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Dissertation

Essays on Profit Shifting and Anti-Tax Avoidance Regulation

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Ruby Doeleman, MSc
Student ID: h12217269

Doctoral Program in International Business Taxation
Subject Area: Economics
WU Vienna University of Economics and Business

Doctoral Committee:

Prof. Dr. Dominika Langenmayr
WU Vienna University of Economics and Business, Katholische Universität Eichstätt-Ingolstadt

Prof. Dr. Dirk Schindler
Erasmus School of Economics

Univ.-Prof. Mag. Dr. Eva Eberhartinger, LL.M.
WU Vienna University of Economics and Business

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Abstract

This dissertation studies how anti-tax avoidance regulation affects multinational enterprises' profit shifting, organizational choices, and real activity. The first chapter shows that Country-by-Country reporting reduces aggregate profit shifting to tax havens but reallocates the remaining shifting toward high-tax affiliates, where tax savings are largest. The second chapter examines how profit shifting is measured and shows that financial statement profits attenuate estimated responses to tax incentives relative to taxable income, largely because of tax-exempt intra-group dividends. The third chapter studies substance requirements in anti-tax avoidance rules. It develops a model in which substance requirements incentivize multinational enterprises to operate fewer tax-haven affiliates while increasing real investment in those that remain, a pattern supported by the data. Taken together, the dissertation shows that anti-tax avoidance rules can affect not only how much profit firms shift, but also where they shift it from, how they organize their group structure, and where they invest.

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Chapter 1

Introduction

1.1 Motivation

Multinational enterprises (MNEs) can reduce their worldwide tax burden by exploiting differences in corporate income taxation across countries. An MNE can organize its group of affiliates and its intra-group transactions in a way that allows it to report profits in low-tax countries even when the underlying economic activity takes place elsewhere (Hines and Rice, 1994). This practice is commonly referred to as profit shifting. Profit shifting erodes tax bases and reduces tax revenue, and policymakers have been aware of the problem for a long time. Already in 1977, the OECD Council urged member states to investigate international tax avoidance and evasion, and to extend the exchange of information between tax authorities.[1] Yet, despite the attention profit shifting has received in research and policy-making, important questions about the magnitude, measurement, and the effects of legislative countermeasures remain unresolved (Dharmapala, 2014).

Despite the large body of research, there is still no consensus on the magnitude of profit shifting. The OECD estimates that countries lose USD 100–240 billion in corporate income tax revenue annually, equivalent to four to ten percent of global corporate income tax revenue. Estimates in the academic literature vary substantially as well. Tørsløv et al. (2023) conclude that approximately one third of global profits are shifted to tax havens, whereas Fuest et al. (2022) estimate that large German MNEs shift around nine percent of their profits. Studies using US foreign direct investment data estimate corporate tax revenue losses ranging from four to forty-five percent (Blouin and Robinson, 2025; Clausing, 2016). Micro-level studies usually find more

[1] OECD/LEGAL/0158.

modest responses. The meta-analyses by Heckemeyer and Overesch (2017) and Beer et al. (2020), for example, report average tax semi-elasticities of approximately -0.8 and -1, respectively. These elasticities imply that a one percentage point increase in the tax-rate differential reduces reported profits by around one percent. The dispersion in estimates of the magnitude of profit shifting reflects a fundamental measurement problem.

The problem is that shifting is not observed directly. Research estimates it from the relationship between reported profits and tax incentives, often using financial statement profits as a proxy for taxable income. However, financial statement profits and taxable income are subject to different rules and can differ even in the absence of profit shifting. Consequently, differences between estimates may reflect both genuine differences in MNE behavior, and differences in what the available data measure. An evaluation of anti-tax avoidance legislation therefore not only depends on behavioral changes of multinationals, but also on whether we can accurately measure these changes.

At the same time, the international tax-policy environment has changed substantially. The past decade of international corporate taxation has been shaped by the OECD Base Erosion and Profit Shifting (BEPS) Project, which currently unites 148 countries to coordinate the design of anti-tax avoidance rules. These policies target different observable features of multinational activity. BEPS Action 13 introduced Country-by-Country (CbC) reporting, under which large MNEs provide tax authorities with a jurisdiction-level overview of profits, taxes, revenues, employment, and tangible assets. BEPS Action 3 introduced Controlled Foreign Company (CFC) rules that tax low-tax income. Many CFC rules contain substance exemptions, under which low-tax affiliates remain outside the rule if they conduct sufficient genuine economic activity. More recently, the Pillar Two global minimum tax has again placed economic substance at the center of international tax policy through its substance-based income exclusion. International anti-tax avoidance rules have therefore developed from increasing the information available to tax authorities toward explicitly conditioning tax consequences on firms' real economic activity.

Evidence on the effectiveness of these anti-tax avoidance rules is mixed. It also seems difficult to disentangle paper-profit-shifting responses from changes in real activity. Interest-limitation and thin-capitalization rules reduce some forms of internal debt, but firms can respond through other financing and investment choices (Buettner et al., 2012; Nicolay et al., 2017). CFC rules reduce the incentive to report passive income in low-tax affiliates, but they also affect where MNEs establish affiliates relative to statutory thresholds (Clifford, 2019; Hansen et al., 2023). Evidence on CbC reporting

similarly points to modest aggregate effects and strategic responses around the reporting threshold (Hugger, 2025; Joshi et al., 2025). Evidence covering several Austrian anti-avoidance rules shows that some measures substantially increase reported taxable income, but might also have real effects (Amberger and Pendl, 2026). A small estimated effect for aggregate outcomes may imply that a rule is ineffective, but could also imply that MNEs respond on a margin that the aggregate outcome does not measure.

This dissertation starts from this distinction between profit shifting and real effects. In my research, I ask how anti-tax avoidance rules change multinational behavior and how researchers can accurately measure these responses. The central argument is that anti-tax avoidance rules do not simply determine how much profit is being shifted. By changing which activities are observable, costly, or necessary to obtain a tax advantage, they also change *how* MNEs organize their tax planning across affiliates and across different margins of adjustment.

How an MNE responds to anti-tax avoidance rules depends on the design of the rule. The three chapters in this dissertation develop this argument from complementary perspectives. Chapter 2 studies a transparency rule. CbC reporting is intended to help tax authorities identify profit shifting by providing information on MNEs' activities across the whole MNE group. The chapter shows that the resulting group-level audit signal links shifting decisions across affiliates. Total profit shifting to tax havens declines, but the remaining shifting is concentrated in affiliates where the tax savings are largest. Chapter 3 turns to measurement of profit shifting. It shows that the standard financial statement proxy for taxable income attenuates estimated income-shifting responses and provides guidance on how to correct for these biases. Chapter 4 studies substance exemptions. When anti-tax avoidance rules require real activity in low-tax affiliates, MNEs consolidate their group structure and invest more in the low-tax affiliates they retain.

