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Pareto-improving tax reforms and the Earned Income Tax Credit

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Taxes, Profit Shifting, and the Real Activities of MNEs: Evidence from 898 Corporate Tax Notches

[Preliminary draft, do not circulate]

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Abstract

This paper exploits exogenous variation in tax notches created by controlled foreign corporation (CFC) rules to better understand the profit-shifting behavior of multinationals. Using new data on CFC rules and bilateral parent-affiliate ownership data, we estimate a profit-shifting semi-elasticity of about 0.32. Furthermore, we provide evidence that the unilateral implementation of anti-tax-avoidance regulation at the parent location leads to profit relocations consistent with tax-minimizing behavior. We do not find any evidence that parent countries benefit from this regulation (in terms of repatriated tax base) or that parent firms bear the economic costs (real outcomes of parents remain unaffected).

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1 Introduction

In an effort to limit opportunities for strategic tax planning by multinational enterprises (MNEs), the European Union (EU) has presented its Anti-Tax Avoidance Directive (ATAD) in 2016. One cornerstone of the ATAD is the implementation of Controlled Foreign Corporation (CFC) rules in all EU member states until 2019. With this proposal, the EU is following recommendations issued by the OECD's project against Base Erosion and Profit Shifting (BEPS) (see OECD (2013)).

Due to the profit-shifting and tax-saving activities of MNEs, international tax issues have become a major policy concern as many high-tax countries see their corporate tax revenue under pressure. Implementing CFC rules is one of the suggested remedies of the mentioned initiatives. These rules specifically aim at taxing foreign income that is exempt from taxation at the parent firm otherwise. In particular, if CFC legislation at the parent location applies to low-tax affiliates abroad, (passive) income of the foreign entities is attributed to the shareholder's (the parent's) tax base.

The specific design of CFC rules creates a discontinuous jump in tax incentives – *a notch* – determining the tax avoidance behavior of MNEs. We exploit the exogenous variation in corporate tax notches created by CFC rules to address fundamental questions on international tax avoidance and tax policy. First, using new data on CFC rules and taxes compiled by the research school of international taxation (RSIT),[1] We document in a large sample of 226 countries that CFC rules have become one of the main instruments to address the tax challenges raised by the activities of MNEs. While 32 countries had CFC rules in the year 2000, this number increased to 66 in 2020. All OECD member countries except for Switzerland and Costa Rica have such rules.[2] Second, exogenous variation in CFC rule treatment allows us to identify a profit-shifting elasticity (in our sample, we count 556 country pairs where CFC rules vis-à-vis foreign countries become binding over time and 342 cases where the opposite is the case, i.e. CFC regulation no longer applies). This

[1] Beside a large number of statutory tax measures, the RSIT's *international tax institution database* (ITID) provides information on CFC rules and their application.

[2] This is not surprising given that the OECD expressed in its 1998 report on harmful tax practices "that countries that do not have such rules [should] consider adopting them and that countries that have such rules [should] ensure that they apply in a fashion consistent with the desirability of curbing harmful tax practices." (OECD, 1998). In its action plan against base erosion and profit shifting (BEPS), the OECD (2013) spells out this point in Action 3: Strengthen CFC Rules.

key parameter of interest is estimated based on a large bilateral ownership dataset at the parent-affiliate level. In our preferred specification, we find a profit-shifting semi-elasticity of about 0.32, which is substantially smaller compared to previous findings. We argue that the variation over time in tax notches (the average tax notch upon treatment in our sample equals 14.52%) correctly captures changes in profit-shifting incentives and enables us to consistently identify a true profit shifting elasticity – while previous estimates are most likely biased as they capture effects unrelated to profit shifting. Third, we show that most of the low-tax affiliates' profits are relocated to the 'next-best' alternative within the MNE, i.e. the best affiliate from a tax-optimizing point of view, which is just not affected by the CFC rule. Fourth, based on our bilateral ownership data, we can examine parent outcomes such as employment, investment, TFP, and profits. These outcomes (measured at the parent level) have been neglected in previous studies, but are of high policy interest, especially for the regulating countries.[3] We do not find any evidence that parent outcomes (tax base and real outcomes) are affected. This finding is consistent with the avoidance and relocation behavior described before.

A thorough analysis of the consequences of CFC rules contributes to a better understanding of tax regulation and allows us to answer some fundamental policy questions. To what extent do regulation policies have consequences on real activity of MNEs? Are profits repatriated to the country implementing regulation? What are the most likely consequences of a 'global' minimum tax? Are there real consequences of such policy interventions?

A general implication of our findings is that unilateral tax regulation leads to more avoidance activities, consistent with MNEs' tax-minimizing behavior. There are at least two interesting interpretations of this result with respect to two central tax policy choices. First, the recent initiative of the G20 countries to introduce a global minimum tax of 15% has very similar consequences compared to a binding CFC rule. In fact, we may interpret the global minimum tax as a unilateral measure – as quite a few countries in the global context are not participating – allowing countries that usually exempt foreign-source income from taxation to attribute tax base of foreign affiliates to domestic shareholders. Second, CFC rules emulate taxation under a worldwide tax system where global group profits are subject to domestic

[3] In our setting, the regulating or home country of the parent firm is the host country of the controlling shareholder or majority owner of a foreign affiliate.

taxation.[4] In light of the fact that not all countries participate in the minimum tax initiative, the finding that CFC rules do not lead to any repatriation of profit to the parent (the coefficients we estimate are close to zero and highly insignificant in all specifications) suggests that countries will not succeed in protecting their domestic tax base.[5] Thus, parent countries bear the full monitoring and enforcement costs of CFC legislation without benefiting from increased corporate tax revenue. At the same time, however, we do not find evidence that parent firms are negatively affected in any real outcome (employment, investment, TFP).

Our paper is related to a small literature on the consequences of CFC rules and tax regulation and to a large literature on tax-motivated profit shifting of MNEs. Ruf and Weichenrieder (2012) show that CFC rules affect the global allocation of passive assets within German MNE groups. In a later study, Egger and Wamser (2015) use German data to examine the effects of CFC rules on foreign affiliates' assets. Most recently and most closely related to our paper, Clifford (2019) examines the impact of CFC rules on MNEs and finds a significant reduction of financial profits in affected affiliates and an increase of incorporations of firms above CFC thresholds.[6]

Compared to all previous studies, our paper differs in terms of empirical identification and outcomes, and allows for a more general interpretation of findings. It is basically the first contribution to actually investigate the link between unilateral policy measures and profit shifting in a bilateral multi-country (affiliate-parent location) setting. Only the latter makes a precise identification of CFC rule treatment possible. Our study is also one of the first ones to address the link between profit shifting activities, the regulation thereof, and real consequences at home.[7] Finally, previous papers lack evidence on the specific re-optimization responses to unilaterally implemented anti-tax avoidance regulation. For instance, a new result of our study is that profits are relocated to the next best alternative – the nearest low-tax

[4]Note that a central element of the 2017 US 'Tax Cuts and Jobs Act' (TCJA) has been the introduction of a territorial tax system, replacing the previous system of worldwide taxation.

[5]For example, the main motivation of the German government to implement a global minimum tax is to "benefit financially from the new rules". Based on government calculations, "Germany's tax revenue will increase as a result of the minimum tax" (see www.bundesfinanzministerium.de, accessed on October 13, 2021).

[6]Clifford (2019) also compares the effects of CFC exposure of domestic affiliates to foreign affiliates in the same group. However, this approach does not account for heterogeneity in the relative attractiveness of domestic and foreign affiliates as profits shifting locations.

[7]A few papers focus on the effects of anti-tax-avoidance rules on real outcomes of foreign affiliates. For example, Buettner et al. (2018), as well as Merlo et al. (2020).

affiliate ranked according to its 'distance' to the relative CFC threshold.

