26,082	27.05	6.25	9	55
All subsidiaries	83,264	24.40	5.92	0	55
Tax haven subsidiaries	144	21.02	16.11	0	35
Non-tax haven subsidiaries	83,120	24.40	5.84	9	55
Developed					
Parent	24,954	27.22	6.21	10	55
Subsidiaries	70,002	25.11	5.73	0	55
Developing					
Parent	1,128	23.32	6.29	0	35
Subsidiaries	13,194	20.72	5.34	0	35

Note: These descriptive statistics are based on the full sample for which there is some financial information available, before the sample was restricted regarding available comparable firms and unconsolidated positive pre-tax profit.

Source: Author's own estimations based on Orbis data.

Likewise, a descriptive analysis of reported profits/losses before tax in US\$'000, distinguishing similarly between parent and subsidiary firms, as well as firms located in tax havens versus non-tax havens and developed versus developing countries, shows unexpectedly higher reported profits in developing countries and non-tax havens, as can be seen in Table 2. These results are not driven by very large firms or the inclusion of firms with consolidated accounts, as profitability (profit/assets) and a restriction to firms with unconsolidated accounts shows similar results.

Table 2: Descriptive statistics: profit/loss before taxes in US\$'000 (2013)

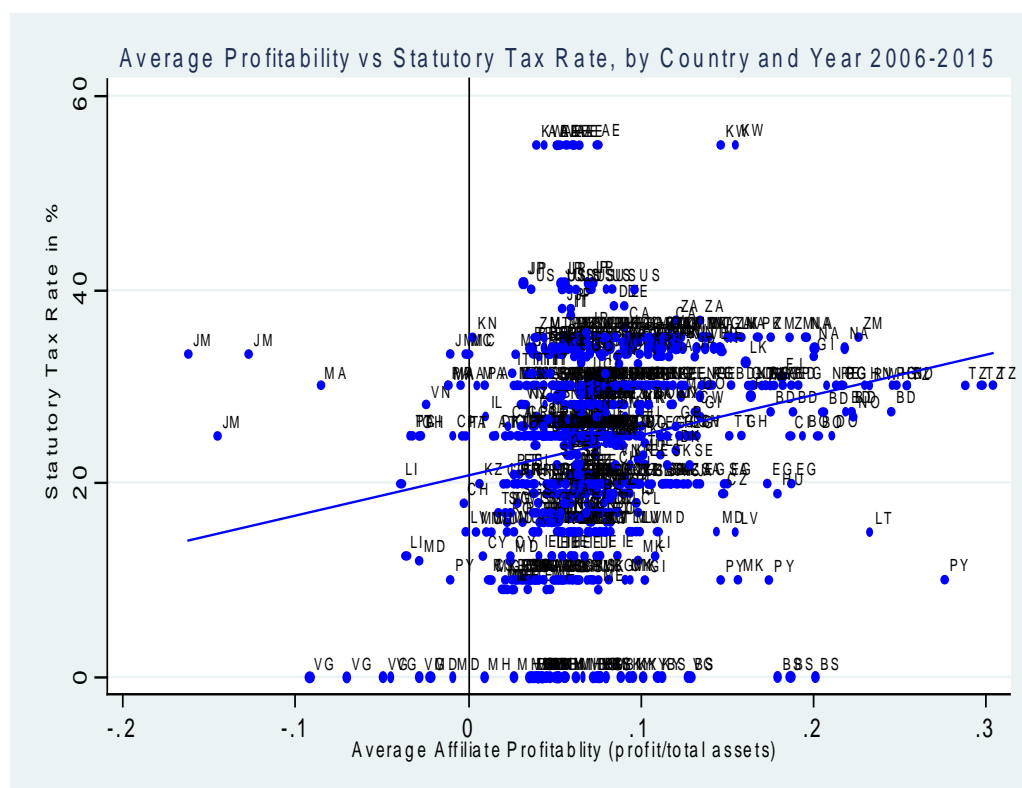
Variable	Observations	Mean	Std. Dev.	Min.	Max.
All countries					
All parent	23,285	104,869	1007,918	-11,100,000	45,400,000
Tax haven parent	437	106,993	512,625	-2,024,000	8,691,000
Non-tax haven parent	26,774	104,828	1,015,045	-11,100,000	45,400,000
All subsidiaries	74,540	9,859	215,495	-27,800,000	29,200,000
Tax haven subsidiaries	98	111,338	320,566	-54,463	2,216,786
Non-tax haven subsidiaries	74,442	9,725	215,295	-27,800,000	29,200,000
Developed					
Parent	21,839	85,748	819,523	-11,100,000	33,600,000
Subsidiaries	63,609	8,519	187,929	-27,800,000	13,200,000
Developing					
Parent	992	505,035	2,950,871	-1,916,463	45,400,000
Subsidiaries	10,872	16,881	332,884	-1,916,463	29,200,000

Note: These descriptive statistics are based on the full sample for which there is some financial information available, before restricting the sample regarding available comparable firms and unconsolidated positive pre-tax profit.

Source: Author's own estimations based on Orbis data.

The expectations raised by the general hypotheses that developing countries should be reporting lower profits has, however, been confirmed by the results of Johannesen et al. (2017). Hence, the contradictory relationship observed in this dataset may suggest that the expected relationship is not visible in the mean profits and profitability, but is, as hypothesized, highly heterogeneous depending on the tax rate in the respective location. Figure 6 therefore plots the average profitability ($=$ pre-tax profit/assets) of affiliates of any MNC group in a country in each sample year against the corporate statutory tax rate in the respective year. This leads to the surprising observation that, if there is a relation at all, average profitability is actually rising with corporate statutory tax rates and, as Figure A3a in Appendix A shows, the observed relationship does not systematically differ by development level of the country at first sight but only when considering

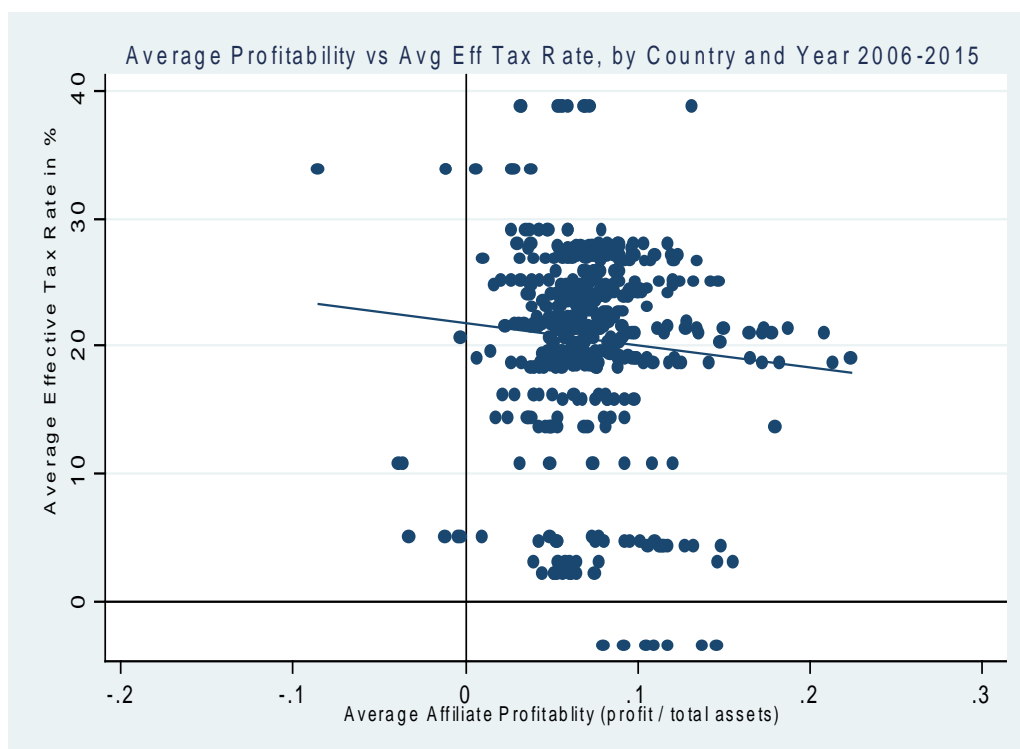
the linear approximations. This appears to be in clear contradiction to the assumption that firms want to maximize their worldwide net profits and are therefore striving to minimize their tax burden.



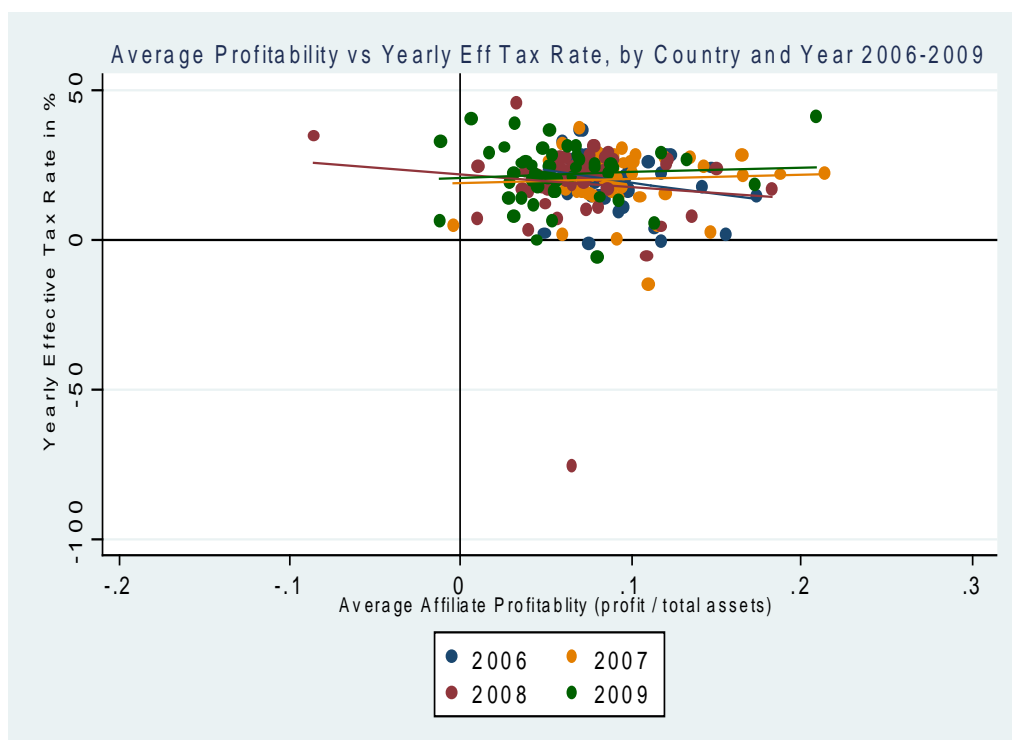
The above relation is, however, not completely unexpected or unexplainable, given the observed misalignment of statutory and average effective tax rates shown in Figure 5. Therefore, if it is the average effective rather than the statutory tax rate that in reality incentivizes firms to shift profits, this should be visible from a similar plot including average effective tax rates instead of statutory rates. Figures 7a and b plot average effective tax rates against average profitability and yearly effective tax rates against average profitability, respectively. Both figures show that average profitability decreases with higher effective tax rates. The relationship observed for the yearly effective tax rates is still downward sloping, but much weaker than for the average effective rates. This implies that firms may not alter their tax planning based on yearly variation of effective tax rates, but instead rather plan according to average effective tax rates over a longer period.

Figure 7: Average effective and yearly effective corporate tax rate versus average profitability

a)



b)

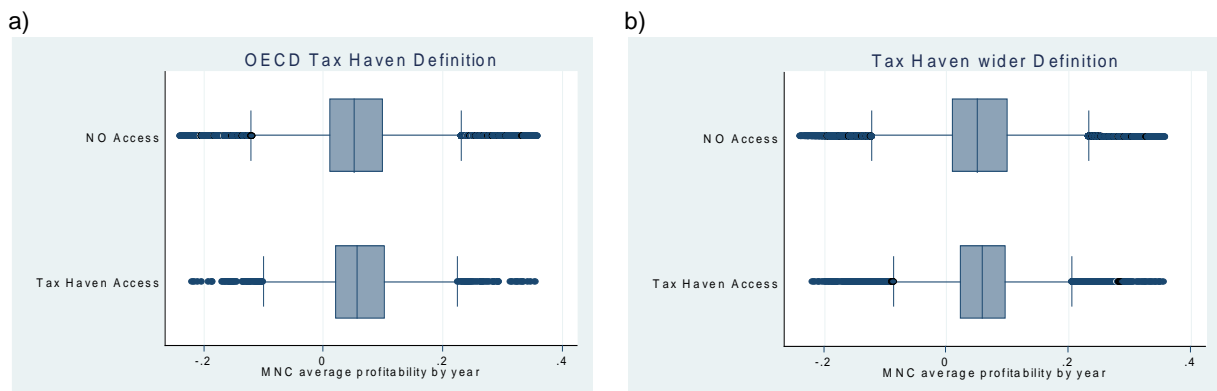


Source: Author's own estimations based on Orbis and Effective Corporate Tax Rate Data.