Taken together, the papers in this dissertation show why evaluating anti-tax avoidance regulation requires taking into account the institutional details of the rule. Transparency regulation can reduce aggregate profits in tax havens, while reallocating profit shifting across source countries. Substance requirements can restrict purely paper-based arrangements, but increase real investment in low-tax affiliates to facilitate continued profit shifting. Financial statement data can understate the tax responsiveness compared to tax-return data. Across these settings, regulation changes the relative attractiveness of different margins of adjustment. Understanding the effects of anti-tax avoidance rules therefore requires studying how MNEs change real behavior, not just how much profit they shift.

1.2 Summary of the Three Chapters

Throughout the dissertation, I use a few terms specific to profit shifting, which I will define here first. An *MNE group* is the set of legally separate companies that are ultimately controlled by the same parent.[2] Each of those companies is an *affiliate*. Affiliates file their own unconsolidated accounts and their own tax return in the country where they are resident. I call a country *high-tax* or *low-tax* relative to the other countries in which the same MNE group operates, because it is the differential between tax rates, not the level, that creates the incentive to shift profit. A *tax haven* is a jurisdiction that combines a very low or zero corporate rate with the legal infrastructure to host affiliates that have little or no operational purpose. *Profit shifting* moves taxable income between affiliates while leaving the underlying activity where it is, through transfer prices, intra-group interest, or royalties. *Investment shifting* moves activities themselves, in the form of fixed assets and employees. *Substance* is real activity, and a *substance requirement* is a provision that exempts the application of an anti-tax avoidance rule for affiliates that have enough substance.

Chapter 2: Could Country-by-Country Reporting Increase Profit Shifting?

Chapter 2, co-authored with Dominika Langenmayr and Dirk Schindler, asks whether CbC reporting changes where profits are shifted *from*. CbC reporting was introduced to reduce an information asymmetry between MNEs and tax authorities. MNEs above a threshold of EUR 750 million in consolidated revenue must report, for every jurisdiction in which they operate, profits, taxes, revenues, employment, and tangible assets to the tax authority. This information is then exchanged between tax authorities of the countries in which the MNE is active. Tax authorities can therefore evaluate the profitability of an affiliate relative to the MNE's worldwide activities and, in particular, observe how much profit is reported in tax havens.

We develop a model with productive affiliates in a high-tax and a low-tax country and a tax haven affiliate. Profit shifting yields tax savings, but also creates tax-planning and audit costs. Before CbC reporting, audit costs depend on the behavior of the local affiliate. With CbC reporting, audit costs additionally depend on the group's total haven profits. This group-level audit signal links previously separable shifting decisions across the MNE group. It generates a *direct effect*—higher expected audit costs reduce

[2] Chapter 2 writes MNC where Chapters 3 and 4 write MNE. The object is the same; I use MNE throughout this introduction.

total profit shifting–and a *substitution effect*—the MNE concentrates the remaining shifting in the high-tax affiliate where the marginal tax saving is largest. The model therefore predicts—relative to a world without CbC reporting—that CbC reporting reduces total haven profits and shifting from low-tax affiliates, but can increase shifting from high-tax affiliates due to the opportunity cost of shifting from the low-tax affiliate.

We test these predictions using unconsolidated Orbis data covering more than 45,000 affiliates of roughly 6,000 large groups over 2012-2021. Exposure to CbC reporting depends on the location of the ultimate parent, the implementation of the reporting requirement in that country, and whether the MNE group exceeds the consolidated-revenue threshold. In a difference-in-differences design, we compare changes in affiliate profitability around the introduction of CbC reporting and allow the treatment effect to vary with the affiliate country's statutory corporate tax rate.

The estimates follow the model's predictions. Profitability in tax-haven affiliates decreases, consistent with a reduction in total profit shifting to tax havens. Profitability in low-tax productive affiliates increases, consistent with less outward shifting from these countries, but decreases in high-tax productive affiliates, consistent with more outward shifting. CbC reporting therefore reduces profit shifting in aggregate while changing the composition of the remaining shifting. Back-of-the-envelope calculations illustrate the quantitative relevance of this reallocation: The estimates imply a loss of approximately 5.3% of pre-CbC-reporting corporate income tax revenue for Germany and 2.9% for Japan, as typical high-tax countries.

The chapter contributes to the literature by showing that a transparency rule can reduce an activity in aggregate while increasing it in particular locations. This result helps reconcile modest aggregate estimates of the effects of CbC reporting with economically meaningful changes in MNE behavior. More broadly, the mechanism applies whenever regulation creates a group-level cost while the benefits of the regulated activity differ across affiliates: MNEs can respond not only by reducing the activity, but also by changing where within the group it takes place.

My contribution to this chapter is as follows. I collected existing literature and institutional details and synthesized it into an overview. For the modeling, the core idea comes from my co-authors, and I contributed by checking derivations and running simulations. I had a primary role in the empirical analysis, including data collection, cleaning, empirical design, coding, running analyses, and writing up the empirical sections of the chapter. All three of us shared in writing and re-writing the chapter. Core strategic decisions about the chapter regarding submission and revision were made together.

Chapter 3: (Mis)measurement of Income Shifting

Chapter 3, co-authored with Harald Amberger and Stefanie Pendl, asks how reliably financial statement profits measure tax-motivated income shifting at the entity level. Most cross-country microdata analyses do not observe taxable income and instead use pre-tax profit reported in unconsolidated financial statements. The chapter directly tests the assumption underlying this approach by comparing financial statement profits with taxable income reported on corporate tax returns for the same legal entities.

The empirical setting is Austria over 2012-2019. Austria provides a useful setting because its corporate income tax rate remained constant over the sample period, while Austrian entities face different and changing tax rates elsewhere in their corporate groups. We construct a dataset linking administrative corporate tax returns from the Austrian Micro Data Center to Orbis Historical financial statements and administrative foreign-affiliate statistics. The matched data allow us to estimate the same income-shifting specification using taxable income and financial statement profit for exactly the same entity-years. Following Hines and Rice (1994) and Huizinga and Laeven (2008), we measure shifting incentives using the difference between the Austrian corporate tax rate and the lowest foreign statutory tax rate available within the group.