The second strand of literature we contribute to is the work on profit shifting of MNEs. Some recent studies, based on macro data, suggest that profit shifting leads to substantial tax revenue losses of high-tax countries (see Tørsløv et al. (2018)). Earlier work, based on micro data, estimates the tax sensitivity of MNEs' profits and particularly the effects of taxes on foreign affiliates' earnings before interest and taxation (EBIT) (for example, Huizinga and Laeven (2008) or Dischinger et al. (2014); see Heckemeyer and Overesch (2017) for a meta study).

This paper is organized as follows. Section 2 presents some fundamental features of countries' CFC rules and some descriptive statistics on these rules. Section 3 describes the parent-affiliate level dataset. Section 4.1 summarizes the findings on profit shifting elasticities; this section includes a number of robustness tests, such as placebo treatments. Section 4.2 presents the central findings on the redistribution of profits within the group, before Section 4.3 focuses on outcomes of the controlling shareholder. Finally, Section 5 concludes.

2 CFC rules: institutional setting, tax incentives, and empirical identification

CFC rules are usually implemented by high-tax countries to prevent firms from shifting profits to affiliates located in countries with low or even zero taxes. Let us illustrate the main feature common to basically all CFC rules around the world. Figure 1 illustrates the incentives created by a CFC rule within an MNE. The example also highlights important variation, exploited for empirical identification below. It also shows that variation in CFC rule treatment is not necessarily related the introduction of new CFC legislation.

Suppose a French MNE – with parent firm and domestic affiliates located in France – faces the French corporate income tax (CIT) rate of 34%. The parent is the majority owner (shareholder) of three foreign affiliates A, B and C facing CIT rates of 30%, 20% and 10%, respectively.

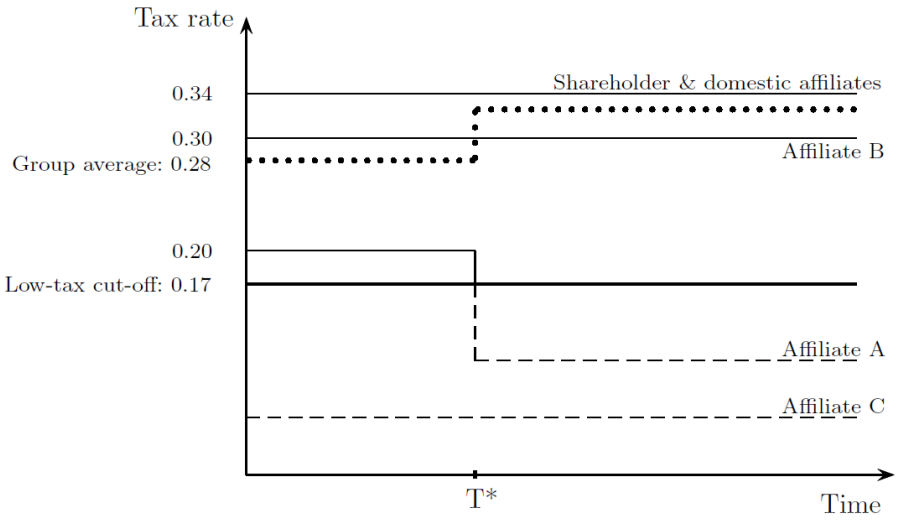
The French CFC rule stipulates that countries with a tax rate lower than 50% of the French rate is a country with 'low' taxes. The consequence is that for passive income of affiliate C, the exemption of foreign source income is no longer granted

by the French tax authorities and foreign income is added to taxable income of the French parent. Note that the focus on passive income is also called the 'tainted income' approach, as this type of income is associated with profit shifting (see Weichenrieder, 1996)

The dotted line, corresponding to the average tax over the three affiliates, accounts for the fact that (passive) income of affiliate C is taxed at the parent's rate (it is 28% instead of 20%). Assume, for the purpose of our example, that the host country of affiliate A cuts its tax rate to 16% at time T^*. Affiliate A is now subject to CFC treatment. Despite the substantial tax cut and even though France has not changed its CFC legislation, the French CFC rule renders affiliate A unattractive from a profit-shifting point of view. The tax treatment of its tainted income brings the average tax over the three affiliates closer to the French tax rate, just as in a system of worldwide taxation. Affiliate B has now become the lowest-tax affiliate in the group and is thus the most attractive location to which profits can be shifted in order to save taxes.[8] In this setting, if the cost of profit shifting are sufficiently low, the MNE may relocate some profits to affiliate B to save taxes, instead of repatriating income to the parent (even though the tax differential between parent and affiliate B is small). Given the tax planning of large MNEs and the fact that these firms usually operate many affiliates around the globe (perhaps with a corporation tax just above the 17% threshold), we would not expect any increase in tax base and revenue in France.

[8]Of course, a large literature acknowledges that the tax saving from profit shifting need to be sufficiently large to account for the cost of these activities (see, for example, Davies et al., 2017)

Figure 1: *Tax incentives within MNE*



Note that the majority of countries, including most EU countries that adapted CFC rules under the ATAD, consider a parent company that holds 50% or more of the total shares of a given subsidiary to be 'controlling'. Other criteria of the CFC definition vary between countries. In Germany, for example, subsidiaries can only be a CFC if they are located in low-tax jurisdictions that are defined as countries with a corporate income tax rate lower than 25%, rather than having a relative threshold like France.

Figure 2: *Global implementation of CFC rules*

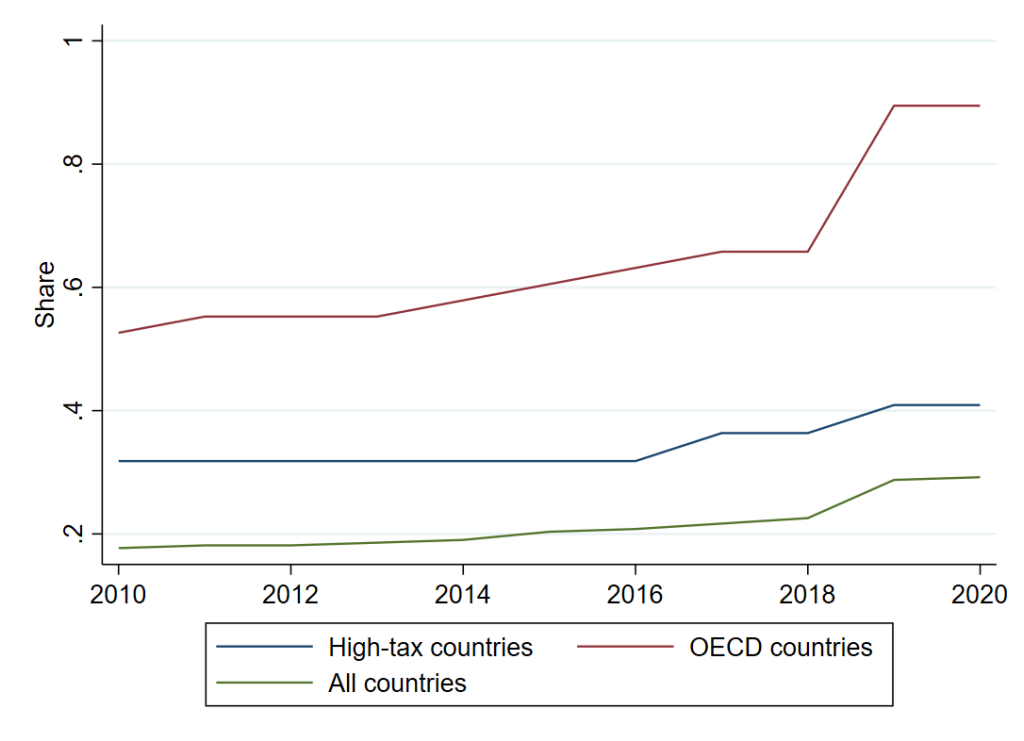


Figure 2 suggests that more and more countries have implemented CFC rules over the last two decades, with a large increase especially after ATAD came into force. The figure also suggests that this increase is predominantly driven by high-tax and OECD countries. These countries are particularly interested in protecting their domestic tax base and in limiting profit-shifting opportunities. The data are taken from the RSIT's $ITID$ database.[9]

The empirical investigation below makes use of the different tax thresholds defined in countries' CFC legislation. We define a CFC indicator variable CFC that equals one if the corporate tax rate of affiliate i's host country is below the threshold stipulated by parent j's home country, i.e. $CFC_{ij} = 1$ if $CIT_i < \overline{T}_{ij}$ (and $CFC_{ij} = 0$, otherwise), where $\overline{T}_{ij}$ denotes the respective threshold, and CIT_i the corporate income tax rate that applies to affiliate i. Thus, affiliates located in low-tax host countries are treated if the parent country's CFC rules are binding.