Moreover, it is observed that the profitability range is not very different when a multinational group has access to at least one tax haven, as can be seen in Figure 8. This is also counter to what

might be expected if firms could maximize tax haven use in their tax planning. Hence, these descriptive statistics raise the expectation that profit-shifting might be observed when using lower average effective tax rates as a profit-shifting incentive.

Figure 8: Tax haven access vs MNC average profitability



Source: Author's own estimations based on Orbis firm-level data and the OECD and Gravelle (2015) definitions of tax havens.

In further support of the claim that this study's methodology—which is based on continuous variation in profits rather than on variation in tax rates, as is more common in the recent literature—might be favourable, coefficients of variations of tax rates and profits have been calculated and are depicted in Tables 3a–b. While the 50th percentile of the coefficiential variation is in both cases very similar, namely 0.573 and 0.532 and thus even slightly higher for the statutory tax rate, the mean standard deviation of the tax rates during the panel period is smaller than the mean standard deviation of the proxied log pre-shifting pre-tax profit, scaled by the mean tax rate and mean proxied log pre-shifting pre-tax profit, respectively, namely 0.568 compared with 0.80. These relatively small differences should, however, be treated with caution, as the differences are much larger when considering proxied pre-shifting pre-tax profit in its non-logarithmic form. In addition, the fact that there are no cases of zero earnings variation over the years, while there is a large share of countries (almost 25 per cent of the distribution) with no tax rate variation during the panel period at all speaks in favour of using a methodology that exploits the continuous and larger variation in earnings, as does this study, rather than the infrequent and potentially endogenous variation in tax rates.

Table 3: Coefficient of variation

a) Coefficient of variation of corporate statutory tax rates				
	Percentiles	Smallest		
1%	0.000	0.000		
5%	0.000	0.000		
10%	0.000	0.000	Observations	22
25%	0.000	0.000		
50%	0.057		Mean	0.0568
			Std. Dev.	0.0467
		Largest		
75%	0.100	0.107	Variance	0.0022
90%	0.118	0.118	Skewness	0.0248
95%	0.124	0.124	Kurtosis	1.4956
99%	0.126	0.126		

b) Coefficient of variation of log parent firm's expected pre-shifting pre-tax profit				
	Percentiles	Smallest		
1%	0.003	0.000		
5%	0.012	0.000		
10%	0.018	0.000	Observations	5,258
25%	0.031	0.000		
50%	0.053		Mean	0.080
		Largest	Std. Dev.	0.127
75%	0.092	1.994	Variance	0.016
90%	0.155	3.024	Skewness	14.557
95%	0.217	3.364	Kurtosis	348.508
99%	0.470	4.012		

Source: Author's own estimations.

Finally, in addition to the points raised in the data section, another aspect of concern regarding the completeness of the Orbis database is the finding of very different proportions of cumulative profits reported in foreign subsidiaries of US parent firms. While Zucman (2014) estimates, using national accounts data, that around 30 per cent of US parent firm MNC groups' profits is made in subsidiaries abroad, according to the Orbis dataset used here this proportion is only 1 per cent. Moreover, the distribution of the subsidiaries with the largest share in their cumulative profits shows a very different country composition. In Zucman (2014) subsidiaries based in Ireland, the Netherlands, Luxembourg, Switzerland, Bermuda and other Caribbean countries, and Singapore make up more than 50 per cent of total subsidiary profits, whereas here, the largest proportions of subsidiary profits are reported in the Netherlands, the UK, Germany, Ireland, and Belgium, as displayed in Figure A4 in Appendix A.

6 Results

The main finding of this study is that none of the different variations of the three models, or their robustness and heterogeneity tests, can provide consistent significant causal evidence of the existence of profit-shifting between any affiliates, nor of a larger impact on developing countries.³²

Following the structure outlined in the methodology section, first, results for the simple one-directional case testing for the existence of profit-shifting out of developing country subsidiaries to parent firms are provided in Tables 4a–c. Subsequently, results for the two multi-directional models, investigating shifting between any affiliate of an MNC worldwide, irrespective of parent or subsidiaries status, are presented in Tables 5a–c and Table 6. For all models, results based on a variety of tax rates are presented first, followed by estimations for a selection of other profit-shifting incentives. An overview of the model variations tested is given in Table A4.

³² These results hold in spite the existence of a negative correlation between the average profitability of firms in a country and the average effective tax rate in that country displayed in Figure 7a. The results of Tables 4 and 5 have also been estimated for a more restricted sample of developing country affiliates. Under the assumption that with a positive earnings shock only part of the additional profit can be shifted abroad, the sample is for robustness checks further restricted to those developing country affiliates with both positive pre-tax profit and positive proxied pre-tax-pre-shifting profit and a higher pre-tax-profit than proxied pre-tax-pre-shifting profit. Estimations based on such a further restricted sample do not, however, lead to robust evidence for profit-shifting, either.

Table 4a: Shifting out of developing country subsidiaries to parent firms located anywhere

Dependent Variable: log_Dest_pre-tax Profit in thUSD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	Type of Panel level FE and Standard Error Cluster Level
Lower Stat Taxed Dest*	-0.0140	0.0216	0.0137	0.00684	0.00993	0.0101	0.00967	-0.0110	
log_Shift_exp_prSR4I	(0.0400)	(0.0268)	(0.0256)	(0.0244)	(0.0245)	(0.0245)	(0.0258)	(0.0358)	
Observations	14,291	14,013	14,013	13,954	13,950	13,950	13,933	13,479	
R-squared	0.711	0.885	0.887	0.895	0.895	0.895	0.901	0.910	MNC group
Much Lower Stat Taxed	-0.532	0.0144	0.00697	-0.163	-0.203	-0.204	-0.162	0.000357	
Dest*log_Shift_exp_prSR4I	(0.453)	(0.255)	(0.256)	(0.183)	(0.193)	(0.193)	(0.170)	(0.0404)	
Observations	14,291	14,013	14,013	13,954	13,950	13,950	13,933	13,479	
R-squared	0.712	0.885	0.887	0.895	0.895	0.895	0.901	0.910	MNC group
Lower Avg Effective (PwC)	0.0137	-0.0187	-0.0193	-0.0179	-0.0169	-0.0165	-0.0203	-0.00430	
Taxed	(0.0142)	(0.0168)	(0.0167)	(0.0151)	(0.0152)	(0.0153)	(0.0146)	(0.0452)	
Dest*log_Shift_exp_prSR4I									
Observations	3,820	3,678	3,678	3,576	3,573	3,573	3,555	3,397	
R-squared	0.691	0.891	0.894	0.908	0.908	0.908	0.921	0.932	MNC group
Lower Yearly Effective (PwC)	0.0154	0.0216	0.0150	0.0354	0.0339	0.0269	-0.00828	-0.0214	
Taxed	(0.0374)	(0.0290)	(0.0276)	(0.0331)	(0.0329)	(0.0335)	(0.0318)	(0.0389)	
Dest*log_Shift_exp_prSR4I									
Observations	1,487	1,341	1,341	1,282	1,282	1,282	1,275	1,201	
R-squared	0.684	0.919	0.922	0.934	0.934	0.934	0.942	0.949	MNC group
Lower Avg Effective (Dowd)	0.0199**	0.00647	0.00756*	0.00774*	0.00788*	0.00785*	0.00523	0.0379*	
Taxed	(0.00803)	(0.00457)	(0.00454)	(0.00445)	(0.00445)	(0.00445)	(0.00428)	(0.0195)	
Dest*log_Shift_exp_prSR4I									
Observations	12,245	11,990	11,990	11,932	11,928	11,928	11,908	11,594	
R-squared	0.721	0.888	0.890	0.898	0.898	0.898	0.903	0.912	MNC group
Lower Avg Effective (Dowd)	0.0199***	0.0429	0.0428	0.0495*	0.0505*	0.0503*	0.0536*	0.0630*	
Taxed									
Dest*log_Shift_exp_prSR4I	-0.00728	-0.0283	-0.0283	-0.029	-0.0291	-0.029	-0.0295	-0.0323	
Observations	12,245	11,834	11,834	11,776	11,772	11,772	11,751	11,431	Shifting-Destination
R-squared	0.721	0.888	0.89	0.898	0.897	0.897	0.903	0.911	Firm combination ID
Lower Avg Effective (Dowd)	0.0199	0.00651	0.00699	0.00436	0.0043	0.00433	0.00306	-0.00262	
Taxed									
Dest*log_Shift_exp_prSR4I	-0.0158	-0.0102	-0.0103	-0.00784	-0.0078	-0.0078	-0.00771	-0.0189	
Observations	12,245	12,244	12,244	12,191	12,187	12,187	12,169	11,868	
R-squared	0.721	0.735	0.737	0.761	0.761	0.761	0.767	0.784	destination country
LowerYearly Effective (Dowd)	-0.0168	0.0445**	0.0485**	0.0515***	0.0516***	0.0512***	0.0531***	0.0457*	
Taxed									
Dest*log_Shift_exp_prSR4I	-0.0216	-0.0191	-0.0191	-0.0191	-0.0189	-0.0189	-0.0192	-0.0244	
Observations	5,330	4,735	4,735	4,704	4,704	4,704	4,691	4,538	
R-squared	0.721	0.912	0.914	0.922	0.922	0.922	0.927	0.932	MNC group
LowerYearly Effective (Dowd)	-0.0168	0.0585**	0.0660***	0.0705***	0.0702***	0.0696***	0.0727***	0.0578*	
Taxed									
Dest*log_Shift_exp_prSR4I	-0.0208	-0.0246	-0.0247	-0.0253	-0.0251	-0.0252	-0.0257	-0.0307	Shifting-Destination
Observations	5,330	4,462	4,462	4,429	4,429	4,429	4,416	4,268	Firm combination ID
R-squared	0.721	0.907	0.909	0.917	0.918	0.918	0.922	0.927	
LowerYearly Effective (Dowd)	-0.0168	-0.0143	-0.012	0.0162	0.0166	0.0167	0.0167	0.0144	
Taxed									
Dest*log_Shift_exp_prSR4I	-0.0223	-0.0205	-0.0213	-0.0227	-0.0224	-0.0224	-0.0224	-0.024	
Observations	5,330	5,328	5,328	5,303	5,303	5,303	5,292	5,159	
R-squared	0.721	0.735	0.737	0.764	0.764	0.764	0.769	0.787	destination country
MNC group FE		x	x	x	x	x	x	x	
Year FE			x	x	x	x	x	x	
Destination 2-digit-NACE-year				x	x	x	x	x	
log_Dest_GDPperCapita					x	x			
log_Dest_Population					x	x			
Destination statutory tax rate						x			
Destination country-year							x		
Country-pair-year								x	

Note: Clustered standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Each regression additionally controls for the parent firm's (Dest) log total assets and the shifting firm's expected pre-shifting pre-tax profit, as well as the interaction dummy separately in the cases where it is time variant. Estimation results identify earnings shocks to subsidiaries located in developing countries based on the profits of comparable firms, defined as those operating in the same economic region and 4-digit NACE industry, abbreviated as SR4I. Shifts to the parent firm are considered irrespective of the number of employees and whether this operates in the same or a different 4-digit NACE industry. Only shifts from those subsidiaries in which the parent holds at least a 90 per cent stake are considered. Only those firms in an MNC group that report consolidated information are excluded from the sample, not the whole MNC group.

Source: Author's own estimations based on Orbis data from 2006–2015.