Using taxable income, we estimate a tax semi-elasticity of -0.9, comparable to existing estimates (Heckemeyer and Overesch, 2017; Beer et al., 2020). At the mean tax differential in our sample, the estimate implies that the average entity shifts roughly two percent of its taxable income out of Austria; for entities with tax-haven ties, the semi-elasticity is approximately -4. Replacing taxable income with pre-tax financial statement profit reduces the estimated semi-elasticity by more than half, to -0.4. We reconcile the two profit measures and show that an important source of this attenuation is tax-exempt intra-group dividend income. Decomposing the impact of different tax-return items, we find that 35% of the difference between can be explained by intra-group dividends alone. Dividends increase financial statement profits but are generally excluded from taxable income. Because entities with stronger outward-shifting incentives also receive more foreign dividend income, the financial statement proxy is inflated precisely where shifting is greater, attenuating the estimated response to tax incentives.

We provide a practical correction to financial-statement profits for researchers that do not have access to tax-return data. Removing foreign dividend income from financial statement profits substantially decreases the gap with the tax-return estimate. Importantly, a similar improvement can be achieved using dividend information reported in the financial statements themselves, so the correction does not require access to confidential tax-return data. The chapter therefore provides a way to improve entity-level

income-shifting estimates rather than only documenting that the standard proxy is imperfect.

The chapter makes two contributions. First, it validates the most common entity-level proxy for taxable income against tax-return data and quantifies the disparity. This evidence complements research on the upward bias in consolidated data by showing that accounting for intra-group dividends can produce the a downward bias at the unconsolidated entity level: Financial statement profits attenuate the estimated shifting response. Second, it demonstrates that measurement error is not neutral across profit-shifting channels. The same accounting item that biases the overall semi-elasticity also affects the empirical importance of profit-shifting strategies.

My contribution to this chapter is as follows. Harald developed the initial idea as part of a grant proposal; he was in charge of managing the grant and the contacts with the data provider. Stefanie collected existing literature and wrote the literature overview and the institutional background. I had a primary role in the early stages of the empirical analysis, including requesting access, data collection, cleaning, empirical design, and coding. Stefanie and I shared running the empirical analysis. All three of us shared in the conceptual development of the chapter as well as in writing and re-writing the draft. Core strategic decisions about the chapter regarding submission and revision were made together.

Chapter 4: Substance-ial Investment Shifting

Chapter 4 asks how substance exemptions change the organizational structure and real investment of MNEs. The chapter starts with a stylized fact about multinational groups that standard models of profit shifting leave unexplained. Among the hundred largest MNEs, the average group has 549 affiliates, 68 of them in offshore financial centers (United Nations Conference on Trade and Development, 2016). In my sample, 48.1% of groups hold at least one haven affiliate, with a mean of 3.7 among those that do. Tax-haven affiliates are dispersed and tend to be located relatively close to the group's productive affiliates rather than concentrated in a single global hub. This raises two related questions: Why does an MNE operate several tax-haven affiliates, and how does requiring real economic activity in each of them change this organizational choice?

I study these questions in the context of CFC rules with substance exemptions. CFC rules allow the parent country to tax certain passive income earned by low-tax foreign affiliates. Substance exemptions switch off this treatment when an affiliate has sufficient economic activity, for example employees, equipment, assets, or premises.

While such exemptions are intended to protect genuine economic activity, they also make access to the tax benefits of a tax-haven affiliate conditional on reporting real activity.

The chapter develops a model based on Salop (1979) in which the MNE chooses its number of tax-haven affiliates endogenously. Productive affiliates shift profits to nearby tax-haven affiliates, where greater distance makes shifting more costly. The MNE chooses how much profit to shift, how much to invest in each tax-haven affiliate, and how many tax-haven affiliates to operate. A substance requirement increases the cost of maintaining each tax-haven affiliate and generates two margins of adjustment. On the *extensive margin*, the MNE operates fewer tax-haven affiliates. On the *intensive margin*, each remaining tax-haven affiliate serves a larger part of the MNE group's productive affiliates and receives greater real investment. Substance requirements therefore induce the MNE to consolidate its profit-shifting structure into fewer, larger tax-haven affiliates.

I test these predictions using Orbis Historical ownership and financial statement data for 2010–2023 combined with information on CFC and substance rules. In addition to OECD data, I hand-collect national legislation on tax-rate thresholds, reform dates, and substance exemptions. Whether an affiliate is affected depends jointly on the country of its controlling shareholder, the CFC rule in force in that country, and whether the affiliate's statutory tax rate falls below the applicable threshold. This creates variation across affiliates located in the same host country but controlled by shareholders in different countries.

The extensive-margin results show that greater exposure to a substance requirement reduces the survival of affected affiliates relative to the group's other affiliates. On the intensive margin, I study tangible fixed assets, employment, and employee costs in low-tax affiliates that become subject to a substance requirement. The estimates suggest that the remaining tax-haven affiliates increase their real economic activity following exposure to a substance requirement, consistent with the intensive-margin prediction of the model.

Finally, I ask whether this additional activity comes at the expense of other affiliates in the MNE group. If substance requirements incentivize MNEs to relocate existing activity from high-tax productive affiliates to tax-haven affiliates, investment should decline in unaffected group members when another affiliate becomes subject to a substance requirement. I find no significant evidence of such a decline. The result is consistent with investment in low- and high-tax affiliates being complementary rather than purely pure substitutes.

The chapter's main contribution is to analyze MNEs' organizational structures in light of substance-based exemptions. Existing work shows that anti-avoidance policies can affect real investment; this chapter additionally makes the number and location of low-tax affiliates a choice of the MNE and shows how substance requirements affect both the extensive and intensive margins of that choice. The findings also speak directly to the substance-based income exclusion under the global minimum tax. A carve-out based on payroll and tangible assets may protect genuine activity, but it simultaneously creates an incentive for MNEs to locate those inputs strategically.

This chapter is single-authored.

1.3 Methodology and Data

Throughout my research, I aim to combine applied theory models that predict outcomes with empirics that test these predictions. I use economic theory, microdata, and institutional detail to identify the margins along which MNEs respond to international tax incentives.

In Chapters 2 and 4, formal models yield predictions about MNE responses to anti-tax avoidance rules. In Chapter 2, the MNE maximizes after-tax profits subject to tax-planning and audit costs. CbC reporting changes the information available to tax authorities and thereby links profit-shifting decisions across affiliates. The comparative statics generate predictions not only for total profit shifting, but also for the allocation across affiliates. In Chapter 4, I use a Salop framework to model an MNE's group structure. The model formalizes the trade-off between investing in tax-haven affiliates and concentrating profit shifting and real investment in fewer affiliates, allowing me to distinguish the extensive and intensive margins of responses to substance requirements.