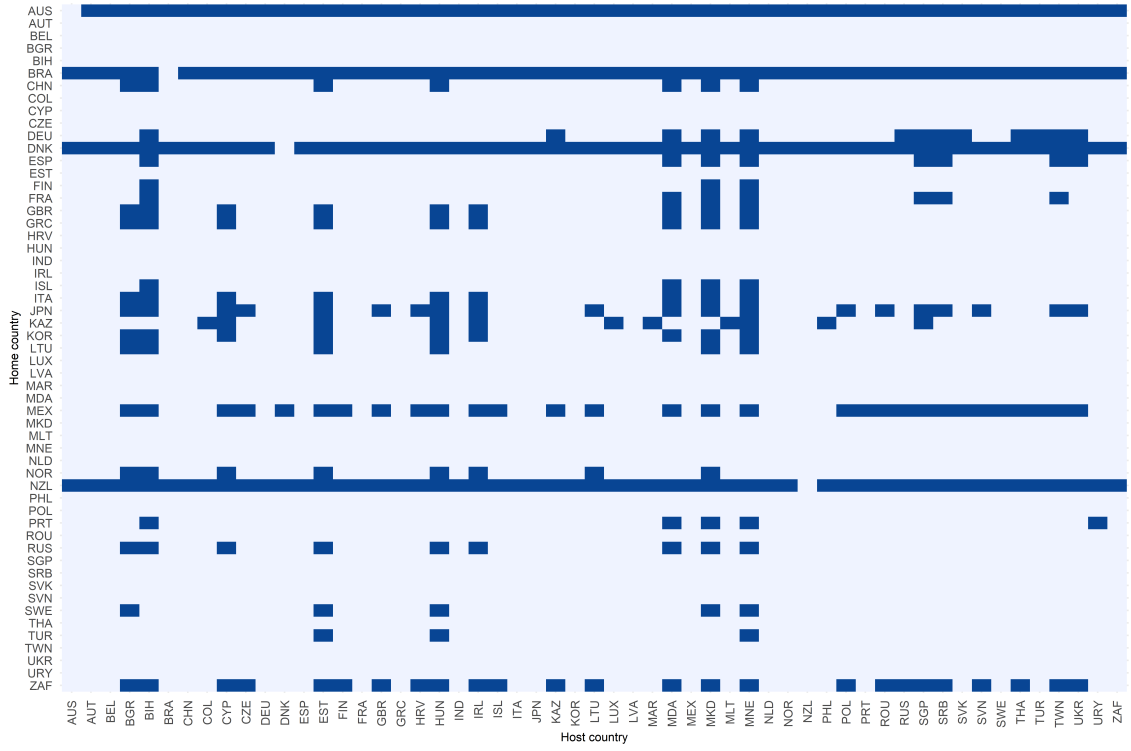
Note that most countries allow foreign affiliates to escape from CFC treatment if a sufficient amount of active business is documented. This is, however, irrelevant for our identification approach as once $CFC_{ij} = 1$, a foreign affiliate cannot be used

[9]For more information, see www.rsit-uni-tuebingen.de/data

as a pure profit-shifting entity any longer. Note that our identification approach relies on variation over time t and switching from $CFC_{ijt} = 0$ to $CFC_{ijt+1} = 1$, and vice versa, meaning that profit-shifting incentives change in a fundamental way.

Figure 3 shows all the combinations among countries with CFC rules in place where the rules are binding bilaterally in 2018 (the blue fields). For example, when Mexico is the home or regulating country (vertical axis), then affiliates of Mexican MNEs located in Cyprus (horizontal axis) are treated by the Mexican CFC rule.

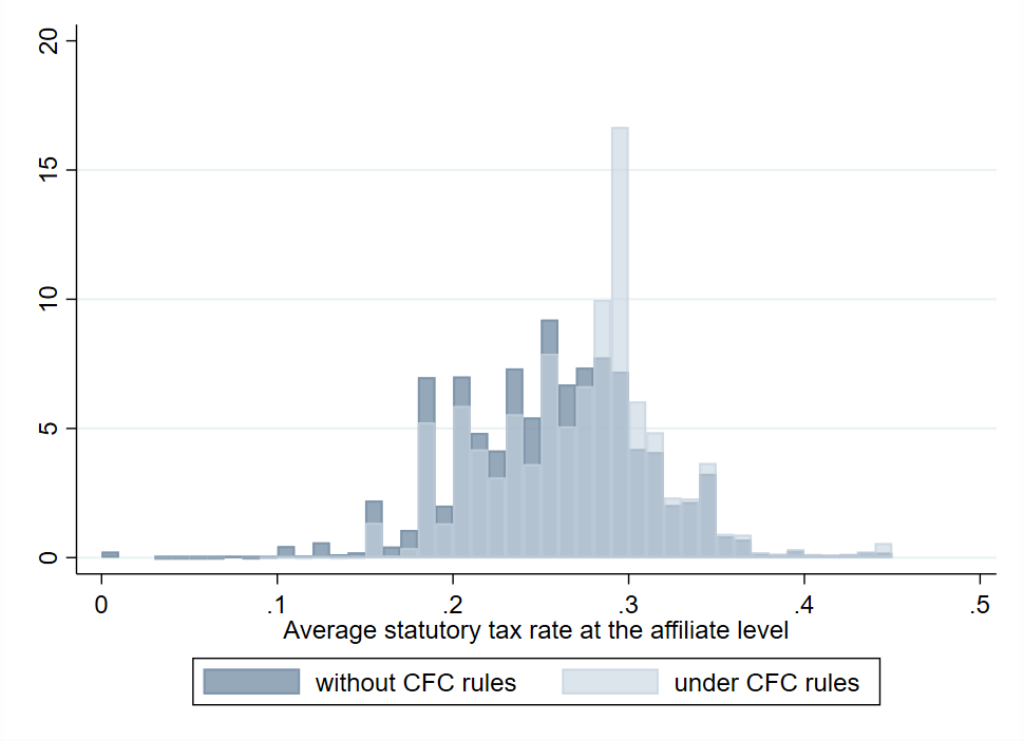
Figure 3: *CFC home countries - bilateral treatment 2018*



The average tax notch, e.g. the difference between host and home CIT, is 14.52 percentage points for the subset of affiliates moving underneath the respective low-tax threshold stipulated by CFC legislation. For a respective country pair, the rules are then binding in a sense that the tax incentives to use foreign affiliates in these host countries for the only purpose of profit shifting are taken away.