The results of the first model, analysing shifts out of subsidiaries located in developing countries to their parent firms, and basic variations of this model are presented in the different panels of Tables 4a–c. Each variation of the model is additionally tested for the robustness of including a variety of controls and fixed effects. The first column shows the model results controlling only for the parent firms' log assets, and the variables of the interaction term separately. The second column presents results additionally controlling for an MNC group fixed effect, and the third column further adds year fixed effects. The subsequent columns add a variety of destination (parent) level fixed effects and controls, such as parent firm-industry-year fixed effects, parent country's GDP

per capita and population size, parent country's statutory tax rate level, and parent-country-year fixed effects or country-pair-year fixed effects.³³

Table 4b: Shifting out of developing country subsidiaries to parent firms located anywhere

Dependent Variable: log_Destination_pre-tax Profit in thUSD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lower Financial Secrecy Index	0.00506	-0.0325	-0.0342	-0.0337	-0.0318	-0.0288	-0.0231	-0.0330
Dest*log_Shift_exp_prSR4I	(0.0123)	(0.0232)	(0.0240)	(0.0242)	(0.0236)	(0.0237)	(0.0221)	(0.0413)
Observations	3,775	3,644	3,644	3,536	3,533	3,533	3,513	3,406
R-squared	0.701	0.896	0.898	0.910	0.911	0.911	0.925	0.933
Lower Global Scale Weight	0.00456	-0.0187	-0.0254	-0.0256	-0.0238	-0.0229	-0.00895	0.0445
Dest*log_Shift_exp_prSR4I	(0.0181)	(0.0205)	(0.0207)	(0.0184)	(0.0183)	(0.0184)	(0.0180)	(0.0506)
Observations	3,790	3,659	3,659	3,549	3,546	3,546	3,526	3,406
R-squared	0.701	0.896	0.898	0.911	0.911	0.911	0.925	0.933
Lower Secrecy Score_Dest*log_Shift_exp_prSR4I	0.00410	-0.0293	-0.0355**	-0.0283	-0.0263	-0.0250	-0.0202	-0.0280
Dest*log_Shift_exp_prSR4I	(0.0122)	(0.0179)	(0.0178)	(0.0176)	(0.0167)	(0.0165)	(0.0148)	(0.0403)
Observations	3,790	3,659	3,659	3,549	3,546	3,546	3,526	3,406
R-squared	0.701	0.896	0.899	0.911	0.911	0.911	0.925	0.933
Tax Haven (Def.OECD)	-0.00444	-0.176	-0.154	-0.200	-0.220	-0.220	-0.0347***	-0.103
Dest*log_Shift_exp_prSR4I	(0.0966)	(0.207)	(0.196)	(0.215)	(0.227)	(0.227)	(0.0125)	(0.0926)
Observations	14,291	14,013	14,013	13,954	13,950	13,950	13,933	13,479
R-squared	0.711	0.885	0.887	0.895	0.895	0.895	0.901	0.910
Tax Haven (Def. broader)	-0.00743	-0.221	-0.193	-0.183	-0.200	-0.200	-0.118	-0.342**
Dest*log_Shift_exp_prSR4I	(0.0415)	(0.148)	(0.141)	(0.136)	(0.141)	(0.141)	(0.0797)	(0.163)
Observations	14,291	14,013	14,013	13,954	13,950	13,950	13,933	13,479
R-squared	0.711	0.885	0.887	0.895	0.895	0.895	0.901	0.911
Lower Avg Eff (Dowd) Taxed Dest*Better Credit Rated Dest*More Developed	0.0193**	0.00341	0.00514	0.00623	0.00626	0.00623	0.00471	0.0336*
Dest*log_Shift_exp_prSR4I	(0.00834)	(0.00466)	(0.00464)	(0.00450)	(0.00450)	(0.00449)	(0.00437)	(0.0197)
Observations	12,245	11,990	11,990	11,932	11,928	11,928	11,908	11,594
R-squared	0.721	0.889	0.890	0.898	0.898	0.898	0.903	0.912
Lower Tax Ranked order*Lower Stat Taxed	-0.00953	0.0122	0.00831	0.00374	0.00551	0.00562	0.00473	-0.00549
Dest*log_Shift_exp_prSR4I	(0.0218)	(0.0145)	(0.0138)	(0.0134)	(0.0134)	(0.0134)	(0.0142)	(0.0188)
Observations	14,291	14,013	14,013	13,954	13,950	13,950	13,933	13,479
R-squared	0.711	0.885	0.887	0.895	0.895	0.895	0.901	0.910
Shift Developing Dest	-0.00364	-0.0188	-0.0155	0.00650	0.00226	0.00249	0.0160	0.0232
Developed*log_Shift_exp_prSR4I	(0.0143)	(0.0324)	(0.0307)	(0.0321)	(0.0320)	(0.0320)	(0.0315)	(0.0389)
Observations	14,291	14,013	14,013	13,954	13,950	13,950	13,933	13,479
R-squared	0.711	0.885	0.887	0.895	0.895	0.895	0.901	0.911
Better Credit Rated	0.0498***	0.00200	0.00149	0.000204	0.000233	0.000285	0.00125	-0.00965
Dest*log_Shift_exp_prSR4I	(0.00866)	(0.00806)	(0.00782)	(0.00715)	(0.00717)	(0.00717)	(0.00668)	(0.0249)
Observations	14,272	13,996	13,996	13,937	13,933	13,933	13,916	13,463
R-squared	0.714	0.885	0.887	0.895	0.895	0.895	0.901	0.910
MNC group FE		x	x	x	x	x	x	x
year			x	x	x	x	x	x
Destination 2-digit-NACE-year				x	x	x	x	x
log_Dest_GDPperCapita					x	x		
log_Dest_Pop					x	x		
Destination statutory tax rate						x		
Destination country-year							x	
Country-pair-year								x

Note: Clustered standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Each regression additionally controls for the parent firm's (Dest) log total assets and the shifting firm's expected pre-shifting pre-tax profit, as well as the interaction dummy separately in the cases where it is time variant. Estimation results identify earnings shocks to subsidiaries located in developing countries based on the profits of comparable firms, defined as those operating in the same economic region and 4-digit NACE industry, abbreviated as SR4I. Shifts to the parent firm are considered irrespective of the number of employees and whether this operates in the same or a different 4-digit NACE industry. Only shifts from those subsidiaries in which the parent holds at least a 90 per cent stake are considered. Only those firms in an MNC group that report consolidated information are excluded from the sample, not the whole MNC group.

Source: Author's own estimations based on Orbis data from 2006–2015.

Only the model with the interaction of parent firms facing lower yearly effective or average effective tax rates according to the rates estimated by Dowd et al. (2017) show some positive significant evidence for tax-motivated profit-shifting out of developing country subsidiaries to their parent firms (Table 4a). However, as the rows below show, these results are not robust to destination country fixed effects and clustering of standard errors at the destination country. Such robustness is, however, considered important to show that the results are not driven by parent firms located in particular countries. Moreover, the results in Table 4a cannot provide any evidence for tax-motivated profit-shifting based on slightly differing yearly or average effective tax rates

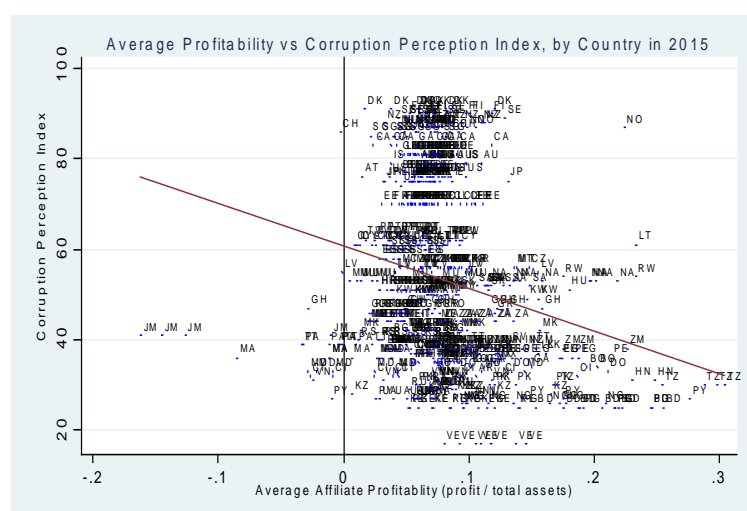
³³ Columns 2–8 correspond in terms of specifications of controls and fixed effects to those estimated in Dharmapala and Riedel (2013). However, instead of subsidiary fixed effects and clustering, this study uses a variety of other panel-level fixed effects and clustering levels.

estimated by PwC & Business Round Table (2011) nor based on statutory tax rates. Also no evidence can be found for profit-shifting to firms with statutory tax rates at least 15 percentage points lower. Hence, results are highly sensitive to the chosen tax rates measure, fixed effects, and clustering level.

Furthermore, the results in Table 4b cannot provide support for the hypothesis suggested by scandals such as the ‘Panama Papers’, that affiliates move their profits systematically to parent firms if these are located in tax havens. Parent firms located in tax havens seem to be a significantly less preferred target destination when controlling for country-pair-year effects, as can be observed in column (8) of Table 4b, where the negative significant sign is counter to what one might have expected. Nor do other factors, such as the parent located in a more developed, better credit-rated or much lower taxed country (relative to other MNC affiliates), seem to provide a stronger incentive for firms to shift their profits there, as these interactions are all insignificant and often hold a negative sign. Further extensions presented in Table 4b, including Financial Secrecy Index measures that consider the extent of transparency rather than assigning a binary variable to tax haven status, do not show any significant results, either.

An explanation for these results may be that the hypothesis regarding profit-shifting assumes that all reported profits are subject to taxation. Such an assumption does not, however, account for the possibilities that (a) countries may use different definitions of taxable income and (b) tax revenues may simply not be collected due to special tax exemptions granted, corruption, or the pure lack of revenue collection capacity. That corruption is a significant factor is supported by the observations from plotting the Corruption Perception Index against the average profitability of affiliates in specific countries in each year, as is done in Figure 9.

Figure 9: Corruption Perception Index versus average profitability



Source: Author's own calculations based on Orbis firm-level data and the Corruption Perception Index (by Transparency International).

Here one observes a negative relationship, meaning that profitability rises as perceived corruption increases, measured in the form of a lower Corruption Perception Index score. This observation is also in line with Johannesen et al.'s (2017) findings that firms located in countries with worse governance indicators report higher profits. This correlation raises the alternative expectation that profits are less likely to be shifted from subsidiaries to parent firms if subsidiaries are in a more corrupt country than the parent firm. The coefficients for the interacted variable of the shifting firm's expected log pre-tax pre-shifting profit with the dummy variable higher government control over corruption would be expected to be negatively significant. Instead, it turns out that MNCs seem significantly incentivized to move profits from developing country subsidiaries to the parent firm when the latter is located in a country with much higher control over corruption (Table 4c).

Table 4c: Shifting out of developing country subsidiaries to parent firms located anywhere