Chapter 3 plays a complementary role by examining whether the outcome commonly used to measure these responses—financial statement profit—accurately captures the underlying tax base. We do not introduce a model, but make a statistical contribution. We estimate the same income-shifting specification using taxable income versus financial statement profit for the same entity-years. We then reconcile differences between the two measures using individual tax-return items and evaluates corrections that can also be implemented with publicly available financial statement data. In this sense, the chapter provides a validation exercise for an outcome used in the empirical literature (and in the other chapters of this dissertation).

The empirical analyses in the three chapters use three different sources of data. First, all three chapters use Historical Orbis data from Bureau van Dijk (now part of

Moody's Analytics). Historical Orbis provides archived information on firms' unconsolidated financial statements and ownership structures, making it possible to reconstruct MNE groups and their activities over time. Bureau van Dijk combines information from company filings, official registries, and other national data providers and standardizes these records across countries (Kalemli-Özcan et al., 2024). Chapters 2 and 4 use these data to study affiliate-level responses across a large number of countries.

Second, Chapter 3 links Orbis to confidential administrative data from the Austrian Micro Data Center (AMDC). Corporate tax returns provide taxable income and detailed tax adjustments, while administrative foreign-affiliate statistics provide ownership relationships between Austrian firms and foreign entities. Linking these sources to Orbis makes it possible to observe financial statement profit and taxable income for the same legal entities. This comparison is particularly relevant for the dissertation as a whole: it clarifies what the Orbis-based profitability measures used in Chapters 2 and 4 capture and why changes in accounting profits should not automatically be interpreted as one-for-one changes in taxable income.

I also hand-collect policy data. Chapter 2 codes the timing and scope of CbC reporting, including implementation in the country of the ultimate parent and the consolidated-revenue threshold. Chapter 4 combines OECD information with hand-collected national legislation on CFC rules. The resulting data capture changes in tax-rate thresholds, the presence of substance exemptions, and the timing of reforms. This institutional detail is necessary because treatment depends not only on whether a policy exists, but also on how the policy applies to a particular affiliate within an MNE group.

The empirical designs exploit different sources of within-firm and within-group variation. Chapter 2 uses the staggered introduction of CbC reporting across parent countries together with the consolidated-revenue threshold. Chapter 3 exploits within-entity changes in foreign statutory corporate tax rates while Austria's own corporate tax rate remains constant. Chapter 4 combines changes in CFC and substance rules with tax-rate thresholds and differences in shareholder location among affiliates operating in the same host country.

Finally, the empirics are organized to be reproducible. Each chapter has a replication package that generates its tables, figures, and estimates. For Chapter 3, the repository is public and can be found here: https://www.wu.ac.at/en/business-taxation/research/oeaw-research-project-cross-border-income-shifting.

1.4 Contributions and Significance

Taken together, the three chapters in this dissertation provide three broader lessons for the analysis and design of international anti-tax avoidance policy.

The first is that anti-tax avoidance rules can change the *margin* on which MNEs respond without eliminating the underlying tax incentive. Regulation typically makes a particular form of tax avoidance more costly by increasing information, restricting a transaction, or conditioning a tax advantage on observable activity. MNEs can respond not only by reducing the targeted behavior, but also by reallocating it across affiliates or substituting toward another margin of adjustment. Chapter 2 illustrates this mechanism for profit shifting: CbC reporting reduces total profits reported in tax havens while reallocating the remaining outward shifting toward high-tax affiliates. Chapter 4 shows a related response in the organization of real activity: substance requirements incentivize MNEs to operate fewer low-tax affiliates while concentrating investment in those that remain. These results imply that modest aggregate effects of an anti-avoidance rule need not indicate that the policy left MNE behavior unchanged. Evaluating a policy therefore requires studying whether behavior reallocates when profit shifting becomes more costly.

The second lesson is that accurate measurement of tax outcomes is important. Profit shifting is not observed directly, and empirical conclusions depend on how closely the outcome used by researchers corresponds to the tax base that firms actually report. Chapter 3 shows that pre-tax financial statement profit substantially understates the sensitivity of taxable income to shifting incentives and can also distort conclusions about the relative importance of different shifting channels. At the same time, the chapter provides practical guidance: Researchers without access to tax returns can use information in unconsolidated financial statements to construct a profit measure that more closely approximates taxable income. More generally, the results show why the institutional details governing financial accounting and taxation should form part of the empirical research design rather than be treated only as a robustness concern.

The third lesson is that economic substance is not necessarily an outcome that can be treated independent of tax planning. Substance-based exemptions are attractive policy attributes because employees and tangible assets appear harder to manipulate than paper profits. However, once the tax treatment of an affiliate depends on its real activity, the MNE has an incentive to adjust that activity. Chapter 4 shows that substance requirements can therefore transform real investment itself into a margin of tax planning. They may align reported profits with larger investment in tax-haven

affiliates, but not necessarily with the activity that generated those profits before the rule was introduced. This distinction is particularly relevant for current international tax policy, including the substance-based income exclusion under the global minimum tax.

These lessons point to a common implication for policy evaluation. Anti-tax avoidance rules should be assessed at the level at which MNEs make decisions, taking into account the entire group structure and different adjustment margins. The relevant question is not only whether the outcome directly targeted by a rule declines, but also how the rule changes the relative attractiveness of alternative locations, organizational structures, and real and financial activity. At the same time, the empirical outcomes used to evaluate these responses should correspond as closely as possible to the underlying tax base. Combining these two perspectives—behavioral adjustment and accurate measurement—affects how we look at the effects of transparency regulation, the measurement of profit shifting, and substance-based anti-tax avoidance rules.

The most important limitation to the research in this dissertation is data quality. All of the chapters rely on financial-statement and ownership data from Orbis. Orbis does not cover all firms or ownership links and is least complete in some of the jurisdictions most relevant for profit shifting. Importantly, as Chapter 3 demonstrates, pre-tax financial statement profit is an imperfect proxy for taxable income. The administrative data in that chapter is from Austria, and the magnitude and potentially the direction of the difference between book and taxable income depend on national accounting and tax rules. The results should therefore not be interpreted as implying that the exact measurement correction identified for Austria transfers mechanically to other countries. Rather, they reinforce the broader point of the dissertation: institutional details, data measurement, and the margins along which firms can respond are integral to the evaluation of international tax policy.

1.5 Outline

The dissertation is structured as follows. All chapters are self-contained and can be read independently. This chapter (Chapter 1) provides the introduction and binds the dissertation together. Chapter 2 contains my paper with Dominika Langenmayr and Dirk Schindler on Country-by-Country Reporting. Chapter 3 contains my paper with Harald Amberger and Stefanie Pendl on the measurement of profit shifting. Chapter 4 contains my single-authored paper on substance rules.