Figure 4 plots the distribution of average tax rates at the location of foreign affiliates. The yellow bars indicate the relevant tax rate under a given CFC regime. As outlined above, if the CFC rule applies to a bilateral pair, then the low-tax affiliate's (passive) income is attributed to the shareholder's tax base. This way, CFC status

Figure 4: *Distribution of average affiliate tax rates*



implies that the relevant tax rate for the affiliate is no longer its lower host-country tax rate but the higher domestic rate. The green bars indicate the counterfactual tax distribution, i.e. if no CFC rule had been in place. The distribution of tax rates is clearly shifted to the left. This suggests that tax incentives within the MNE change quite substantially once a CFC rule becomes binding. We exploit this change in incentives to investigate profit reallocation within MNE groups. In our data, implemented CFC rules increases the mean affiliate tax rate by 8%, from 20.7% to 28.7%.

We can disentangle the variation in our data based on the direction of the source of the shift. Changes in treatment status can be caused by the implementation of CFC rules or changes in the tax rate of either the home country or the host country. Sometimes, both countries change their tax rates in the same year so that a shift falls into both categories. On the country level, we observe 898 bilateral changes in CFC treatment that translate into 19,620 changes at the firm level.

Table 1 summarizes the different types of shifts in our sample. The average tax notch from moving into treatment is larger than the notch for firms moving out of treatment. This is intuitive as CFC treatment typically applies to pairs with a large tax differential between home and host country. Moving out of treatment means

Table 1: *Shifts in CFC treatment - Country level*

Type of shift	Number of shifts	Average tax notch
Into treatment	556	16.2pp
New CFC rule	250	16.7pp
Threshold change	99	20.4pp
Host CIT change	244	14.3pp
Out of treatment	342	6.0pp
Threshold change	225	6.7pp
Host CIT change	149	5.2pp

that both tax rates are becoming more similar and thus the tax notch becomes smaller.

3 Firm-level data

The second source of data is Bureau van Dijk's ORBIS database. ORBIS is a firm-level dataset that comprises information on firms' financial statements and their ownership relationships. The specific parent-affiliate ownership relation is crucial in the context of CFC legislation and CFC treatment.[10]

Descriptive statistics on the firm-level data, tax variables, as well as additional country-level data (taken from the World Bank's *World Development Indicators* database) are presented in Table 2.[11]

[10]Note that, while the analysis of Clifford (2019) relies on ORBIS' definition of global ultimate ownership to identify parent companies, we exploit ownership information in ORBIS to identify the direct majority shareholder of an affiliate. Although most countries include direct and indirect shareholders in their definition of a parent company, complex ownership structures within MNE networks can create conflicts in the applicability of CFC rules. For instance, if a Czech affiliate is directly held by a Japanese shareholder it can be subject to Japanese CFC legislation. However, if this Czech affiliate is ultimately owned by a German holding, it would be exempt from CFC ruling from the holding's perspective since Germany exempts EU countries from its legislation. For this reason, and from our point of view, it is always preferable to base the analysis and CFC application on the controlling direct shareholders rather than ORBIS' ultimate owners.

[11]See table *A*.2 for a detailed description of all variables and their respective sources. Note that in Section 4.2, we use total factor productivity (TFP) and investment as additional outcome variables to obtain a better understanding of the driving factors behind the observed effects. TFP is estimated following the methodology proposed by Levinsohn and Petrin (2003), using material inputs as a proxy for unobserved productivity shocks.

Table 2: *Summary statistics*

	N	Mean	Std. Dev.	Median
CIT_i (host corporate tax rate)	1,505,743	0.256	0.07	0.25
CIT_j (home corporate tax rate)	1,505,743	0.28	0.06	0.30
$log(\text{PTP}_i)$ (pre-tax profits)	739,458	13.00	2.59	13.14
$log(\text{FA}_i)$ (fixed assets)	1,237,444	13.35	3.43	13.51
$log(\text{PTP}_j)$	299,433	14.32	2.73	14.39
$log(\text{FA}_j)$ (fixed assets)	506,844	15.75	3.16	15.84
CFC_{ij} (CFC rule, binary)	1,505,743	0.12	0.33	0
Group exposure	1,505,743	0.12	0.25	0
Group size	1,505,743	47.73	185.45	10

These summary statistics highlight the important advantage of our newly compiled dataset, including parent- as well as affiliate-level information with complete financial statements for both parties. This allows us to analyze the impact of CFC treatment on the directly affected affiliates, the indirectly affected affiliates in the same group, and their direct shareholder.

4 Empirical Results

4.1 Effectiveness of CFC rules

We begin our analysis by estimating the effect of a CFC rules on profits:[12]

$$log(PTP_{it}) = \beta_0 + \beta_1 CIT_{it} + \beta_2 CFC_{ijt} + \beta_3 (CIT_{it} \times CFC_{ijt}) + \beta \mathbf{X_{it}} + \gamma_\mathbf{i} + \gamma_\mathbf{t} + \epsilon_\mathbf{it}, \quad (1)$$

where $log(PTP_{it})$ (pre-tax profit) denotes the profit and loss before taxes of affiliate i in year t. We measure profitability in terms of pre-tax profits which comprises both operating and financial profits.[13] Although CFC rules are generally targeted at passive income, we expect CFC rule treatment to reduce the overall attractiveness of an affiliate as a profit-shifting entity. While many profit-shifting channels such as debt shifting or licensing will reflect in financial profits, transfer price manipulation affects operating profits. Therefore, we expect affiliates overall profitability to be

[12] Our specification basically follows Huizinga and Laeven (2008) and Lohse and Riedel (2013).

[13] See Heckemeyer and Overesch (2017) for a discussion on the tax sensitivity of pre-tax profits versus earnings before interest and taxation.

the correct measure.[14]

Previous literature interprets the estimate on CIT_{it}, the statutory corporate income tax rate at the host location, as a profit-shifting semi-elasticity. We argue, however, that the coefficient on β_2, which captures the effect of the tax notch created by the CFC rule, adequately reflects the response to profit-shifting incentives. We also include an interaction term between the host country tax rate CIT_{it} and the CFC indicator to further analyze firms' tax sensitivity. We would expect that firms under CFC treatment are no longer sensitive to their host country tax rate – if treated, tainted income would now be taxed at the parent location.

Furthermore, we include firm and country-specific control variables in the vector $\mathbf{X_{it}}$. Following Huizinga and Laeven (2008), we condition on the log of the number of employees and fixed assets to control for firm size effects. On the country level, we control for the inflation rate, unemployment and corruption as well as the host country's GDP level, GDP per capita and GDP growth. This way, we capture time-varying economic trends that are not absorbed by the fixed effects. All specifications include year and affiliate fixed effects, denoted by γ_i and γ_t, respectively.

[14]Section A.2 provides evidence that CFC treatment has an even larger significant negative impact on financial profits.

Table 3: *Baseline Results*

Dep. variable: $log(PTP_{it})$	(1)	(2)	(3)
CFC_{ijt}		-0.0469***	-0.0611***
		(0.010)	(0.007)
CIT_{it}	-0.548***	-0.667***	
	(0.000)	(0.000)	
$CFC_{ijt} \times CIT_{it}$			-0.283
			(0.423)
$(1 - CFC_{ijt}) \times CIT_{it}$			-0.698***
			(0.000)
CIT_{jt}	0.167	0.281**	0.295**
	(0.162)	(0.028)	(0.022)
$log(FA_{it})$	0.0736***	0.0736***	0.0736***
	(0.000)	(0.000)	(0.000)
$log(Empl._{it})$	0.265***	0.265***	0.265***
	(0.000)	(0.000)	(0.000)
$Inflation_{it}$	-0.00782***	-0.00779***	-0.00771***
	(0.000)	(0.000)	(0.000)
$Unemployment_{it}$	-0.0205***	-0.0205***	-0.0203***
	(0.000)	(0.000)	(0.000)
$Corruption_{it}$	-0.0483**	-0.0471**	-0.0479**
	(0.043)	(0.048)	(0.044)
$log(GDP_{it})$	-0.822***	-0.768***	-0.770***
	(0.001)	(0.002)	(0.002)
$log(GDP\ p.c._{it})$	0.449*	0.397	0.404
	(0.071)	(0.112)	(0.106)
$GDP\ growth_{it}$	0.0145***	0.0144***	0.0144***
N	385,413	385,413	385,413
R^2	0.875	0.875	0.875