Dependent Variable: log_Destination_pre-tax Profit in thUSD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Developing_Shift*Much Higher control over corruption*Lower Avg eff (Dowd) Taxed Dest*log_Shift_exp_prSR4I	-0.0263 (0.0210)	0.00994 (0.0158)	0.0144 (0.0156)	0.0198 (0.0159)	0.0198 (0.0159)	0.0198 (0.0159)	0.0286* (0.0161)	0.0333* (0.0193)
Observations	12,245	11,990	11,990	11,932	11,928	11,928	11,908	11,594
R-squared	0.722	0.889	0.890	0.898	0.898	0.898	0.903	0.912
Higher control over corruption Dest*log_Shift_exp_prSR4I	0.0578 (0.0456)	-0.0160 (0.0332)	-0.0153 (0.0324)	0.00976 (0.0339)	0.00869 (0.0337)	0.00886 (0.0337)	0.00270 (0.0317)	0.0262 (0.0344)
Observations	14,291	14,013	14,013	13,954	13,950	13,950	13,933	13,479
R-squared	0.711	0.885	0.887	0.895	0.895	0.895	0.901	0.911
Higher corruption perception index Dest*log_Shift_exp_prSR4I	0.0573*** (0.0117)	-0.0118 (0.0118)	-0.0109 (0.0112)	-0.00984 (0.00995)	-0.00957 (0.00996)	-0.00951 (0.00993)	-0.00697 (0.00946)	-0.0150 (0.0304)
Observations	14,274	13,996	13,996	13,936	13,936	13,936	13,918	13,463
R-squared	0.713	0.885	0.887	0.894	0.895	0.895	0.900	0.910
Developing_Shift*Much higher government effectiveness Dest*Lower Avg eff (Dowd) taxed Dest*log_Shift_exp_prSR4I	-0.0225 (0.0208)	0.0170 (0.0158)	0.0180 (0.0157)	0.0192 (0.0162)	0.0185 (0.0162)	0.0185 (0.0162)	0.0238 (0.0162)	0.0306 (0.0195)
Observations	12,245	11,990	11,990	11,932	11,928	11,928	11,908	11,594
R-squared	0.721	0.889	0.890	0.898	0.898	0.898	0.903	0.912
Higher government effectiveness Dest*log_Shift_exp_prSR4I	0.0168 (0.0544)	-0.0205 (0.0389)	-0.0177 (0.0366)	-0.00958 (0.0383)	-0.0133 (0.0375)	-0.0131 (0.0375)	-0.00928 (0.0315)	0.00637 (0.0413)
Observations	14,291	14,013	14,013	13,954	13,950	13,950	13,933	13,479
R-squared	0.712	0.885	0.887	0.895	0.895	0.895	0.901	0.910
Much Higher control over corruption*Lower Avg eff (Dowd) Taxed Dest*log_Shift_exp_prSR4I	-0.0263 (0.0210)	0.00994 (0.0158)	0.0144 (0.0156)	0.0198 (0.0159)	0.0198 (0.0159)	0.0198 (0.0159)	0.0286* (0.0161)	0.0333* (0.0193)
Observations	12,245	11,990	11,990	11,932	11,928	11,928	11,908	11,594
R-squared	0.722	0.889	0.890	0.898	0.898	0.898	0.903	0.912
Much Higher corruption perception index*Lower Avg eff (Dowd) Taxed Dest*log_Shift_exp_prSR4I	0.0181** (0.00834)	0.00161 (0.00466)	0.00358 (0.00464)	0.00458 (0.00451)	0.00467 (0.00450)	0.00464 (0.00450)	0.00374 (0.00439)	0.0284 (0.0198)
Observations	12,228	11,973	11,973	11,914	11,914	11,914	11,893	11,578
R-squared	0.720	0.888	0.890	0.897	0.897	0.897	0.903	0.911
Developing_Shift*Much Higher corruption perception index*Lower Avg eff (Dowd) Taxed Dest*HicpLeTDevS_log_Shift_exp_prSR4I	0.0181** (0.00834)	0.00161 (0.00466)	0.00358 (0.00464)	0.00458 (0.00451)	0.00467 (0.00450)	0.00464 (0.00450)	0.00374 (0.00439)	0.0284 (0.0198)
Observations	12,228	11,973	11,973	11,914	11,914	11,914	11,893	11,578
R-squared	0.720	0.888	0.890	0.897	0.897	0.897	0.903	0.911
Much higher government effectiveness*Lower Avg eff (Dowd) taxed Dest*log_Shift_exp_prSR4I	-0.0225 (0.0208)	0.0170 (0.0158)	0.0180 (0.0157)	0.0192 (0.0162)	0.0185 (0.0162)	0.0185 (0.0162)	0.0238 (0.0162)	0.0306 (0.0195)
Observations	12,245	11,990	11,990	11,932	11,928	11,928	11,908	11,594
R-squared	0.721	0.889	0.890	0.898	0.898	0.898	0.903	0.912
MNC group FE		x	x	x	x	x	x	x
year			x	x	x	x	x	x
Destination 2-digit-NACE-year				x	x	x	x	x
log_Dest_GDPperCapita					x	x		
log_Dest_Pop					x	x		
Destination statutory tax rate						x		
Destination country-year							x	
Country-pair-year								x

Note: Clustered standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Each regression additionally controls for the parent firm's (Dest) log total assets and the shifting firm's expected pre-shifting pre-tax profit, as well as the interaction dummy separately in the cases where it is time variant. Estimation results identify earnings shocks to subsidiaries located in developing countries based on the profits of comparable firms, defined as those operating in the same economic region and 4-digit NACE industry, abbreviated as SR4I. Shifts to the parent firm are considered irrespective of the number of employees and whether this operates in the same or a different 4-digit NACE industry. Only shifts from those subsidiaries in which the parent holds at least a 90 per cent stake are considered. Only those firms in an MNC group that report consolidated information are excluded from the sample, not the whole MNC group.

Source: Author's own estimations based on Orbis data from 2006–2015.

This supports the earlier hypothesis that MNCs avoid keeping profits in countries with a high risk of expropriation. As in the case the of the average effective tax rates according to Dowd et al. (2017), however, these results are not very robust to the model specification. Using a larger gap

between perceived corruption³⁴, government effectiveness, and control over corruption and additionally controlling for more developed parent firms and lower effective tax levels does not affect the results, either.

A potential source of bias may arise from the country composition of the developing country subsidiaries remaining in the final sample. Moreover, these results suggest a potentially higher level of complexity. Subsidiaries in developing countries might be affected more greatly by profit-shifting to more attractive locations within the MNC group than by pure repatriation of profits to the parent firm. Tables 5a–c therefore present the results of one of the two multi-directional profit-shifting models that allow shifting between affiliates in any direction irrespective of parent and subsidiary status.

Table 5a: Shifting out of developing countries (excl. tax havens) to affiliates worldwide

Dependent Variable: log_Destination_pre-tax Profit in thUSD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lower Stat Taxed Dest*	0.00631	0.00439	0.00410	0.00497	0.00652	0.00536	0.000985	-0.0120**
log_Shift_exp_prSR4I	(0.00766)	(0.00533)	(0.00534)	(0.00516)	(0.00522)	(0.00521)	(0.00467)	(0.00607)
Observations	462,064	461,828	461,828	461,819	461,797	461,797	461,806	461,265
R-squared	0.663	0.704	0.705	0.720	0.720	0.721	0.726	0.729
Much Lower Stat Taxed	0.0286	0.0270	0.0170	0.0148	0.0142	0.0138	0.0206	0.00792
Dest*log_Shift_exp_prSR4I	(0.0250)	(0.0222)	(0.0221)	(0.0222)	(0.0224)	(0.0221)	(0.0207)	(0.0231)
Observations	462,064	461,828	461,828	461,819	461,797	461,797	461,806	461,265
R-squared	0.663	0.703	0.704	0.720	0.720	0.721	0.726	0.729
Lower Avg Effective (PwC)	-0.00905**	-0.0141***	-0.0137***	-0.00695*	-0.00612**	-0.00706**	-0.000610	0.0107
Taxed								
Dest*log_Shift_exp_prSR4I	(0.00395)	(0.00443)	(0.00438)	(0.00381)	(0.00293)	(0.00293)	(0.00224)	(0.00835)
Observations	201,597	201,465	201,465	201,430	201,427	201,427	201,424	201,227
R-squared	0.652	0.690	0.691	0.711	0.712	0.712	0.718	0.720
Lower Yearly Effective	0.00657	-0.0134*	-0.0137*	-0.00578	-0.00548	-0.00535	0.000700	0.000841
(PwC) Taxed								
Dest*log_Shift_exp_prSR4I	(0.0101)	(0.00791)	(0.00787)	(0.00702)	(0.00686)	(0.00689)	(0.00637)	(0.00701)
Observations	82,040	81,862	81,862	81,839	81,839	81,839	81,837	81,757
R-squared	0.645	0.686	0.687	0.708	0.708	0.709	0.714	0.717
Lower Avg Effective	-0.00751*	-0.0141***	-0.0134***	-0.00507**	-0.00259	-0.00614***	-0.00173	-0.000996
(Dowd) Taxed								
Dest*log_Shift_exp_prSR4I	(0.00450)	(0.00290)	(0.00296)	(0.00248)	(0.00205)	(0.00207)	(0.00161)	(0.00359)
Observations	409,620	409,407	409,407	409,395	409,377	409,377	409,387	409,161
R-squared	0.661	0.702	0.703	0.718	0.718	0.719	0.724	0.727
Lower Yearly Effective	0.000991	-0.0141***	-0.0114**	-0.00526	-0.00353	-0.00309	0.000181	0.00190
(Dowd) Taxed								
Dest*log_Shift_exp_prSR4I	(0.0111)	(0.00491)	(0.00500)	(0.00421)	(0.00382)	(0.00380)	(0.00339)	(0.00364)
Observations	178,793	178,197	178,197	178,192	178,184	178,184	178,188	178,103
R-squared	0.661	0.706	0.707	0.722	0.722	0.723	0.728	0.731
MNC group FE		x	x	x	x	x	x	x
year			x	x	x	x	x	x
Destination 2-digit-NACE-								
year				x	x	x	x	x
log_Dest_GDPperCapita					x	x		
log_Dest_Pop					x	x		
Destination statutory tax								
rate						x		
Destination country-year							x	
Country-pair-year								x

Note: Clustered standard errors at the MNC group level in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Each regression additionally controls for the destination firm's (Dest) log total assets and the shifting firm's expected pre-shifting pre-tax profit, as well as the interaction dummy separately in the cases where it is time variant. Estimation results identify earnings shocks to subsidiaries located in developing countries based on the profits of comparable firms, defined as those operating in the same economic region and 4-digit NACE industry, abbreviated as SR4I. Shifts to the destination firm are considered irrespective of the number of employees and whether this operates in the same or a different 4-digit NACE industry. Only shifts between those affiliates in which the parent holds at least a 90 per cent stake or involve the parent itself are considered. Only those firms in an MNC group that report consolidated information are excluded from the sample, not the whole MNC group.

Source: Author's own estimations based on Orbis data from 2006–2015.

³⁴ A high gap is here defined as a >1.5 point difference on a scale from -2.5 to 2.5.

Table 5b: Shifting out of developing countries (excl. tax havens) to affiliates worldwide

Dependent Variable: log_Destination_pre-tax Profit in thUSD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lower Financial Secrecy Index	-0.0115*	-0.0165***	-0.0162***	-0.0135***	-0.0140***	-0.00983***	0.00600	0.00372
Dest*log_Shift_exp_prSR4I	(0.00647)	(0.00438)	(0.00426)	(0.00421)	(0.00398)	(0.00373)	(0.00408)	(0.00513)
Observations	201,302	201,181	201,181	201,146	201,134	201,134	201,138	201,025
R-squared	0.657	0.694	0.695	0.715	0.715	0.716	0.721	0.724
Lower Global Scale Weight	0.00679	0.00458	0.00505	0.0101**	0.0143***	0.00850*	0.00555	0.0102
Dest*log_Shift_exp_prSR4I	(0.00568)	(0.00472)	(0.00473)	(0.00400)	(0.00490)	(0.00510)	(0.00407)	(0.0102)
Observations	202,088	201,967	201,967	201,932	201,920	201,920	201,921	201,702
R-squared	0.657	0.694	0.695	0.715	0.716	0.716	0.722	0.724
Lower Secrecy	-0.0172**	-0.0299***	-0.0297***	-0.0224***	-0.0195***	-0.0203***	0.00611*	0.00366
Score_Dest*log_Shift_exp_prSR4I	(0.00718)	(0.00461)	(0.00447)	(0.00476)	(0.00491)	(0.00469)	(0.00346)	(0.00638)
Observations	202,088	201,967	201,967	201,932	201,920	201,920	201,921	201,702
R-squared	0.658	0.696	0.696	0.715	0.716	0.716	0.722	0.724
Tax Haven (Def.OECD)	0.0162	0.0367	0.0377	0.0682*	0.0736**	0.108***	0.0452	0.00959
Dest*log_Shift_exp_prSR4I	(0.0310)	(0.0446)	(0.0447)	(0.0351)	(0.0345)	(0.0342)	(0.0708)	(0.0702)
Observations	462,064	461,828	461,828	461,819	461,797	461,797	461,806	461,265
R-squared	0.663	0.703	0.704	0.720	0.720	0.721	0.726	0.729
Tax Haven (Def. broader)	-0.00969	-0.00784	-0.00811	0.00361	0.0150	0.00330	-0.0669***	-0.0733***
Dest*log_Shift_exp_prSR4I	(0.0151)	(0.0136)	(0.0137)	(0.0138)	(0.0150)	(0.0159)	(0.0253)	(0.0250)
Observations	462,064	461,828	461,828	461,819	461,797	461,797	461,806	461,265
R-squared	0.663	0.703	0.704	0.720	0.720	0.721	0.726	0.729
Lower Avg Eff (Dowd) Taxed	-0.0105*	-0.0171***	-0.0166***	-0.00625**	-0.00113	-0.00385	-0.00208	-0.00114
Dest*Better Credit Rated Dest*More								
Developed	(0.00604)	(0.00375)	(0.00380)	(0.00311)	(0.00244)	(0.00246)	(0.00179)	(0.00476)
Dest*log_Shift_exp_prSR4I								
Observations	409,620	409,407	409,407	409,395	409,377	409,377	409,387	409,161
R-squared	0.661	0.702	0.703	0.718	0.718	0.719	0.724	0.727
Lower Tax Ranked order*Lower Stat	0.00301	0.00231	0.00228	0.00257	0.00336	0.00275	0.000301	-0.00658**
Taxed Dest*_log_Shift_exp_prSR4I	(0.00418)	(0.00297)	(0.00298)	(0.00291)	(0.00292)	(0.00292)	(0.00261)	(0.00334)
Observations	462,064	461,828	461,828	461,819	461,797	461,797	461,806	461,265
R-squared	0.663	0.704	0.705	0.720	0.720	0.721	0.726	0.729
Shift Developing Dest	-0.00956	-0.0276***	-0.0285***	-0.0234***	-0.0175***	-0.0147***	0.00421	0.0061
Developed*log_Shift_exp_prSR4I	-0.00839	-0.00438	-0.0044	-0.00427	-0.0057	-0.00559	-0.00454	-0.00737
Observations	462,064	461,828	461,828	461,819	461,797	461,797	461,806	461,265
R-squared	0.663	0.704	0.705	0.72	0.72	0.721	0.726	0.729
Better Credit Rated	-0.00291	-0.00929**	-0.00951**	-0.00284	0.00455*	0.00443*	-0.00395	-0.00663
Dest*log_Shift_exp_prSR4I	(0.00815)	(0.00392)	(0.00385)	(0.00331)	(0.00272)	(0.00269)	(0.00242)	(0.00498)
Observations	461,861	461,626	461,626	461,617	461,595	461,595	461,606	461,090
R-squared	0.663	0.704	0.705	0.720	0.720	0.721	0.726	0.729
MNC group FE		x		x	x	x	x	x
year			x	x	x	x	x	x
Destination 2-digit-NACE-year				x	x	x	x	x
log_Dest_GDPperCapita					x	x		
log_Dest_Pop					x	x		
Destination statutory tax rate						x		
Destination country-year							x	
Country-pair-year								x