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Chapter 2

Could Country-by-Country Reporting Increase Profit Shifting?[1]

Ruby Doeleman, Dominika Langenmayr, and Dirk Schindler

Abstract. Since 2016, Country-by-Country reporting has provided tax authorities with detailed information about multinationals' worldwide activities. We model Country-by-Country reporting as increasing tax planning and tax audit costs for profit-shifting multinationals, where the latter costs depend on the share of profits in tax havens. Then, Country-by-Country reporting makes shifting profits from a high-tax country to a tax haven more attractive compared to shifting from a low-tax country. Thus, while total profits shifted to the haven decrease, profit shifting from high-tax affiliates may *increase* relative to the situation without Country-by-Country reporting. We confirm these changes in profit-shifting patterns using a difference-in-differences design.

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2.1 Introduction[2]

International profit shifting by multinational corporations (MNCs) has long challenged tax authorities (e.g., Beer et al., 2024; Merlo and Wamser, 2024), in part because it was difficult to detect with the available information. Country-by-Country (CbC) reporting substantially narrowed this information gap. Before CbC reporting, tax authorities typically observed only the local affiliate, its reported profits, and its transfer prices. If an affiliate was weakly profitable, authorities could not tell whether this reflected low real profitability or profit shifting within the group, because they lacked information on whether the MNC was more profitable elsewhere—particularly in tax havens. CbC reporting fundamentally changed this information environment. For each jurisdiction, large MNCs are now required to report pre-tax profits, taxes paid, revenues, employment, and tangible assets. This information is exchanged among tax authorities, so that national tax authorities now have, for the first time, a group-wide overview of the geographic distribution of profits and real activity, allowing them to directly observe the profitability of tax haven entities and to assess local outcomes within the full global context (OECD, 2017). While the OECD presented CbC reporting as a major breakthrough originally, its effect on tax payments of affected MNCs turned out to be modest at best (e.g., Joshi, 2020; Overesch and Wolff, 2021; Hugger, 2025).

In this paper, we investigate how CbC reporting changes profit shifting patterns. We first develop a theoretical model, which confirms that CbC reporting reduces profit shifting overall. Our central contribution is to show that CbC reporting changes where profits are shifted from: While profit shifting from low-tax affiliates declines, profit shifting from high-tax affiliates may increase relative to a world without CbC reporting. We confirm this pattern using affiliate-level data in a difference-in-differences design. In particular, profitability in tax havens declines, indicating a reduction in total profit shifting, and profitability of low-tax affiliates rises, consistent with reduced outward shifting. Strikingly, profitability of high-tax affiliates decreases, consistent with increased outward profit shifting. According to our back-of-the-envelope calculations, Germany (as a typical high-tax country) loses about 5.3% of its corporate income tax revenue.

[2]My contribution to this chapter is as follows. I collected existing literature and institutional details and synthesized it into an overview. For the modeling, the core idea comes from my co-authors, and I contributed by checking derivations and running simulations. I had a primary role in the empirical analysis, including data collection, cleaning, empirical design, coding, running analyses, and writing up the empirical sections of the chapter. All three of us shared in writing and re-writing the chapter. Core strategic decisions about the chapter regarding submission and revision were made together.

Intuitively, this pattern arises because CbC reporting changes how tax authorities target tax audits. Tax authorities now target firms with high total profits in tax havens, but CbC reports do not reveal from which country these profits originate. As a result, profit shifting decisions across affiliates become interlinked: Shifting more profits from one affiliate raises the expected audit costs for the entire group. Then, firms optimally concentrate remaining profit shifting where tax savings are highest, i.e., in the high-tax country. This reallocation explains how CbC reporting increases shifting from high-tax countries despite decreasing overall profit shifting.

To analyze these effects formally, we develop a model of profit shifting under CbC reporting. The model considers an MNC with two productive affiliates, one located in a high-tax country and one in a low-tax country, as well as a tax-haven affiliate that serves as a profit center. The MNC can shift profits from the productive affiliates to the tax haven through intra-group payments, such as royalties or service fees. Profit shifting generates tax savings but is costly. We distinguish between two types of costs that MNC affiliates face. First, *tax planning costs* capture the resources required to design and justify transfer prices that deviate from arm's-length benchmarks. Second, *tax audit costs* capture the expected costs of tax audits, which increase with the perceived aggressiveness of the firm's profit-shifting behavior. Before CbC reporting, tax authorities observe only domestic information so that tax audit costs depend solely on the local affiliate's behavior. With CbC reporting, tax audit decisions by tax authorities additionally rely on the total amount of profits reported in the tax haven.

This change in the information available for tax audits links profit-shifting decisions across affiliates. When tax audit costs depend on total haven profits, shifting profits from one affiliate raises the tax audit risk for the entire group. As a result, CbC reporting has two effects. A direct effect increases expected tax audit costs and reduces total profit shifting to tax havens. A substitution effect reallocates profit shifting toward affiliates where tax savings are highest. Because shifting profits out of high-tax countries yields larger tax savings than shifting out of low-tax countries, MNCs optimally concentrate profit shifting in high-tax affiliates. The model therefore predicts asymmetric effects across countries: Tax havens lose tax base; low-tax countries unambiguously gain; and high-tax countries benefit less and may even lose tax base if tax audit costs are sufficiently important relative to tax planning costs.

To test the model's predictions, we use unconsolidated affiliate-level data from Orbis covering more than 45,000 affiliates belonging to about 6,000 large MNCs worldwide. We employ a difference-in-differences design that compares affiliates of MNCs subject to CbC reporting with affiliates of otherwise similar MNCs that are not (yet)

subject to CbC reporting, before and after CbC reporting becomes effective. Whether an affiliate becomes subject to CbC reporting depends on the location of the ultimate parent and on whether the group meets a revenue threshold. Guided by the theory, we focus on changes in affiliate profitability—measured as profit before tax relative to total assets—and allow treatment effects to differ systematically with statutory tax rates.

The empirical results strongly support the model's predictions. Following the introduction of CbC reporting, affiliates in low-tax countries experience an increase in profitability, consistent with reduced outward profit shifting from these locations. In contrast, affiliates in high-tax countries become less profitable, indicating increased profit shifting out of high-tax locations. These opposing effects imply a reallocation of profit shifting within the MNC rather than a uniform reduction across affiliates. We also find that profitability in tax-haven affiliates declines, consistent with a reduction in total profit shifting. Taken together, the empirical findings support the substitution mechanism highlighted by the model.