Notes: Includes only firm groups with parent shareholders in countries with an established CFC regime and a defined low-tax cut-off and groups with at least two affiliates and observations before 2018 because of the ATAD announcement. All specifications include affiliate and year fixed effects. CFC binary is an indicator variable that takes the value 1 if the respective affiliate is in a host country with a corporate income tax below the specified threshold. Country controls include GDP level, growth and GDP per capita. Host CIT is centered around 16% in column (3). Standard errors clustered at the firm group level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We start by including only CIT_{it} in column (1). Column (2) augments the estimation by including the CFC indicator. As expected, the coefficient is significant and negative, suggesting that CFC treatment reduces pre-tax profits by 4.7%. This effect is smaller than previous estimates for financial profits (see Clifford (2019)). Column (3) explores the interaction between CFC rule and tax rate. The interaction term is insignificant for firms under CFC status. This confirms our initial hypothesis that firms under CFC status become insensitive to their host country tax rate as their income becomes subject to domestic taxation. We find a slightly increased tax responsiveness, compared to column (1), for those affiliates that are not restricted

by CFC rules; the coefficient on $(1 - CFC_{ijt}) \times CIT_{it}$. The estimates also suggest that the parent tax rate is positively related to $log(PTP_{it})$, as expected.

On average, an affiliate falling under CFC treatment experiences a tax not by 14.52 percentage points, which computed as the difference between the host country and the home countries tax rate. This allows us to compute a semi-elasticity for pre-tax profits of 0.32. Our estimation produces a more reliable estimate of the profit shifting elasticity as we are exploiting discreet and sizable changes in the tax incentives.

Table A.3 in the appendix provides estimates for the effects of CFC treatment on financial profits. CFC_{ijt} has a significant negative effect on financial profits across all specifications. In our preferred specification, CFC treatment is associated with a 13.6% reduction in financial profits, suggesting a semi-elasticity close to one. Furthermore, Table A.4 provides evidence on the robustness of the estimates in Table 3 to different sets of fixed effects as well as a simple placebo test. Table A.5 compares the CFC treatment effect reported in table 3 to placebo treatments one year prior or after the actual treatment status. The coefficient for CFC treatment in the placebo estimations remains insignificant which suggests that there are no anticipatory or delayed responses associated with CFC treatment.

4.2 Profit reallocation after treatment

The objective of policymakers when implementing CFC rules is to incentivize MNEs to repatriate profits to their home location (to the parent). The alternative choice a large MNE can make, however, is to reallocated profits in a tax-optimizing way to minimize the aggregate tax burden.This part of the analysis, thus, aims at identifying the effect of CFC rules on unaffected affiliates while controlling for firm and group characteristics.

For the unaffected affiliates, we expect firms just above their low-tax threshold to benefit the most from CFC treatment. We may denote these affiliates as the 'next-best' alternative.

To test this hypothesis, we implement a heterogeneity analysis based on differences in tax incentives. We construct dummy variables for 2 percentage point bins of the normalized tax rate and indicator variables that measure a group's exposure

to CFC treatment.[15] To be specific, we estimate

$$log(PTP_{it}) = \sum_{j=1}^{B} \alpha_b \times \mathbb{1}[tax_{it} \in tax_b] \times EXP_{it} + \beta X_{it} + \gamma_i + \gamma_t + \epsilon_{it}, \qquad (2)$$

where $log(PTP_{it})$ denotes the log of an affiliate's pre-tax profits. In the interaction terms, $\mathbb{1}[tax_{it} \in tax_b]$ is a dummy variable that is equal to 1 if the affiliate's host country tax rate in time t falls into bin b. Therefore, α_b measures the effects of exposure measures EXP_{it} on firms in bin b. Table A.6 in the appendix provides summary statistics for the individual bins of unaffected affiliates.

Similar to Clifford (2019), we use two different indicators to measure EXP_{it}, i.e., the exposure of a firm group to CFC treatment. The first one is a continuous group exposure variable that captures the fraction of treated affiliates in a group. The second indicator is the total number of treated affiliates in the group. This second indicator is thus a discrete measure for new CFC cases in the group, ignoring total group size. Our approach to identifying the reallocation pattern after differs from Clifford (2019) in that we capture heterogeneities stemming from the affiliates varying local tax rates. The coefficient α_b captures the bin-specific effect of exposure, $\mathbf{X_{it}}$ includes firm-level and host-country control variables and γ_i and γ_t denote affiliate and time fixed-effects.

[15] The normalized tax rate is the distance between an affiliate's host country CIT and its relevant CFC threshold.

Figure 5: *Group exposure*

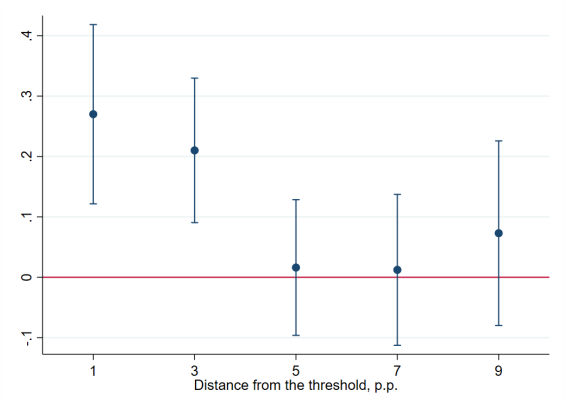
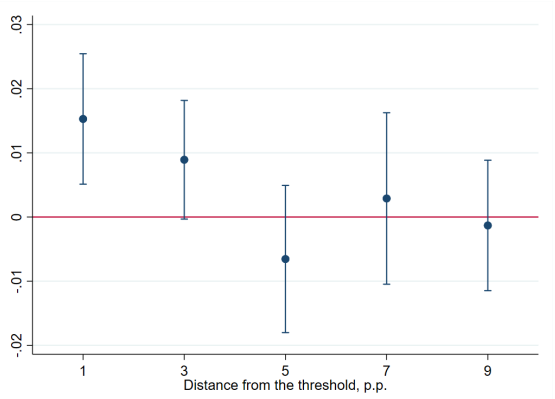


Figure 6: *Number of treatments*



Notes: Dependent variable $log(PTP_{it})$ of the affiliate. Estimations include controls for fixed assets, employees, GDP level, growth and GDP per capita, inflation, unemployment and corruption. Affiliate and year fixed effects included, standard errors clustered at the firm-group level. Vertical lines represent 95% confidence intervalls. For more precision, these estimations include only the first five bins, that is affiliates 0 to 10 percentage points above their threshold. Extending the analysis to all affiliates above the threshold leaves the results virtually unchanged, see Figure A.1.

Figures 5 and 6 graphically present the estimation results. The pattern confirms our initial hypothesis that affiliates just above the threshold are most likely to benefit from increased CFC exposure. For both measures, the coefficients for the interaction term are significant and positive for firms with a CIT that is between 0 and 2 percentage points above the relevant threshold. For affiliates further away from the threshold, the effect turns insignificant. This finding is novel and highlights that MNEs seek second-best solutions whenever they are treated at some location.

Concerning the magnitude of effects, the median group size in this sample is nine affiliates. If one of them is treated by a CFC rule, group exposure increases from 0 to 11%. For untreated affiliates just above the threshold, this would be associated with an average increase in pre-tax profits of about 3%. Among profit-making firms in this bin, the median firm's profits amount to 393,385 USD, which implies an average increase of 11,801 USD for each of these firms. However, none of the firms located zero to two percentage points above the threshold are domestic.[16] In the second bin, two to four percentage points above the threshold, the effect becomes slightly weaker. The ratio of domestic to foreign firms in this bin is roughly 1:36.