Note: Clustered standard errors at the MNC group level in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Each regression additionally controls for the destination firm's (Dest) log total assets and the shifting firm's expected pre-shifting pre-tax profit, as well as the interaction dummy separately in the cases where it is time variant. Estimation results identify earnings shocks to affiliates located in developing countries based on the profits of comparable firms, defined as those operating in the same economic region and 4-digit NACE industry, abbreviated as SR4I. Shifts to the destination firm are considered irrespective of the number of employees and whether this operates in the same or a different 4-digit NACE industry. Only shifts between those affiliates in which the parent holds at least a 90 per cent stake or involve the parent itself are considered. Only those firms in an MNC group that report consolidated information are excluded from the sample, not the whole MNC group.

Source: Author's own estimations based on Orbis data from 2006–2015.

The second model (equation (9)) does not, however, provide any significant evidence when considering shifts between any affiliates, even when considering potential profit-shifting flows in any direction. While there is a concern that insignificant results could stem from the inclusion of many irrelevant shifting pairs, no significant patterns can be observed even when restricting the model according to the expected enhanced shifting direction out of developing countries and excluding shifting firms located in tax havens. Contrary to general expectations, Table 5a does not provide evidence of profit-shifting to lower taxed affiliates, still less of profit-shifting to affiliates at the lower end of the MNC affiliate tax range. This result holds irrespective of the tax rate measure.

Table 5b illustrates that affiliates are no more likely to shift profits to affiliates located in tax havens, irrespective of the tax haven measure. Nor are profits more likely to be shifted from developing country to developed country affiliates, as this interaction also remains insignificant or even

negatively significant (Table 5b). Moreover, perceived corruption, control over corruption, and government effectiveness do not appear to be significant profit-shifting incentives (Table 5c).

Table 5c: Shifting out of developing countries (excl. tax havens) to affiliates worldwide

Dependent Variable: log_Destination_pre-tax Profit in thUSD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Developing_Shift*Much Higher control over corruption*Lower Avg eff (Dowd) Taxed Dest*log_Shift_exp_prSR4I	-0.00757 (0.0136)	-0.0168** (0.00712)	-0.0192*** (0.00662)	-0.00939* (0.00555)	-0.00830 (0.00523)	-0.0108** (0.00538)	-0.00451 (0.00448)	-0.000976 (0.00399)
Observations	409,620	409,407	409,407	409,395	409,377	409,377	409,387	409,161
R-squared	0.661	0.702	0.703	0.718	0.718	0.719	0.724	0.727
Higher control over corruption Dest*log_Shift_exp_prSR4I	0.00360 (0.0114)	-0.0118 (0.00794)	-0.0145* (0.00785)	-0.00613 (0.00797)	-0.00446 (0.00767)	-0.00528 (0.00759)	0.00610 (0.00637)	0.00696 (0.00711)
Observations	462,064	461,828	461,828	461,819	461,797	461,797	461,806	461,265
R-squared	0.663	0.704	0.705	0.720	0.720	0.721	0.726	0.729
Higher corruption perception index Dest*log_Shift_exp_prSR4I	-0.00469 (0.00807)	-0.0248*** (0.00447)	-0.0256*** (0.00444)	-0.0193*** (0.00448)	-0.00952** (0.00427)	-0.0111*** (0.00424)	0.00106 (0.00358)	0.00341 (0.00609)
Observations	462,047	461,811	461,828	461,802	461,783	461,783	461,791	461,251
R-squared	0.663	0.704	0.705	0.720	0.720	0.721	0.726	0.729
Developing_Shift*Much higher government effectiveness Dest*Lower Avg eff (Dowd) taxed Dest*log_Shift_exp_prSR4I	-0.00575 (0.0132)	-0.0152** (0.00695)	-0.0177*** (0.00647)	-0.00836 (0.00542)	-0.00754 (0.00511)	-0.0104** (0.00530)	-0.00280 (0.00434)	0.000762 (0.00380)
Observations	409,620	409,407	409,407	409,395	409,377	409,377	409,387	409,161
R-squared	0.661	0.702	0.703	0.718	0.718	0.719	0.724	0.727
Higher government effectiveness Dest*log_Shift_exp_prSR4I	-0.000754 (0.0114)	-0.00959 (0.00781)	-0.0119 (0.00784)	-0.00285 (0.00714)	-0.00265 (0.00702)	8.62e-05 (0.00690)	0.00581 (0.00617)	0.00270 (0.00747)
Observations	462,064	461,828	461,828	461,819	461,797	461,797	461,806	461,265
R-squared	0.663	0.704	0.705	0.720	0.720	0.721	0.726	0.729
Much Higher control over corruption*Lower Avg eff (Dowd) Taxed Dest*log_Shift_exp_prSR4I	-0.00757 (0.0136)	-0.0168** (0.00712)	-0.0192*** (0.00662)	-0.00939* (0.00555)	-0.00830 (0.00523)	-0.0108** (0.00538)	-0.00451 (0.00448)	-0.000976 (0.00399)
Observations	409,620	409,407	409,407	409,395	409,377	409,377	409,387	409,161
R-squared	0.661	0.702	0.703	0.718	0.718	0.719	0.724	0.727
Much Higher corruption perception index*Lower Avg eff (Dowd) Taxed Dest*log_Shift_exp_prSR4I	-0.0108** (0.00543)	-0.0181*** (0.00337)	-0.0176*** (0.00343)	- (0.00290)	-0.00324 (0.00220)	- (0.00228)	-0.00154 (0.00169)	-0.00180 (0.00436)
Observations	409,603	409,390	409,390	409,378	409,363	409,363	409,372	409,147
R-squared	0.661	0.702	0.703	0.718	0.718	0.719	0.724	0.726
Developing_Shift*Much Higher corruption perception index*Lower Avg eff (Dowd) Taxed Dest*HicpLeTDevS_log_Shift_exp_prSR4I	-0.0108** (0.00543)	-0.0181*** (0.00337)	-0.0176*** (0.00343)	0.00760*** (0.00290)	-0.00324 (0.00220)	0.00678*** (0.00228)	-0.00154 (0.00169)	-0.00180 (0.00436)
Observations	409,603	409,390	409,390	409,378	409,363	409,363	409,372	409,147
R-squared	0.661	0.702	0.703	0.718	0.718	0.719	0.724	0.726
Much higher government effectiveness*Lower Avg eff (Dowd) taxed Dest*log_Shift_exp_prSR4I	-0.00575 (0.0132)	-0.0152** (0.00695)	-0.0177*** (0.00647)	-0.00836 (0.00542)	-0.00754 (0.00511)	-0.0104** (0.00530)	-0.00280 (0.00434)	0.000762 (0.00380)
Observations	409,620	409,407	409,407	409,395	409,377	409,377	409,387	409,161
R-squared	0.661	0.702	0.703	0.718	0.718	0.719	0.724	0.727
MNC group FE		x	x	x	x	x	x	x
year			x	x	x	x	x	x
Destination 2-digit-NACE-year				x	x	x	x	x
log_Dest_GDPperCapita					x	x		
log_Dest_Pop					x	x		
Destination statutory tax rate						x		
Destination country-year							x	
Country-pair-year								x

Note: Clustered standard errors at the MNC group level in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Each regression additionally controls for the destination firm's (Dest) log total assets and the shifting firm's expected pre-shifting pre-tax profit, as well as the interaction dummy separately in the cases where it is time variant. Estimation results identify earnings shocks to affiliates located in developing countries based on the profits of comparable firms, defined as those operating in the same economic region and 4-digit NACE industry, abbreviated as SR4I. Shifts to the destination firm are considered irrespective of the number of employees and whether this operates in the same or a different 4-digit NACE industry. Only shifts between those affiliates in which the parent holds at least a 90 per cent stake or involves the parent itself are considered. Only those firms in an MNC group that report consolidated information are excluded from the sample, not the whole MNC group.

Source: Author's own estimations based on Orbis data from 2006-2015.

Even with a restriction to more plausible shifting flows from any non-tax haven developing country affiliate to destinations worldwide, there may remain a concern that profit-shifting is diluted through large numbers of irrelevant combinations and noise in the data. The third model therefore does not consider individual shifts between each affiliate. Instead, as discussed in the methodology section, it groupwise aggregates the predicted pre-tax pre-shifting profits of all affiliates except the destination affiliate based on their characteristics relative to the destination affiliate (e.g. meaning it aggregates the predicted pre-tax pre-shifting profits of all affiliates that would have an incentive to shift profits in one group and of all affiliates that should, based on their

characteristics relative to the destination affiliate, not have any incentive to shift profits to that respective destination).

The results of the third model (equation (11)), presented in Table 6, are similarly unexpected. According to the theoretical model that firms aim to maximize global profits, MNC groups might be expected to report more profits in countries in which they face a lower tax rate than their current MNC group average tax rate. As in the previous models, it is assumed that not only the lower tax rate but also other measures may play a role as an incentive to shift profits to a particular destination. Therefore, the interaction term of a destination affiliate being located in a lower than mean taxed destination includes additional dummies of the destination being better credit rated and located in a more developed country. In line with expectations, there is no significant evidence for profit-shifting from the group of affiliates in lower taxed, better rated, and more developed countries, which would lead to an increased overall MNC tax burden and higher risk. Columns (1–3) in panel a) display significant evidence that a profit shock to other affiliates that are located in higher taxed, worse rated, and more developed countries are more likely to be forwarded to an affiliate with a lower than MNC group mean average effective tax rate. This effect vanishes, however, when including destination firm fixed effects, as shown in columns (4–7), as well as when clustering standard errors at the MNC group level (panel b)) or MNC-year level (panel c)) or including MNC group fixed effects. Hence, this model cannot provide robust significant causal evidence of lower average effective tax rate- and better credit rating-motivated profit-shifting. These results are robust to using statutory tax rates (panels d)–f)).

Apart from this, none of the results of the models that use log transformations is driven by firms reporting zero profits, as the results are robust to using hyperbolic sine transformations instead, which do not exclude zero profit cases. Furthermore, the results are not driven by a too restrictive ownership stake requirement. Relaxing this to a minimum stake of 50 per cent does not change the results. Neither do results vary by the shifting firm's industry, its geographic region, or the country's development status.³⁵ Results are, moreover, robust to using an alternative, more aggregate-comparable firm sample in the same 2-digit NACE industry (results not provided here).

While this study uses the best currently available data, there remains a concern, as mentioned in the data section, that the results might be an outcome of the specific remaining sample firms that provided unconsolidated financial accounts data and are in regions and industries for which there exist sufficient comparable firms in the same industry and economic region with positive average profitability. For many highly specialized firms, even with perfect data availability, there might also not be a sufficiently high number of comparable firms in the world if one were to insist on using a more disaggregated 4-digit NACE industry measure. If these types of firms were the main profit-shifters, these flows could never be captured by this methodology. The results are, however, also robust to a less restrictive comparable firm approach that takes all firms in the same 2-digit NACE industry as comparable firms. This thus enlarges the sample of comparable firms for each affiliate. Hence, the argument that the lack of evidence for significant causal profit-shifting is a result of insufficient comparable firms does not seem to have a lot of weight because if profit-shifting is a widespread phenomenon. However, the representativeness of the number of MNC affiliates listed in Orbis varies by region as well and this may non-randomly exclude existing comparable domestic firms and MNC affiliates.