These empirical patterns extend the existing literature on the effects of CbC reporting and help reconcile differences between consolidated- and affiliate-level analyses. Several studies document that CbC reporting led to only modest changes in aggregate tax outcomes. Relying on firm-level data, Joshi (2020) uses the CbC reporting revenue threshold in regression discontinuity and difference-in-differences designs. She finds a significant but modest increase in affected MNCs' consolidated effective tax rates (ETRs), and only limited evidence for a decrease in profit shifting at the affiliate level.[3] Hugger (2025) uses bunching analysis to show significant regulatory avoidance: MNCs avoid becoming subject to CbC reporting by reporting consolidated revenue below the EUR 750 million threshold. He also studies the effect of CbC reporting on tax avoidance in a difference-in-differences design and finds that consolidated ETRs of affected MNCs increase significantly. At the affiliate-level, the tax sensitivity of profits declines after the introduction of CbC reporting.[4]

The empirical literature on the EU Capital Requirements Directive (CRD) IV, which introduced public CbC reporting for the financial sector, also provides insight

[3]On aggregate level, Joshi (2020)'s results do not hold when she uses the consolidated cash ETR as dependent variable, and they become insignificant when controlling for average statutory tax rates and the number of affiliates. On affiliate level, she does not find significant evidence that affiliate-level pre-tax earnings increase after MNCs become subject to CbC reporting.

[4]Hugger (2025) also splits the sample into high- and low-tax affiliates. He finds that the share of pre-tax profits reported in high-tax countries increases, but does not find a significant effect for low-tax countries. These results differ from ours, possibly because Hugger (2025) does not include affiliate- or country-level fixed effects and relies on a substantially smaller sample.

into the relationship between tax avoidance and transparency. Overesch and Wolff (2021) estimate a difference-in-differences model for the ETR of EU banks compared to banks not covered by the directive. They find evidence that CbC reporting increases ETRs, but only for banks that are particularly exposed to the CbC reporting requirements because they report tax-haven activities. Their event-study evidence suggests that the aggregate effect is limited. Joshi et al. (2020) study public CbC reporting for EU banks by estimating a production function using the tax-incentive variable developed by Huizinga and Laeven (2008). They find limited evidence that public CbC reporting increases the pre-tax income of EU banks' affiliates and do not find robust evidence for an increase in the ETR of affected EU banks in general.

As a main take-away, private and public CbC reporting appear to have modest aggregate tax effects, while affiliate-level effects remain unclear. The substitution effect we propose offers an explanation for this pattern. CbC reporting reduces total profit shifting, but also concentrates remaining shifting in high-tax affiliates. This reallocation buffers aggregate tax payments and can mute average affiliate-level effects on profitability and ETRs. The back-of-the-envelope calculations in Section 2.7.4 show that this effect can be quantitatively meaningful.

Focusing on U.S. MNCs, Nessa et al. (2025) use difference-in-difference and regression discontinuity models around the threshold of USD 850 million and do not find significant effects of CbC reporting, neither for paper profit shifting nor for real activity. They see two reasons for these null results: First, U.S. tax authorities already had relatively rich information prior to CbC reporting through IRS Form 5471 so that the introduction of CbC reporting provided little additional information to U.S. tax authorities. Second, the U.S. did not implement the OECD's Multilateral Competent Authority Agreement on the exchange of CbC reports and shares CbC reports with fewer jurisdictions than other countries such that "...U.S. CbCR may provide less incremental information to relevant tax authorities than non-U.S. CbCR" (Nessa et al., 2025, pp. 954f). Thus, also non-U.S. tax authorities gain little additional information on U.S. MNCs. That the U.S. limits information exchange with other countries is in line with our results: The U.S. is a high-tax country (until 2018 at least) and according to our model does not stand to gain (much) from CbC reporting.

Further literature studies the real effects of CbC reporting. Using difference-in-differences and regression discontinuity analysis, De Simone and Olbert (2022) study European MNCs and show that firms respond to CbC reporting by reallocating real activity: Capital and employment increase in countries with preferential tax regimes—which correspond to low-tax countries in our model—while tax-haven affiliates are

closed. In contrast, using a regression discontinuity design, Joshi et al. (2025) find that outbound-shifting affiliates reduce their misalignment between profits and real activity, but in a surprising way: Rather than reporting higher income and reducing profit shifting, misaligned affiliates in non-haven countries primarily reduce their fixed assets, i.e., scale back economic activity. At the same time, affiliates that were not shifting profits abroad increase their fixed assets. Our results complement this strand of the CbC literature in two ways. First, our theory shows how economic substance in haven affiliates can facilitate profit shifting and provides a mechanism for why such affiliates may nevertheless be phased out under CbC reporting. Second, we highlight and empirically support an additional adjustment margin: Beyond reallocating real activity, MNCs also strategically adjust paper profit shifting in response to CbC reporting.

More broadly, our paper contributes to the theoretical literature on anti-tax avoidance rules and their incentive effects. A recurring insight in this literature is that policies designed to curb profit shifting can alter firms' behavior in unintended ways. Work on thin capitalization and earnings stripping rules highlights that anti-avoidance measures can reduce profit shifting but at the cost of distorting investment incentives or shifting activity across margins (Haufler and Runkel, 2012; Gresik et al., 2017; Mardan, 2017; Haufler et al., 2018). We add to this literature by showing that a transparency-based anti-avoidance measure—CbC reporting—can have similarly unintended effects: While it reduces profit shifting overall, it can increase profit shifting out of high-tax countries. We are not aware of any other paper showing that well-intended and well-drafted regulation directly *increases* the activity that it aims to curb.

Finally, the substitution effect highlighted in this paper is not specific to CbC reporting but arises more generally whenever three conditions are met. First, regulation imposes costs at the group level. Second, the benefits from the regulated activity accrue at the affiliate or activity level and are heterogeneous, for example because tax savings differ or marginal profitability varies across activities and locations. Third, the regulation constrains aggregate outcomes but does not pin down where within the group the regulated activity originates. In such settings, firms optimally comply with regulation by reallocating remaining activity toward affiliates or activities with the highest marginal gains.