The significant effect for firms in the second bin above the threshold might be driven by firm groups where the untreated affiliate with lowest tax rate in the group

[16]See table A.6 for detailed summary statistics.

is further away from its cut-off. We exploit the group structure provided by the data to rank affiliates according to their tax rate, from lowest to highest, within their firm group. Similar to equation (2), we interact group exposure with the rank of the unaffected affiliate. Here, we estimate

$$log(PTP_{it}) = \sum_{j=1}^{N} \alpha_j \times \mathbb{1}[rank_{it}] \times EXP_{it} + \beta X_{it} + \gamma_i + \gamma_t + \epsilon_{it}, \tag{3}$$

where $\mathbb{1}[rank_{it}]$ is a categorical variable that indicates the low-tax rank of a given affiliate. For example, a value of 1 would denote the affiliate with the lowest tax rate that is just not CFC treated within the group.[17] Foreign affiliates with $rank = 1$ have an average tax differential of 7 percentage points to their shareholder.

[17]Note however that there can be affiliates in different locations sharing a rank if these locations have the same CIT.

Table 4: *Ranked affiliates*

Dependent variable:	$log(PTP_{it})$
$\mathbb{1}[Rank = 1] \times EXP$	0.0819**
	(2.17)
$\mathbb{1}[Rank = 2] \times EXP$	0.0532
	(1.03)
$\mathbb{1}[Rank = 3] \times EXP$	0.0568
	(0.91)
$\mathbb{1}[Rank = 4] \times EXP$	0.0817
	(1.12)
$\mathbb{1}[Rank = 5] \times EXP$	0.0314
	(0.39)
$\mathbb{1}[Rank = 6] \times EXP$	-0.0691
	(-0.67)
$\mathbb{1}[Rank = 7] \times EXP$	-0.104
	(-0.90)
$\mathbb{1}[Rank = 8] \times EXP$	0.158
	(1.14)
$\mathbb{1}[Rank = 9] \times EXP$	0.0236
	(0.14)
$\mathbb{1}[Rank = 10] \times EXP$	0.0511
	(0.28)
$\mathbb{1}[Rank = 11] \times EXP$	0.259
	(1.08)
$\mathbb{1}[Rank = 12] \times EXP$	0.391
	(1.79)
$\mathbb{1}[Rank = 13] \times EXP$	0.264
	(1.11)
$\mathbb{1}[Rank = 14] \times EXP$	0.315
	(1.13)
$\mathbb{1}[Rank = 15] \times EXP$	0.290
	(1.00)
$\mathbb{1}[Rank = 16] \times EXP$	-0.0256
	(-0.07)
$\mathbb{1}[Rank = 17] \times EXP$	0.237
	(0.55)
$\mathbb{1}[Rank = 18] \times EXP$	0.0524
	(0.12)
$\mathbb{1}[Rank = 19] \times EXP$	-0.328
	(-0.92)
$\mathbb{1}[Rank = 20] \times EXP$	0.310
	(0.70)
N	378739
R^2	0.8718

Notes: Includes only unaffected affiliates ranked 1st to 20th lowest tax neighbors (which includes 99% of all affiliates that are unaffected by CFC rules in our ample) in with parent countries that have a defined CFC threshold. Includes affiliate and year fixed effects, affiliate controls include log(Fix.Assets), log(Empl), country controls include home CIT, inflation, corruption, unemployment, GDP level, growth and GDP per capita. t statistics in parentheses, standard errors clustered at the firm group level.* $p < 0.10$, ** $p < 0.05$, ***

Table 4 presents the results. It clearly shows that only the nearest tax-neighbor, the affiliates with the lowest tax rate in the group, see a significant effect from

increased group exposure. The point estimates for all other ranks are (mostly) positive but insignificant.

4.3 Effects on the parent shareholder

Let us finally focus on outcomes at the parent shareholder. To evaluate the implications of CFC rules, this is central. To the best of our knowledge, there are no previous studies that directly identify the impact of profit-shifting restrictions on shareholder outcomes. We examine both the effects on parents' tax base but also on real activities like investment, employment, or TFP.

Since the objective of CFC rules is to limit profit shifting from domestic shareholders to their foreign affiliates, and thus increase the domestic tax base, we will first focus profits.

As shown in table 2, many shareholders hold multiple affiliates. If one of the their affiliates comes under CFC treatment, the shareholder may be indirectly affected, even though the local tax incentive remains unchanged. Since foreign affiliates in low-tax countries are often central to a shareholder's tax planning strategy, we might expect effects at the shareholder (parent) level. To identify the effects on the shareholder, we collapse our data across all subsidiaries by shareholder and year. The collapsed dataset contains information on the yearly financial statement of each shareholder, together with the weighted average of its subsidiaries financial statement and the share of affiliates that fall under CFC status. We estimate:

$$log(y_{jt}) = \beta_0 + \beta_1 EXP_{jt} + \beta \mathbf{X_{jt}} + \gamma_{\mathbf{j}} + \gamma_{\mathbf{ht}} + \epsilon_{\mathbf{jt}}, \tag{4}$$

where EXP_{jt} is the exposure to CFC treatment of shareholder j in time t, $\mathbf{X_{jt}}$ a set of shareholder-level control variables, and γ_j and γ_{ht} represent shareholder j and home-country-h-by-year-t fixed effects, respectively. In this specification, it is critical that we control for home-country time effects to ensure that the coefficient β_1 does not capture any economic trend the home country's tax policy and the shareholder's financial outcomes simultaneously. Note, though, that our results are robust if we include just aggregate time effects, otherwise. By controlling for γ_{ht} , β_1 captures only variation that is directly driven by changes in CFC exposure of shareholder j. To measure exposure, we use the (unweighted) continuous share of

treated affiliates and a dummy variable CFC_{jt} that is equal to 1 if shareholder j holds at least one affiliate that in under CFC treatment in time t.

Table 5: *Effects on the parent shareholder - Pre-tax profits*

Dep. variable: $log(PTP_{jt})$	(1)	(2)	(3)	(4)
EXP_{jt}	0.0216	0.0132		
	(0.447)	(0.863)		
CFC_{jt}			0.00545	0.0132
			(0.731)	(0.863)
$log(FA_{jt})$	0.128***	0.0753***	0.128***	0.0753***
	(0.000)	(0.000)	(0.000)	(0.000)
$log(Empl._{jt})$	0.219***	0.291***	0.219***	0.291***
	(0.000)	(0.000)	(0.000)	(0.000)
Sample	Full	Single affiliate	Full	Single Affiliate
N	206673	31854	206673	31854
R^2	0.886	0.859	0.886	0.859

Notes: Group exposure is a continuous indicator of the share of affiliates exposed to CFC stats, CFC binary is dummy variable that indicates if there is at least one CFC case in the group. All specifications include firm and Standard errors clustered at the firm group level.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5 summarizes the regression results for shareholders' pre-tax profits. In all of our specifications, the coefficient for group exposure remains small and clearly insignificant. These results are in line with our expectations from the previous sections. Even when restricting the sample to parents that hold only a single affiliate in columns (2) and (4), the coefficient on group exposure remains insignificant. As discussed above, even though CFC exposure makes profit shifting less attractive from the perspective of the parent, it does not necessarily increase the domestic tax base. This is fully consistent with the above finding that profits are shifted to third locations.