³⁵ When distinguishing between emerging and least developed countries.

Table 6: Grouped shifting between any affiliates of an MNC group

Dependent Variable: log_Dest_Pre-tax Profit in thUSD		(1)	(2)	(3)	(4)	(5)	(6)	(7)	Panel level FE
a)	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Higher Avg Eff (PwC)	0.0145*** (0.00252)	0.0144*** (0.00251)	0.00531*** (0.00232)	0.000175 (0.00333)	0.00139 (0.00302)	0.000681 (0.00327)	0.00115 (0.00298)	Destination Firm
	Taxed WorseRated Less Developed Shift-group SR4I	0.00190 (0.00131)	0.00192 (0.00133)	0.000675 (0.000922)	0.00411 (0.00357)	0.000761 (0.00228)	0.00532 (0.00365)	0.00266 (0.00243)	
	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Lower Avg Eff (PwC)	-0.000120 (0.000165)	-8.92e-05 (0.000160)	0.000162 (0.000151)	-0.000792 (0.000537)	-0.000501 (0.000638)	-0.000772 (0.000625)	-0.000498 (0.000708)	
	Taxed BetterRated More Developed Shift-group SR4I	-0.0137*** (0.00234)	-0.0130*** (0.00233)	-0.00575*** (0.00216)	0.000322 (0.00322)	-0.00110 (0.00293)	-0.000590 (0.00315)	-0.00133 (0.00287)	
	cumulative log_Shift_exp_pr Lower Avg Eff (PwC) Taxed BetterRated More Developed Shift-group SR4I	0.873*** (0.00819)	0.873*** (0.00822)	0.938*** (0.00821)	0.996*** (0.0246)	0.988*** (0.0207)	1.007*** (0.0245)	0.988*** (0.0206)	
	log_Dest_TotalassetsthUSD	6,335,123 (0.646)	6,335,123 (0.647)	6,335,117 (0.680)	6,332,539 (0.869)	8,198,535 (0.866)	6,332,545 (0.866)	8,198,541 (0.864)	
	Observations	6,335,123	6,335,123	6,335,117	6,332,539	8,198,535	6,332,545	8,198,541	
	R-squared	0.646	0.647	0.680	0.869	0.866	0.866	0.864	
	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Higher Avg Eff (PwC)	0.0145 (0.0115)	0.0144 (0.0118)	0.00531 (0.00570)	0.00636 (0.00455)	0.00555 (0.00415)	0.00418 (0.00345)	0.00388 (0.00321)	
	Taxed WorseRated Less Developed Shift-group SR4I	0.00190 (0.00131)	0.00192 (0.00136)	0.000675 (0.000806)	0.000202 (0.000659)	0.00111 (0.00105)	-0.000894*** (0.000257)	-0.000844* (0.000484)	
b)	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Lower Avg Eff (PwC)	-0.000120 (0.000456)	-8.92e-05 (0.000444)	0.000162 (0.000405)	-2.06e-05 (0.000442)	6.71e-05 (0.000435)	-0.000833** (0.000407)	-0.000663 (0.000427)	MNC
	Taxed BetterRated More Developed Shift-group SR4I	-0.0137 (0.0103)	-0.0130 (0.0102)	-0.00575 (0.00561)	-0.00829* (0.00477)	-0.00768* (0.00443)	-0.00681* (0.00382)	-0.00634* (0.00357)	
	cumulative log_Shift_exp_pr Higher Avg Eff (PwC) Taxed WorseRated Less Developed Shift-group SR4I	0.873*** (0.00933)	0.873*** (0.00964)	0.938*** (0.0246)	0.949*** (0.0277)	0.933*** (0.0231)	0.927*** (0.0219)	0.913*** (0.0184)	
	log_Dest_TotalassetsthUSD	6,335,123 (0.646)	6,335,123 (0.647)	6,335,117 (0.680)	6,334,291 (0.703)	8,200,696 (0.692)	6,334,297 (0.695)	8,200,700 (0.686)	
	Observations	6,335,123	6,335,123	6,335,117	6,334,291	8,200,696	6,334,297	8,200,700	
	R-squared	0.646	0.647	0.680	0.703	0.692	0.695	0.686	
	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Higher Avg Eff (PwC)	0.0145 (0.0115)	0.0144 (0.0118)	0.00531 (0.00570)	0.00662 (0.00464)	0.00576 (0.00426)	0.00450 (0.00342)	0.00401 (0.00321)	
	Taxed WorseRated Less Developed Shift-group SR4I	0.00190 (0.00131)	0.00192 (0.00136)	0.000675 (0.000806)	0.000107 (0.000632)	0.00101 (0.00105)	-0.00108*** (0.000202)	-0.00102** (0.000445)	
	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Lower Avg Eff (PwC)	-0.000120 (0.000456)	-8.92e-05 (0.000444)	0.000162 (0.000405)	-2.35e-05 (0.000452)	7.58e-05 (0.000438)	-0.000841** (0.000404)	-0.000663 (0.000423)	
	Taxed BetterRated More Developed Shift-group SR4I	-0.0137 (0.0103)	-0.0130 (0.0102)	-0.00575 (0.00561)	-0.00876* (0.00496)	-0.00800* (0.00461)	-0.00729* (0.00385)	-0.00644* (0.00358)	
c)	cumulative log_Shift_exp_pr Lower Avg Eff (PwC) Taxed BetterRated More Developed Shift-group SR4I	0.873*** (0.00933)	0.873*** (0.00964)	0.938*** (0.0246)	0.950*** (0.0285)	0.933*** (0.0237)	0.926*** (0.0221)	0.912*** (0.0186)	MNC-year
	log_Dest_TotalassetsthUSD	6,335,123 (0.646)	6,335,123 (0.647)	6,335,117 (0.680)	6,299,396 (0.715)	8,169,510 (0.703)	6,299,404 (0.708)	8,169,518 (0.697)	
	Observations	6,335,123	6,335,123	6,335,117	6,299,396	8,169,510	6,299,404	8,169,518	
	R-squared	0.646	0.647	0.680	0.715	0.703	0.708	0.697	
	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Higher Avg Eff (PwC)	0.00144 (0.00195)	0.00285 (0.00196)	-0.000319 (0.00176)	-0.00119 (0.00141)	-0.000657 (0.00128)	-0.00110 (0.00144)	-0.000793 (0.00130)	
	Taxed WorseRated Less Developed Shift-group SR4I	6,333,499 (0.643)	6,333,499 (0.644)	6,333,493 (0.679)	6,330,858 (0.869)	8,196,777 (0.866)	6,330,864 (0.866)	8,196,783 (0.864)	
	Observations	6,333,499	6,333,499	6,333,493	6,330,858	8,196,777	6,330,864	8,196,783	
	R-squared	0.643	0.644	0.679	0.869	0.866	0.866	0.864	
	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Higher Avg Eff (PwC)	0.00144 (0.00610)	0.00285 (0.00595)	-0.000319 (0.00233)	-0.000330 (0.00156)	-0.000373 (0.00171)	-0.000346 (0.00153)	-0.000869 (0.00187)	
	Taxed WorseRated Less Developed Shift-group SR4I	6,333,499 (0.643)	6,333,499 (0.644)	6,333,493 (0.679)	6,332,644 (0.701)	8,198,974 (0.692)	6,332,650 (0.695)	8,198,978 (0.685)	
d)	Observations	6,333,499	6,333,499	6,333,493	6,332,644	8,198,974	6,332,650	8,198,978	Destination Firm
	R-squared	0.643	0.644	0.679	0.701	0.692	0.695	0.685	
	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Higher Avg Eff (PwC)	0.00144 (0.00610)	0.00285 (0.00595)	-0.000319 (0.00233)	-0.000493 (0.00164)	-0.000653 (0.00178)	-0.000469 (0.00147)	-0.00120 (0.00186)	
	Taxed WorseRated Less Developed Shift-group SR4I	6,333,499 (0.643)	6,333,499 (0.644)	6,333,493 (0.679)	6,298,321 (0.714)	8,168,323 (0.702)	6,298,329 (0.708)	8,168,331 (0.697)	
	Observations	6,333,499	6,333,499	6,333,493	6,298,321	8,168,323	6,298,329	8,168,331	
	R-squared	0.643	0.644	0.679	0.714	0.702	0.708	0.697	
	Controls and Fixed Effects								
	Year		x	x	x	x	x	x	
	Destination 2-digit NACE industry-year fixed effects			x	x	x			
	Destination Country-year			x			x	x	
	Panel Type fixed effect				x	x	x	x	
e)	Lower than MNC mean Avg Eff(PwC) Taxed Dest*cumulative log_Shift_exp_pr Higher Avg Eff (PwC)	0.00144 (0.00610)	0.00285 (0.00595)	-0.000319 (0.00233)	-0.000493 (0.00164)	-0.000653 (0.00178)	-0.000469 (0.00147)	-0.00120 (0.00186)	MNC
	Taxed WorseRated Less Developed Shift-group SR4I	6,333,499 (0.643)	6,333,499 (0.644)	6,333,493 (0.679)	6,298,321 (0.714)	8,168,323 (0.702)	6,298,329 (0.708)	8,168,331 (0.697)	
	Observations	6,333,499	6,333,499	6,333,493	6,298,321	8,168,323	6,298,329	8,168,331	
	R-squared	0.643	0.644	0.679	0.714	0.702	0.708	0.697	
	Controls and Fixed Effects								
	Year		x	x	x	x	x	x	
	Destination 2-digit NACE industry-year fixed effects			x	x	x			
	Destination Country-year			x			x	x	
	Panel Type fixed effect				x	x	x	x	
	Observations	6,333,499	6,333,499	6,333,493	6,298,321	8,168,323	6,298,329	8,168,331	
	R-squared	0.643	0.644	0.679	0.714	0.702	0.708	0.697	
f)	Controls and Fixed Effects								MNC-year
	Year		x	x	x	x	x	x	
	Destination 2-digit NACE industry-year fixed effects			x	x	x			
	Destination Country-year			x			x	x	
	Panel Type fixed effect				x	x	x	x	
	Observations	6,333,499	6,333,499	6,333,493	6,298,321	8,168,323	6,298,329	8,168,331	
	R-squared	0.643	0.644	0.679	0.714	0.702	0.708	0.697	
	Controls and Fixed Effects								
	Year		x	x	x	x	x	x	
	Destination 2-digit NACE industry-year fixed effects			x	x	x			
	Destination Country-year			x			x	x	
	Panel Type fixed effect				x	x	x	x	

Note: Robust standard errors in parentheses (clustered at destination firm (a,d), MNC group (b,c,e,f)) *** p<0.01, ** p<0.05, * p<0.1.

Each regression additionally controls for the destination firm's (Dest) log total assets and the time-varying interaction dummy variable. These results are based on the sum of earnings shocks to affiliates located in (more) less developed, (better) worse credit rated, and (lower) higher statutory taxed countries that have been calculated using comparable firms to the subsidiaries located in the same economic region and operating in the same 4-digit NACE industry. A further restriction to this model is that it only considers affiliates that are at least 90 per cent owned by the parent and the parent. This restriction is relaxed in the model variations presented in columns (5) and (7) to at least 50 per cent). Only firms with consolidated information are excluded, not their whole MNC.

Source: Author's own estimations based on Orbis data from 2006–2015.

Furthermore, it might be of concern that these findings are a result of excluding firm years at the top and bottom 1 per cent of the profitability distribution as outliers, in that doing so might exclude MNC affiliates that are operating at both extremes of the profitability distribution due to their profit-shifting activities. Moreover, in the process of calculating the expected pre-shifting pre-tax profit, one loses all those firms reporting zero profits. As a robustness check, those firms' profitability rates below the bottom 1 per cent and above the top 1 per cent of the distribution are replaced by the profitability of the firms at the cut-off. Likewise, the profitability ratios for all those firms reporting zero profitability or zero assets are replaced by the lowest positive profitability ratio in the sample. Estimations using a sample adjusted in this way do not, however, change the results. Moreover, the results are robust to using predicted profitability instead of log profit as a dependent variable.