This mechanism is not limited to taxation. A closely related example are EU fleet-wide CO_2-emission standards for car manufacturers. These impose penalties based on average emissions at the fleet level, while allowing emissions to differ across vehicle types. Manufacturers therefore comply with aggregate targets by concentrating remaining emissions in high-margin vehicle segments, such as SUVs or luxury cars

(see, e.g., Knittel, 2012). While total emissions fall, emissions associated with specific products—and potentially specific locations where these products are predominantly used—may increase. As in the case of CbC reporting, regulation that operates at the group level can thus reshape the allocation of activity across units, with uneven local consequences despite achieving its aggregate objective.[5]

We next discuss the institutional background of CbC reporting. Subsequently, in Section 2.3, we set up a stylized model of profit shifting. Section 2.4 characterizes the effects of CbC reporting on profit shifting and tax bases across countries, highlighting the direct reduction in overall profit shifting and the substitution effect toward high-tax affiliates. Section 2.5 illustrates this mechanism in a stylized setting with multilateral CbC reporting and homogeneous shifting costs to sharpen intuition and clarify the underlying forces. We highlight links of our theoretical analysis to previous empirical findings in Section 2.6 and also derive testable predictions of our model. Section 2.7 presents our own empirical analysis. Section 2.8 concludes.

2.2 Country-by-Country Reporting

In 2015, the OECD published its Base Erosion and Profit Shifting (BEPS) Action 13 Final Report on Transfer Pricing Documentation and Country-by-Country Reporting (OECD, 2015). BEPS Action 13 requires countries that are part of the Inclusive Framework on BEPS to implement CbC reporting requirements in their national legislation.[6] An MNC is obliged to submit a CbC report in the year after its consolidated global revenues exceed EUR 750 million (OECD, 2015, p. 9). This threshold is assessed on a year-by-year basis, and MNCs cannot voluntarily opt in or out of CbC reporting.

Based on 2016 data from Bureau van Dijk's Orbis, 90% of worldwide MNC profits are covered (OECD, 2020, par. 505). The OECD (2016) suggests that CbC reporting covers around 7,000 MNC groups worldwide—a lower bound, since not all countries that participate in CbC reporting provide data for these statistics. Based on current data from Orbis, a total of 9,600 MNCs have consolidated revenue above EUR 750 million, which amounts to 16.5% of all MNCs in the database.

[5] A similar logic arises under consolidated capital regulation in the financial sector, such as Basel III for banks or Solvency II for insurance groups, where minimum capital or leverage requirements are assessed at the group level. When the consolidated constraint binds and local requirements are not tighter, financial groups retain discretion over the allocation of risk across subsidiaries and may shift activity toward units with higher marginal returns.

[6] As of 2026, 147 countries are part of the Inclusive Framework on BEPS, and over 120 have implemented CbC reporting (OECD, 2025, p. 10).

The goal of CbC reporting is to generate and provide high-level information that tax authorities can use for transfer pricing and BEPS risk assessments. CbC reporting should enable tax authorities to identify artificial profit shifting, understand, and address such BEPS behaviors (OECD, 2015, p. 9). The CbC report therefore provides a starting point for tax authorities to target audit resources more effectively.[7]

CbC reporting entails a three-tiered structure. First, the 'Ultimate Parent Entity' drafts a *master file*, which provides standardized information on the MNC's global activities and organizational structure relevant to all jurisdictions in which members of the MNC group operate. Second, domestic affiliates provide information about their material business activities in *local files*, which include information on related party transactions, the amounts involved, and the transfer pricing analysis behind these transactions.[8] Lastly, the MNC has to file a *CbC report* where it provides information on the following items for each jurisdiction where it is active: Revenues, profit or loss before tax, income tax paid, income tax accrued, stated capital, accumulated earnings, number of employees, and tangible assets. Usually, the ultimate parent entity files the CbC report in the country where it is resident.[9] The tax authorities then forward the CbC report to all other participating countries where the MNC is active.

OECD BEPS Action 13 mandates 'private' CbC reporting, under which tax authorities exchange CbC reports only among themselves and not with the public. The alternative is 'public' CbC reporting, which the EU began implementing in 2024.[10] We focus on private CbC reporting and analyze how additional transparency toward tax authorities affects MNCs' tax audit costs. Public CbC reporting also entails public scrutiny and may generate reputational ('shaming') effects, which we abstract from.[11]

[7] As an example that CbC reports are used to target audits, the IRS' Final Regulations on CbC reporting (TD 9773) state that "[...] the information reported on the CbCR will be used for high-level transfer pricing risk identification and assessment, and that transfer pricing adjustments will not be made solely on the basis of a CbCR, but that the CbCR may be the basis for further inquiries into transfer pricing practices or other tax matters which may lead to adjustments." According to Clausing (2020, p. 526), this guidance implies that MNCs face a massively reduced incentive to overstate their income, especially in tax havens.

[8] The MNC's ultimate parent entity has to submit local files with transaction-level transfer pricing documentation to their host countries, which are—in principle—not exchanged with other countries. Therefore, our analysis does not incorporate these local files.

[9] All EU countries require a constituent entity in the EU to be assigned status of Surrogate Parent Entity whenever the Ultimate Parent Entity is situated outside of the EU and is not obliged to file a CbC report there. Thus, any MNC that earns consolidated revenues of more than EUR 750 million and owns an affiliate situated within the EU is subject to CbC reporting requirements.

[10] Since 2014, EU banks have to make CbC reports public (see, e.g., Overesch and Wolff, 2021).

[11] Recent empirical evidence suggests that consumers do not respond persistently to tax-aggressive behavior (Asay et al., 2024) and that firms do not incorporate reputational concerns into tax avoidance decisions (Gallemore et al., 2014; Baudot et al., 2019).

Public opinion would most likely focus on (misalignment of) profits reported in tax havens, and if anything, trigger a mechanism that is analogous and reenforcing to the effect that we are going to identify.

2.3 A Model of Profit Shifting and Tax Audit Costs

We set up a stylized model of profit shifting with a single MNC with three affiliates. To keep the model tractable, we abstract from endogenous real activity and let the MNC decide only on profit shifting. Nonetheless, the model yields insights into how economic substance in tax havens can help to justify profit shifting.

The MNC owns two productive affiliates, one in the high-tax country H and one in the low-tax country L. These affiliates face corporate tax rates t_i with $t_H > t_L$. In addition, the MNC owns a tax-haven affiliate $i = 1$, taxed at a rate $t_1 < t_L$. All countries apply the tax exemption principle so that the MNC operates under a territorial tax system. Thus, the location of the headquarters (henceforth HQ) does not affect the taxation of intra-group income flows.[12] Therefore, we assume—without loss of generality—that the parent firm is a pure holding company residing in any of the three countries.

Each productive affiliate $i \in \{H, L\}$ earns taxable profit π_i. The tax-haven affiliate $i = 1$ invoices the productive affiliates $i \neq 1$ a fee $R_i + P_i$ for the use of a management service (or a trademark). Assuming that the economic value of the service (i.e., the arm's-length price) is equal to R_i, any payment $P_i \neq 0$ constitutes international profit shifting. To maintain business operations, the haven affiliate exogenously hires $L_1 > 1$ employees at a wage rate w_1, implying the presence of some real economic activity (or 'substance') in the tax haven.