Table 6 extends the analysis of the affected shareholder to real outcomes. Beyond the allocation of profits, changes in the shareholder's scope for tax planning might influence real business activities. To capture a variety of potential real effects, we define four outcome variables: (1) annual employment growth $log(Empl_{jt}) - log(Empl_{j,t-1})$; (2) the log of total factor productivity (TFP); (3) the log of investment spending, defined as the yearly change in tangible and intangible fixed assets plus depreciation; and (4) the debt ratio, defined as current liabilities divided by total assets. In columns (1) and (2) we condition on the log of sales as a measure of firm size, in columns (3) and (4) we follow the literature and condition on the

one-period lag of sales and employees and tangible assets respectively.[18]

Table 6: *Effects on the parent shareholder - Investment*

	(1)	(2)	(3)	(4)
Dep. variable:	Empl. growth	$log(TFP)$	$log(Inv)$	Debt ratio
CFC_{jt}	0.00542	-0.00265	0.0320	0.000204
	(0.392)	(0.348)	(0.180)	(0.940)
$log(Sales_{jt})$	0.0638***	0.0932***		
	(0.000)	(0.000)		
$log(Empl_{j,t-1})$			0.186***	
			(0.000)	
$log(Sales_{j,t-1})$			0.128***	
			(0.000)	
$log(Tang.Assets_{jt})$				-0.00604***
				(0.000)
N	152610	179552	133920	361846
R^2	0.215	0.753	0.836	0.788

Notes: Includes Parent and Country-by-Year fixed effects and parent firms from countries with and without CFC regimes, group exposure measure the share of affected affiliates (number of affiliates) and CFC is equal to one if there is at least one CFC affiliate in the group. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Since we condition on parent-country-year effects, which are captured by γ_{ht}, our results are unaffected by shocks common to all parents in a given country. As before in Table 5, we are unable to identify any significant effects of CFC exposure at the parent firm. None of the defined measures of real activity react to changes in CFC exposure. In summary, we are unable to provide evidence for the effect of CFC treatment at the shareholder level. Taken together with the evidence from Section 4.2 that suggests that profits are predominantly reallocated to third countries to avoid CFC rules, we conclude that the overall revenue effects for the home country will be rather small. They should be weighted agains the considerable administrative cost that is associated to the monitoring and enforcement of such a policy.

5 Conclusion

The results in the previous sections illustrates that CFC legislation is effective, but has unintended consequences. While it reliably reduces reported pre-tax profits for affected affiliates, we do not find evidence that the domestic tax base increases. This highlights that mobile firms can easily avoid unilateral tax policy by reorganizing their tax planning activities.

[18] We follow Egger et al. (2014) for the estimation of investment effects and Buettner et al. (2012) for the estimation of the debt ratio.

Using a fixed-effects panel approach, we examine the reallocation behavior within MNEs. We provide conclusive evidence that MNEs re-optimize their profit-shifting strategies if governments change their scope for tax planning. Our evidence suggests that the remaining tax differentials that are not covered by CFC rules allow firms to circumvent domestic taxation. It seems that home countries benefit very little compared to third countries above the threshold in terms of tax revenue. Additional robustness checks found no significant effect on domestic affiliates or profits at the shareholder level, while foreign subsidiaries in affected groups see a significant increase in pre-tax profits.

Our results have policy implications. For all government action and especially the recent tax policy initiatives, the case for state intervention seems to be straightforward. However, this intervention should be globally coordinated and it clearly is key to get low-tax and tax haven countries on board. The costs of unilateral measures – more avoidance behavior, administrative and monitoring cost – clearly exceed the benefits. In fact, the latter seem to be non-existent.

A Appendix

A.1 Data

Table A.1: *Countries with CFC Rules*

Argentina	Czech Republic	Italy	Norway	South Africa
Austria	Finland	Japan	Pakistan	Spain
Azerbaijan	France	Kazakhstan	Peru	Sweden
Belgium	Germany	Korea, Rep.	Portugal	Tajikistan
Bulgaria	Greece	Lithuania	Romania	Turkey
Chile	Hungary	Luxembourg	Russia	UK
China	Iceland	Malta	Slovakia	Venezuela
Croatia	Ireland	Mexico	Sao Tome and Principe	
Cyprus	Israel	Netherlands	Slovenia	

Table A.2: *Variable definitions and sources*

Variable	Definition and source
CIT_{it}	Statutory corporate income tax rate of country i in period t; *Source: RSIT ITID database*
$log(FA)$	Log of fixed assets *Source: Orbis database*
$log(Empl.)$	Log of number of employees *Source: Orbis database*
$log(Size)$	Log of total assets *Source: Orbis database*
$log(GDP)$	GDP at PPP in constant 2017 prices *Source: World Bank, World Development Indicators (WDI)*
$log(GDP\ p.c.)$	GDP per capita at PPP in constant 2017 prices *Source: World Bank, World Development Indicators (WDI)*
$GDP\ growth$	GDP growth (annual %) *Source: World Bank, World Development Indicators (WDI)*
$Inflation$	Inflation rate (annual %) *Source: World Bank, World Development Indicators (WDI)*
$Unemployment$	Unemployment (% of total labor force) *Source: International Labour Organization, ILOSTAT*
$Corruption$	Control of Corruption index [-2.5; 2.5] *Source: World Bank, World Governance Indicators*
$Dom.\ Credit$	Domestic credit to private sector (% of GDP) *Source: World Bank, World Development Indicators (WDI)*
$Fin.\ Freedom$	Financial Freedom index [0; 100] *Source: The Heritage Foundation, 2021 Index of Economic Freedom*

A.2 Additional results

Table A.3: *CFC rules and financial profits*

Dep. variable: $log(Financial\ profits_{it})$	(1)	(2)	(3)	(4)
CFC_{ijt}	-0.137***	-0.167***	-0.122**	-0.164***
	(0.003)	(0.000)	(0.010)	(0.001)
CIT_{it}	-1.030***	-0.932***		
	(0.003)	(0.007)		
CIT_{jt}	-0.288	-0.418	0.00296	-0.121
	(0.388)	(0.216)	(0.993)	(0.726)
$log(FA_{it})$	0.172***		0.166***	
	(0.000)		(0.000)	
$log(Sales_{it})$		0.202***		0.199***
		(0.000)		(0.000)
$log(Empl._{it})$	0.134***	0.105***	0.136***	0.104***
	(0.000)	(0.000)	(0.000)	(0.000)
$Inflation_{it}$	-0.0130***	-0.0118***		
	(0.001)	(0.003)		
$Unemployment_{it}$	0.0303***	0.0329***		
	(0.000)	(0.000)		
$Corruption_{it}$	0.267***	0.290***		
	(0.000)	(0.000)		
$log(GDP_{it})$	0.484	0.114		
	(0.469)	(0.867)		
$log(GDP\ p.c._{it})$	0.482	0.811		
	(0.461)	(0.226)		
$GDP\ growth_{it}$	-0.0205***	-0.0202***		
	(0.000)	(0.000)		
Affiliate FE	X	X	X	X
Year FE	X	X		
Host-Year FE			X	X
N	170079	167812	170048	238939
R^2	0.872	0.872	0.873	0.875

Includes only firm groups with parent shareholders in countries with an established CFC regime and groups with at least two affiliates. CFC binary is an indicator variable that takes the value 1 if the respective affiliate is in a host country with a corporate income tax below the specified threshold. Country controls include GDP level, growth and GDP per capita. Standard errors clustered at the firm group level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: *Effectiveness of CFC rules - Robustness Check*