While the obtained results might at first sight seem to contradict the expectations raised in the media and the previously mentioned recent working papers on profit-shifting out of developing countries, they could on the other hand highlight the importance of controlling for country-pair fixed effects, which the previous studies did not do. Moreover, the results could be explained by potentially different and more complex tax planning mechanisms. Apart from the profit-shifting incentivizing measures considered here, varying interest rates for capital may incentivize firms to move profits to the country where they can accumulate the highest interest gains. This may balance out or exceed some tax disadvantages in those countries. Hence, the methodology used in this paper might not be capable of detecting profit-shifting through the channels most commonly used in these developing countries. Another possibility may be that modelling profit-shifting in this way shows up only in higher level subsidiaries rather than in the first-level subsidiaries included here. The inconclusive results may also provide support for the effectiveness of the rising number of controlled foreign corporation (CFC) rules, designed to restrict tax deferral or reduction through affiliates in lower tax jurisdictions. One argument supporting this point would be Dharmapala's (2014) finding that researchers have over time found evidence for lower levels of profit-shifting.

While the findings of this study contradict expectations regarding the extent of profit-shifting, they do not mean that firms are not systematically engaging in such behaviour. They rather provide preliminary evidence that on a global scale MNCs do not incorporate windfall profits into their profit-shifting schemes or adjust their long-term schemes according to earnings shocks. Hence, further research providing causal evidence of profit-shifting is needed, research that can look beyond the first level of subsidiaries and can draw on a more complete and representative sample, as well as disentangling the profit-shifting mechanisms based on lower tax rates or other incentives that may induce profit-shifting out of developing countries. Moreover, additional research is needed to disentangle tax-incentivized profit-shifting from the mechanisms that may in developing countries work in the opposite direction but with the same ultimate consequence of lower government tax revenues, such as higher mean corruption and lower fiscal capacity. While the above-mentioned factors may to various extents explain the insignificant results obtained in this study, the main issue doubtless remains the very incomplete firm-level data—in particular the lack of unconsolidated data for all affiliates of an MNC.

7 Conclusion

In the light of rising public concern about the negative impact of MNCs' profit-shifting behaviour, especially on developing countries' tax base, this study aimed at providing causal empirical evidence of the existence and greater extent of profit-shifting out of subsidiaries located in developing countries to parent firms or to any other MNC group affiliates in a lower taxed country. Using 10-year worldwide panel data (2006–2015) from the commercial firm-level dataset Orbis,

provided by Bureau van Dijk, including tax havens and developing countries, rather than solely European or US firms, this study overcomes the geographical limitations of most previous studies. Moreover, the methodology applied here does not rely on infrequent and potentially endogenous changes in tax rates within or between countries. Rather, it is based on earnings shocks relative to comparable firms in the same industry and economic region. This study can thereby control for the variation of tax rates over time and between countries using country-pair-year fixed effects, and overcome the limitations of previous research in this field. By including effective tax rates, credit rating, and indicators of development status, tax haven status, and corruption, this study responds to concerns raised that corporate statutory tax rates do not reflect actual tax rates and addresses the hypothesis that profit-shifting decisions are not solely tax motivated but are moderated by additional factors.

Despite other recent studies' findings on developing countries, a negative correlation between average effective tax rate and MNC affiliates' average profitability, and the expectations raised in the media, this study is unable to provide robust causal empirical evidence that MNCs are more likely to shift profits out of subsidiaries located in developing countries to their parent firm or any other affiliate, if these face a lower tax rate. Profit-shifting cannot be observed out of affiliates located in developing countries or any location to affiliates that are located in more developed, less corrupt countries with a better credit rating and lower effective tax rate. While the introduction or strengthening of CFC rules in some countries might have rendered some earlier shifting streams unprofitable³⁶, this is unlikely to explain the global pattern observed. Alternatively, the absence of significant evidence in a global sample using a methodology based on earnings shocks may be seen as suggestive that windfall profits are not optimally shifted or incorporated into existing long-term profit-shifting schemes.

The absence of robust causal empirical evidence of profit-shifting out of developing countries can under no circumstances be regarded as evidence of the absence of profit-shifting out of developing countries. It rather raises concerns about the robustness of earlier studies using the Orbis database across time period and method chosen. While Orbis is currently the most comprehensive worldwide firm-level database, it is neither complete nor representative in terms of the firms included and potentially lacks data on the decisive affiliates in the profit-shifting network. Like other studies using Orbis data, this study focused for simplicity on first-level affiliates. This stresses the need to estimate the extent of profit-shifting in a less abstracted, simplified manner. While this study makes a start in investigating potential profit-shifting between any affiliate of an MNC group, more research on horizontal and vertical profit-shifting within a more complicated, multi-layered 'spider's web' of MNC affiliate connections, using additional levels of subsidiaries and a more realistic effective tax rate measure is needed. Only studies investigating a more complete set of affiliate connections and directions will come closer to revealing the connections through which profits are, according to media and civil society reports and a few academic publications such as Zucman (2014), regularly shifted.

Furthermore, being able to use only the final year's ownership structure in the 10-year panel period, despite potential ownership changes during the course of the years, may create a special bias through the rising influence of emerging M&A market buyers. Besides, there remains a concern that potential tax revenue is lost or shifted, which is not taken into account due to shifting channels that cannot be captured by the methodology used here, as potentially a majority of firms are involved in these practices. Moreover, the lack of comparable firms in the same economic region may bias the results. Given the complexity of MNCs' corporate tax planning, designed by

³⁶ Egger and Wamser (2015), for example, find a strong effect of CFC rules on German MNCs' foreign activities.

professional tax consultants to not be easily traceable, further extensions including industry-specific effective tax rates, tax holidays, tax collection rates, interest rates, variations in fiscal year dates, and taxable corporate income should be considered in future work. Apart from this, the lower fiscal capacity and higher corruption levels in developing countries may well render profit-shifting obsolete if taxes can be more easily avoided through special tax deals or the sheer lack of tax collection infrastructure and capacity in a country. This potential mechanism working in the opposite direction, but with the same ultimate result as profit-shifting—namely, lower tax revenues—might be investigated in future research. Besides, further research is needed generally to examine the extent of profit-shifting and the exact mechanisms and channels through which it operates.

Finally, and on a positive note, the results presented here have two important policy implications precisely because of the lack of the expected significant causal evidence for the existence of profit-shifting out of developing countries. The absence of a more complete and representative firm-level dataset, and of unconsolidated financial data for the largest MNCs in particular, stresses the need for a more disaggregated global reporting requirement of financial data. Only more transparency in the unconsolidated amounts and location of profits will allow governments to map the actual profit-shifting out of their countries and enable lost tax revenues to be calculated. In the short run, a more in-depth analysis of transfer mispricing and real effective tax rates based on administrative tax data may provide a data source from which it is possible to identify systematic profit-shifting for each specific country case.

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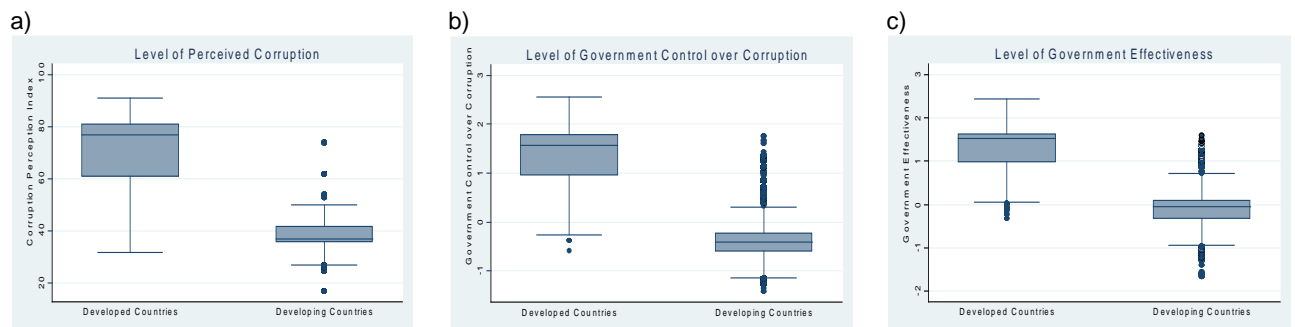
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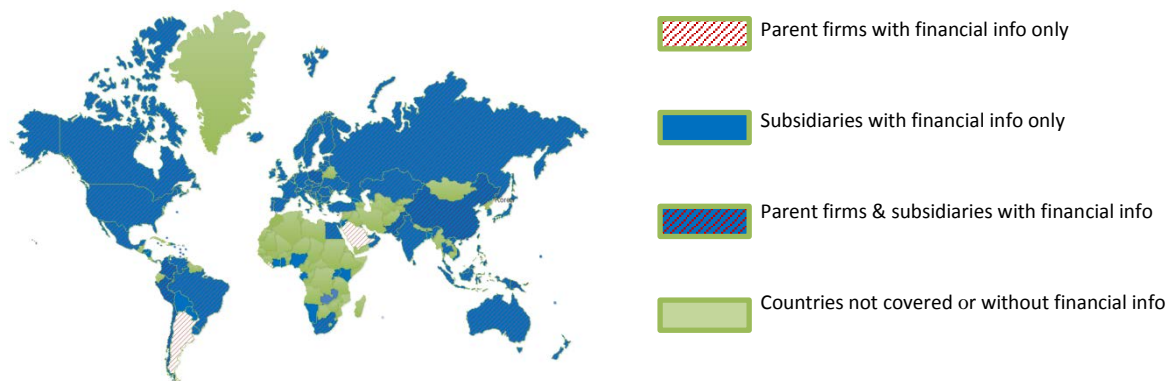
Appendix A

Figure A1: Level of corruption measure over development status



Source: Author's own calculations based on Corruption Perception Index, World Bank World Governance Indicators, and HDI Index.

Figure A2: Country sample map, based on existing data before sample restrictions



Source: Author's own figure based on Orbis financial information data availability.

Figure 1 consists of four scatter plots (a, b, c, d) showing the relationship between Average Profitability and various factors by country and year 2006-2015. Each plot includes data points for Developed Countries (blue) and Developing Countries (orange) with corresponding regression lines.

- a) Average Profitability vs Statutory Tax Rate, by Country and Year 2006-2015:** The y-axis is 'Statutory Tax Rate in %' (0 to 60) and the x-axis is 'Average Affiliate Profitability (profit/total assets)' (-0.2 to 0.3). The regression line for Developed Countries (blue) is slightly negative, while for Developing Countries (orange) it is positive.
- b) Average Profitability vs FSI, by Country and year 2006-2015:** The y-axis is 'Financial Secrecy Index (FSI)' (0 to 1500) and the x-axis is 'Average Affiliate Profitability (profit/total assets)' (-0.2 to 0.3). The regression line for Developed Countries (blue) is negative, while for Developing Countries (orange) it is slightly positive.
- c) Average Profitability vs Secrecy Score, by Country and Year 2006-2015:** The y-axis is 'Secrecy Score' (30 to 80) and the x-axis is 'Average Affiliate Profitability (profit/total assets)' (-0.2 to 0.3). The regression line for Developed Countries (blue) is positive, while for Developing Countries (orange) it is slightly negative.
- d) Average Profitability vs Global Scale Weight, by Country and Year 2006-2015:** The y-axis is 'Global Scale Weight' (0 to 20) and the x-axis is 'Average Affiliate Profitability (profit/total assets)' (-0.2 to 0.3). The regression line for Developed Countries (blue) is negative, while for Developing Countries (orange) it is slightly positive.

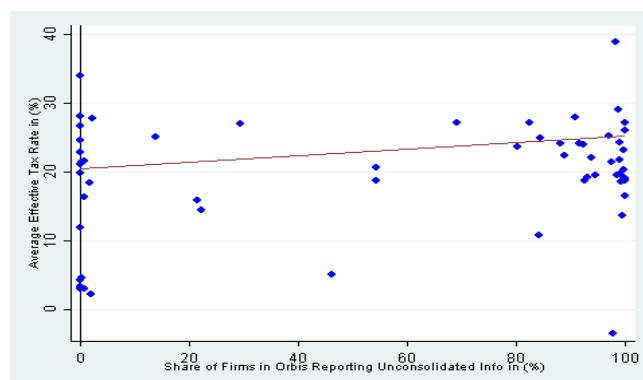
Source: Author's own estimations based on firm-level data from the Orbis database, statutory tax rates, and FSI data from the Tax Justice Network.

The graph shows that the Netherlands (NL) consistently has the highest percentage of respondents believing the Internet will be used to spread terrorism, peaking at approximately 55% in 2012. Germany (DE) starts high at around 23% in 2006 but drops significantly to around 5% by 2014. Great Britain (GB) shows a notable increase from 2011 to 2014, rising from about 19% to 22%. Most other countries remain below 10% throughout the period.

Year	NL	DE	GB	IE	BE	IT	FR	SE	ES
2006	27%	23%	14%	1%	8%	1%	1%	1%	1%
2007	35%	12%	10%	1%	11%	1%	1%	1%	1%
2008	45%	7%	10%	1%	10%	1%	1%	1%	1%
2009	43%	4%	9%	1%	13%	1%	1%	1%	1%
2010	40%	5%	8%	1%	11%	1%	1%	1%	1%
2011	42%	6%	19%	1%	8%	1%	1%	1%	1%
2012	55%	5%	9%	1%	6%	1%	1%	1%	1%
2013	43%	4%	19%	1%	4%	1%	1%	1%	1%
2014	37%	10%	22%	1%	4%	1%	1%	1%	1%

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Figure A5: Average effective tax rate by percentage of firms reporting unconsolidated information



Source: Author's own estimations based on Orbis firm-level data and OECD tax haven definitions.

Table A1: Overall sample overview

	Initial Sample					Same economic region and 4-digit NACE industry – average effective tax rate – Shifting any firm WW to any firm WW					Same economic region and 4-digit NACE industry – corporate statutory tax rate – Shifting firm developing to parent firm WW					Same economic region and 4-digit NACE industry – corporate statutory tax rate – Shifting firm developing to any firm WW				
Country	# Total countries/ unique firms	# Parent firm countries	# Subsidiary firm countries	# Unique parent firms	# Unique Subsidiary firms	# Total countries	# Destination firm countries	# Shifting origin firm countries	# Destination firm years	# Shifting origin firm years	# Total countries	# Parents firm countries	# Subsidiary firm countries	# Parent firm years	# Subsidiary firm years	# Total countries	# Destination firm countries	# Shifting origin firm countries	# Destination firm years	# Shifting origin firm years
Total	117 109,815	87	108	26,551	83,264	66	58	63	6,335,123	6,335,123	51	47	18	11,601	14,291	60	55	23	462,064	462,064
Very High Human Development		45	42	24,954	70,002	35	35	5,902,925	5,846,475		32	NA	10,713	NA		35	NA	379,745	NA	
High Human Development		25	33	981	12,739	16	19	422,686	476,972		13	15	879	14,222		16	16	80,966	453,825	
Medium Human Development		7	20	140	410	3	6	9,465	11,307		1	2	1	61		3	6	1,336	7,954	
Low Human Development		3	7	7	45	-	1	-	16		-	-	-	-		-	17	285		
no status		7	6	469	68	4	2	47	353		1	1	8	8		1	1	6,037	-	
Tax haven		12*	13*	469*	144*	8	7	80,381	80,591		6	-	164	-		6	-	21	82	
# of shifting firms with destination in a tax haven				1724*					80,381					193					6,037	
Africa		4	12	33	50	-	-	-	-		-	-	-	-		-	-	-	-	
Asia (complete)		24	26	2,182	9,586	11	12	318,339	351,368		6	NA	937	NA		10	NA	55,850	NA	
Asia Pacific (developing)		15	20	825	8,260	7	8	237,255	268,029		4	7	402	4,866		7	8	65,371	253,255	
Europe		38	37	21,928	71,692	36	36	5,971,901	5,950,006		35	7	10,619	9,525		36	7	391,906	199,624	
Latin America & Caribbean		15	25	498	646	8	12	12,715	10,697		4	4	37	173		6	8	1,636	8,900	
North America		2	2	1,761	72	1	1	45	45		1	NA	1	NA		1	NA	2	NA	
Australia Pacific		4	5	149	1,217	2	2	32,123	23,007		1	NA	7	NA		2	NA	3,149	NA	
Oceania																				

*only using OECD and not extended Tax Haven classification

Note: 'Unique firms' refers to individual firm observations, not accounting for the number of years of data there exists for this firm, whereas 'firm years' counts all possible shifting combinations in each year of the respective specification as a separate observation.

Source: Author's own estimations.

Table A2: Regional categories of firms

Economic region categories	
1 EU + city states in Europe	8 Association of Southeast Asian Nations (ASEAN)
2 non-EU Europe	9 Economic Community of West African States (ECOWAS)
3 North America	10 Southern African Customs Union
4 Latin America	11 Australia Pacific
5 Caribbean	12 non-European former Soviet Union states
6 Middle East and Northern Africa (MENA)	13 East Asia
7 East African Community (EAC)	14 South Asia
	15 Southern/Middle African other remaining countries

Source: Author's own classification.

Table A3: Data sources

Variable	Data explanation	Data source	Years available	Reference and or link
Lower Stat Tax	Statutory corporate income tax rates	Big 4 and local authorities	2006–2015	see separate list
Lower Avg Effective (PwC) Taxed	Average effective tax rate 2006–2009	PwC & Business Round Table	2006–2009*	PwC & Business Round Table (2011). Global Effective Tax Rates. Retrieved 19 March 2016 from: http://businessroundtable.org/sites/default/files/Effective_Tax_Rate_Study.pdf
Lower Yearly Effective (PwC) Taxed	Yearly effective tax rates for the years 2006–2009	PwC & Business Roundtable	2006–2009	PwC & Business Round Table (2011). Global Effective Tax Rates. Retrieved 19 March 2016 from: http://businessroundtable.org/sites/default/files/Effective_Tax_Rate_Study.pdf
Lower Avg Effective (Dowd) Taxed	Average effective tax rate 2006–2012	Dowd et al. (2017)	2006–2012	Dowd et al. (2017)
Lower Yearly Effective (Dowd) Taxed	Yearly Effective tax rates for the years 2006–2012	Dowd et al. (2017)	2006–2012	Dowd et al. (2017)
Pop	Population of	World Bank	2006–2015	http://data.worldbank.org/indicator/SP.POP.TOTL
GDP per capita	GDP per capita (in current US \$)	World Bank Human Development Index	2006–2016	http://data.worldbank.org/indicator/NY.GDP.PCAP.CD
Dev	Developed Country Status**	Financial Secrecy Index	2013*	Human Development Report 2014
FSI	Secrecy Index (comprising SSc and GSW)	Tax Justice Network	2013*	Tax Justice Network (n.d.). Financial Secrecy Index - 2013 Results. Retrieved 21 January 2015 from http://www.financialsecrecyindex.com/introduction/fsi-2013-results
GSW	Global Scale Weight	Tax Justice Network	2013*	Tax Justice Network (n.d.). Financial Secrecy Index - 2013 Results. Retrieved 21 January 2015 from http://www.financialsecrecyindex.com/introduction/fsi-2013-results
SSc	Secrecy score	Tax Justice Network	2013*	Tax Justice Network (n.d.). Financial Secrecy Index - 2013 Results. Retrieved 21 January 2015 from http://www.financialsecrecyindex.com/introduction/fsi-2013-results
BetterRated	Standard & Poor's Country Credit Rating	Standard & Poor's***	2015****	Orbis, Bureau van Dijk

* assumed to be valid for whole 10-year period, ** only countries classified as 'very high human development' countries by the Human Development Report are considered Developed Countries; all others are regarded as Developing Countries, *** provided by Orbis, Bureau van Dijk, **** assumed to be the credit rating for the whole period³⁷.

Sources: Author's own compilation.

³⁷ As country credit ratings have been changing, yearly data might be preferable, but the author has currently no access to those.

Table A4: Overview of data and model variations estimated

Data	
Tax rates	
Statutory	yearly average
PwC Effective	yearly average
Dowd et al. (2017) Effective	yearly average
Earnings measure and transformation	
Profit/Loss before tax	levels log hyperbolic sine profitability (pre-tax profit/total assets)
Sample	
Sample restrictions	
Affiliates not in same 4-digit industry as shifting counterpart	>90% owned >50% owned
Affiliates irrespective of industry of shifting counterpart	>90% owned >50% owned
Asset value	any >1000 thUSD
Profit	any >0
Years	all pre-crisis 2006-2008 post -crisis 2011-2015
Number of employees	all > 5
Origin destination affiliates	all parent subsidiaries
Comparable firms	
> 10 firms in same 4-digit NACE industry & economic region	all domestic only
> 10 firms in same 2-digit NACE industry	all domestic only
Outlier treatment of comparable firms	
zero profit	drop with log, stays with hyperbolic sine replaced by next non-zero profit value
zero assets	drops automatically through inability to divide by zero
Profitability > 99% of distribution	drop replaced by cutoff value
Profitability<1% of distribution	drop replaced by cutoff value
negative profit	drop with log, stays with hyperbolic sine drop
negative assets	drop with log, stays with hyperbolic sine drop
profit<0 & assets<0	keep drop because undistinguishable from direct positive profitability

Table A4 (cont'd)

Methodology		
Model	Fixed effects	
Unbalanced panel data with fixed effects	year	
	shifting firm	
	MNC group	
	MNC group-year	
	industry-year	
	destination country-year	
	shifting-destination firm combination pair	
	country-pair-year	
Repeated cross-sections with fixed effects	destination-country	
	year	
	shifting firm	
	MNC group	
	MNC group-year	
	industry-year	
	destination country-year	
	shifting-destination firm combination pair	
Control variables destination	country-pair-year	
	destination-country	
	log GDP per capita	
	Tax rate (in level)	
	log population	
	Number of employees	
	Assets	
	levels	
Control VARIABLES SHIFTING Origin	log	
	hyperbolic sine	
Region	all	
	specific economic region	
Industry	all	
	specific aggregated industry group	
Shifting origin and destination specific controls & interaction dummies		
Development status	all	
	developed	
	developing	least developed
		emerging economies
	lower taxed	any tax measure above
Lower taxed destination	lower taxed & lower than mean of MNC affiliates	any tax measure above
	lowest taxed of MNC affiliates	any tax measure above
	more than 15 percentage point lower tax rate than origin	any tax measure above
Better S&P country credit rated	as average (end year 2015)	
Corruption	Corruption Perception Index	lower perceived corruption (higher index score)
		lower than 10 point lower perc. Corr. (higher index score)
	government effectiveness	higher government effectiveness
		higher than 0.5 higher government effectiveness
	government control over corruption	higher control over corruption
Tax haven		higher than 0.5 higher control over corruption
	restrictive (former uncooperative jurisdictions OECD list)	
	broad definition (Gravelle, 2015)	
Financial Secrecy Index	lower Financial Secrecy Index score	
	lower Global Scale Weight	
	lower secrecy score	

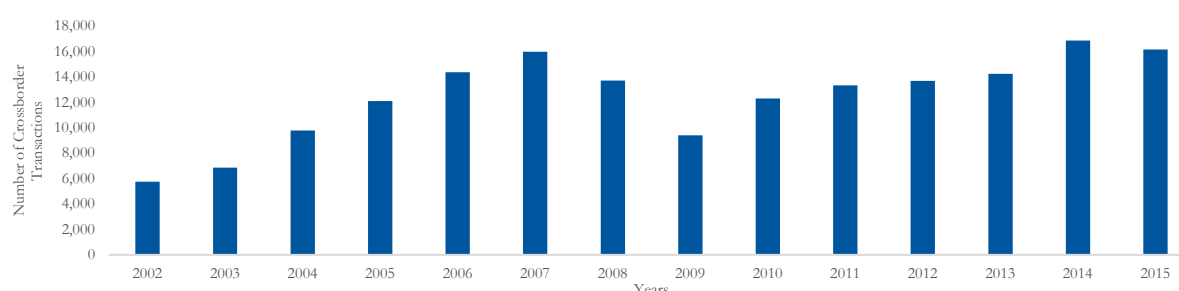
Source: Author's own specification.

Appendix B

During the time period covered in this study there was no abnormal increase in the number of M&A or divestment activities, due for instance to the global financial crisis of 2008/09, in comparison with earlier periods. On the contrary, there was an initial drop in the number of such activities before a stabilization at a lower level, rather than a rise back to the previous increasing trend in the number of transactions (Kengelbach et al. 2015). As Figure B1 shows, the volume was at the same levels as during the 2003–2012 period used by Johannesen et al. (2017), even when considering only cross-border M&As that lead to the creation of an MNC or result in a change in the country of the majority owner. The only exception is the low volume in 2003.

A remaining concern may, however, be that there was a change in the composition of buying and target country firms of M&A transactions, which could lead to a bias in the shifts observed. A report by JPMorgan (2016) reports an increase in Chinese buyers, who represented only 5 per cent of all buyers in 2005 but 50 per cent in 2015. Nevertheless, any bias will affect this study less than those that cover periods longer before the surge in Chinese takeover activity.

Figure B1: Cross-border M&A transaction volume, 2002–2015



Note: The figures represent completed cross-border M&A transactions (mergers, acquisitions, and demergers) of private and public firms.

Source: Author's own graph based on data from Merger Markets.³⁸

³⁸ Special thanks to Jennifer Müller for providing the data for this table through her access to the Merger Markets database.