Dep. variable: $log(PTP_{it})$	(1)	(2)	(3)	(4)
CFC_{it}	-0.0419**	-0.0469***	-0.0692***	-0.0402*
	(0.038)	(0.010)	(0.003)	(0.056)
$(1 - CFC_{ijt}) \times CIT_{it}$			-0.799***	-0.487***
			(0.000)	(0.000)
$CFC_{ijt} \times CIT_{it}$			-0.251	-0.181
			(0.486)	(0.607)
CIT_{it}		-0.667***		
		(0.000)		
CIT_{jt}		0.281**		
		(0.028)		
$log(FA_{it})$	0.0693***	0.0736***	0.0725***	0.0736***
	(0.000)	(0.000)	(0.000)	(0.000)
$log(Empl._{it})$	0.278***	0.265***	0.267***	0.265***
	(0.000)	(0.000)	(0.000)	(0.000)
$Inflation_{it}$		-0.00779***	-0.00772***	-0.00769***
		(0.000)	(0.000)	(0.000)
$Unemployment_{it}$		-0.0205***	-0.0167***	-0.0206***
		(0.000)	(0.000)	(0.000)
$Corruption_{it}$		-0.0471**	-0.0807***	-0.0490**
		(0.048)	(0.004)	(0.040)
$log(GDP_{it})$		-0.768***	-0.870***	-0.775***
		(0.002)	(0.002)	(0.001)
$log(GDP\ p.c._{it})$		0.397	0.568**	0.386
		(0.112)	(0.046)	(0.122)
$GDP\ growth_{it}$		0.0144***	0.0144***	0.0147***
		(0.000)	(0.000)	(0.000)
Affiliate FE	X	X	X	X
Year FE		X		X
Pair FE		X	X	X
Host-Year FE	X			
Home-Year FE	X		X	
N	385419	385413	385407	385413
R^2	0.876	0.875	0.875	0.875

Includes only firm groups with parent shareholders in countries with an established CFC regime and a defined low-tax cut-off and groups with at least two affiliates and observations before 2018 because of the ATAD announcement. CFC binary is an indicator variable that takes the value 1 if the respective affiliate is in a host country with a corporate income tax below the specified threshold. Country controls include GDP level, growth and GDP per capita. Host CIT is centered around 16% in column (3). Standard errors clustered at the firm group level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: *Effectiveness of CFC rules - Placebo Test*

	Coef.	SE	95% conf.	interval
CFC_{it}	-0.0469***	(0.010)	-0.082	-0.011
CFC_{it-1}	-0.0354	(0.113)	-0.050	0.022
CFC_{it+1}	-0.0140	(0.443)	-0.080	0.008

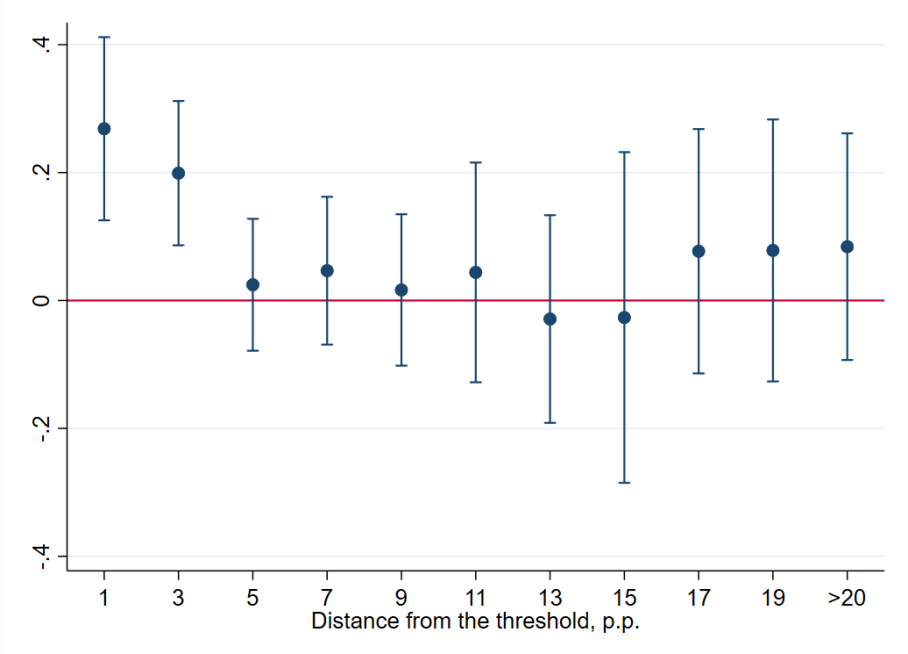
Includes firm and year fixed effects as well as firm and country-level control variables. S Standard errors clustered at the firm group level.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.6: *Summary statistics - Tax bins*

Bin	*Obs.*	*tax differential to parent*	*distance to threshold*	*affiliate tax rate*	*share of foreign affiliates*	*share with* $CIT_{it}<$ CIT_{jt}
1	102,454	0,08	0,01	0,22	1,00	1,00
2	73,164	0,07	0,03	0,21	0,97	0,96
3	301,782	0,02	0,05	0,24	0,30	0,26
4	184,917	0,01	0,07	0,26	0,41	0,27
5	165,680	0,00	0,09	0,25	0,40	0,15
6	87,750	0,00	0,11	0,26	0,76	0,29
7	104,051	-0,01	0,13	0,28	0,55	0,24
8	113,408	-0,02	0,15	0,31	0,41	0,12
9	109,534	-0,01	0,17	0,34	0,18	0,05
10	51,957	-0,03	0,19	0,36	0,34	0
11	28,220	-0,06	0,23	0,41	0,49	0

Mean values for each defined bin of affiliates above their threshold

Figure A.1: *Heterogeneity analysis - CIT bins, full sample*



Dependent variable log(pre-tax profit$_{it}$) of the affiliate. Estimations include controls for fixed assets, employees, GDP level, growth and GDP per capita, inflation, unemployment and corruption. Affiliate and year fixed effects included, standard errors clustered at the firm-group level. Vertical lines represent 95% confidence intervalls.

References

Buettner, T., Overesch, M., Schreiber, U., and Wamser, G. (2012). The impact of thin-capitalization rules on the capital structure of multinational firms. *Journal of Public Economics*, 96(11-12):930–938.

Buettner, T., Overesch, M., and Wamser, G. (2018). Anti profit-shifting rules and foreign direct investment. *International Tax and Public Finance*, 25(3):553–580.

Clifford, S. (2019). Taxing multinationals beyond borders: Financial and locational responses to cfc rules. *Journal of Public Economics*, 173:44–71.

Dischinger, M., Knoll, B., and Riedel, N. (2014). The role of headquarters in multinational profit shifting strategies. *International Tax and Public Finance*, 21(2):248–271.

Egger, P. H., Merlo, V., and Wamser, G. (2014). Unobserved tax avoidance and the tax elasticity of fdi. *Journal of Economic Behavior & Organization*, 108:1–18.

Egger, P. H. and Wamser, G. (2015). The impact of controlled foreign company legislation on real investments abroad. a multi-dimensional regression discontinuity design. *Journal of Public Economics*, 129:77–91.

Heckemeyer, J. H. and Overesch, M. (2017). Multinationals' profit response to tax differentials: Effect size and shifting channels. *Canadian Journal of Economics/Revue canadienne d'économique*, 50(4):965–994.

Huizinga, H. and Laeven, L. (2008). International profit shifting within multinationals: A multi-country perspective. *Journal of Public Economics*, 92(5-6):1164–1182.

Levinsohn, J. and Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *Review of Economic Studies*, 70(2):317–341.

Lohse, T. and Riedel, N. (2013). Do transfer pricing laws limit international income shifting? evidence from european multinationals. *CESifo Working Paper Series*, (4404).

Merlo, V., Riedel, N., and Wamser, G. (2020). The impact of thin–capitalization rules on the location of multinational firms' foreign affiliates. *Review of International Economics*, 28(1):35–61.

OECD (2013). *Action plan on base erosion and profit shifting*. OECD, Paris.

Ruf, M. and Weichenrieder, A. J. (2012). The taxation of passive foreign investment: lessons from german experience. *Canadian Journal of Economics/Revue canadienne d'économique*, 45(4):1504–1528.

Tørsløv, T., Wier, L., and Zucman, G. (2018). The missing profits of nations. *National Bureau of Economic Research*.