Shifting income to the tax haven triggers both convex tax planning costs and convex tax audit costs. Tax planning costs capture the costs related to the ex-ante business decision, whereas tax audit costs relate to the ex-post consequences of such tax planning. As there is no overlap between the two events, we can assume that the costs are additively separable. In Appendix 2.A, we present an alternative, multiplicative

[12] Territorial taxation has become the dominant regime among OECD countries. Only Chile, Israel, Mexico, and South Korea still apply worldwide taxation within the OECD. Under territorial taxation, inter-corporate dividends are not subject to additional taxation, and—conditional on a given allocation of profits—the overall tax burden of the MNC is independent of the location of the HQ. Empirical evidence suggests that profit shifting is more pronounced under territorial than under worldwide taxation; see Markle (2016) and Langenmayr and Liu (2023).

specification that results qualitatively in the same effects.[13] Let us now discuss the tax planning and tax audit costs in turn.

Tax planning costs comprise compliance costs and costs for consultants and lawyers to strategically implement a favorable transfer price and justify the deviation from the true arm's-length price because the exact arm's-length value of the transfer price is unknown to the tax authorities.[14] We follow previous literature in modelling tax planning costs (Juranek et al., 2018): We define convex tax planning (or 'concealment') costs C^C over the level of shifted profits P such that $C_i^C = C_i^C(P_i)$. The tax-haven affiliate receives shifted profits without additional costs. For simplicity, we assume a quadratic cost function in the productive affiliates $i = H, L$. Consequently, the tax planning costs C_i^C in country i are

$$C_i^C = C^C(P_i) = \frac{\theta_i^C}{2} P_i^2,\ i = H, L,$$

where θ_i^C represents a cost parameter that captures the difficulty of enabling and justifying profit shifting and the tightness of transfer pricing regulation in country $i = H, L$.[15]

Tax audit costs capture the costs incurred by an MNC when facing a tax audit. Tax audits are costly because they require resources, extensive documentation, and may disrupt regular business operations. The more aggressively a tax authority perceives an MNC to engage in profit shifting, the more frequent, intensive, and thorough tax audits will be. Higher audit intensity increases the resources the MNC must devote to dealing with tax inspectors, fulfilling information requests, and potentially negotiating costly settlements. All of these considerations result in convex tax audit costs.[16]

[13] In that specification, the tax audit costs are a probability that measures the frequency and intensity of a tax audit. Multiplying this probability with the standard tax planning costs leads to the expected costs of profit shifting. In that setting, the audit probability can even be linear (i.e., does not need to be convex) in shifted profits. As this alternative probability specification complicates the formal analysis without yielding relevant differences in effects, we stick to the simpler setting with additive cost components and only sketch some of the effects under the alternative specification in Appendix 2.A.

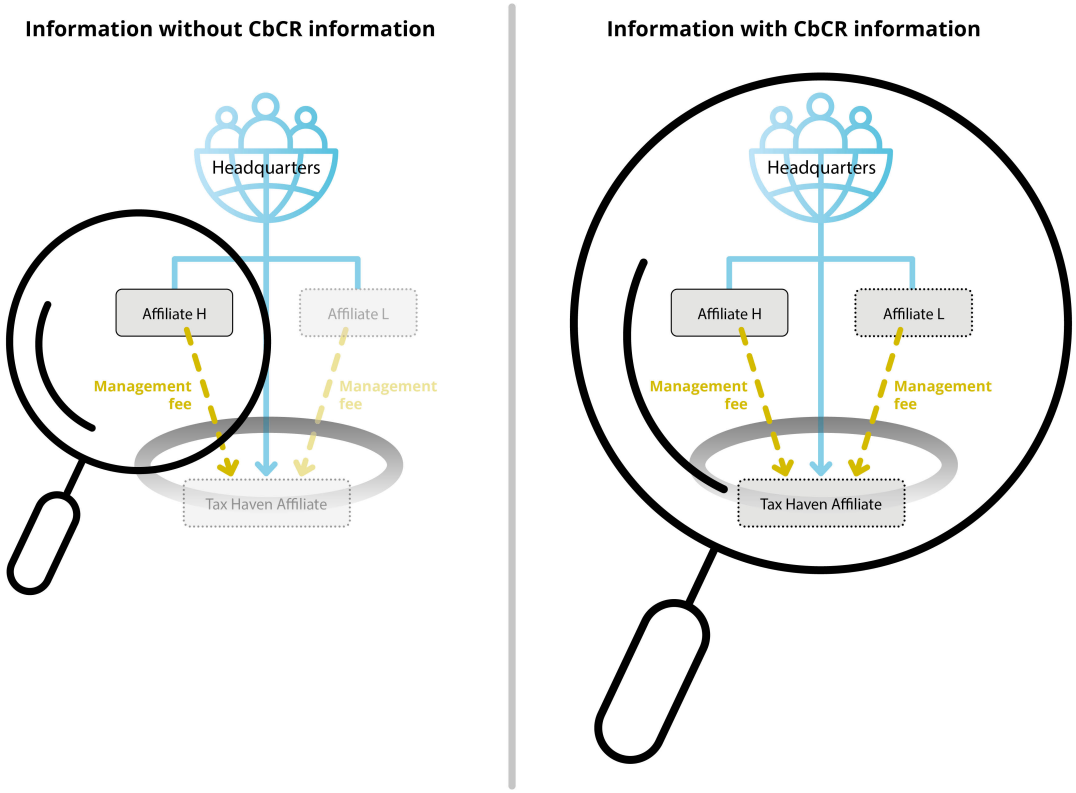
[14] The true arm's-length price might also be unknown to the MNC itself. For related literature on transfer pricing costs, see, for example, Haufler and Schjelderup (2000) and Gresik and Osmundsen (2008). These costs also include costs related to double taxation, see Martini et al. (2025). Grubert (2003) interprets the tax planning costs as costs for "greater than efficient" (Grubert, 2003, p. 224) levels of intercompany transactions.

[15] Tax planning costs in our model do not depend on the size of the MNC, although empirical evidence suggests that profit shifting is more prevalent among large firms (see, e.g., Rego, 2003; Dyreng et al., 2008). The latter rests on complex shifting structures being associated with fixed costs that need to be recovered (Davies et al., 2018; Goldbach et al., 2021). Since CbC reporting applies only to MNCs with consolidated revenues of at least EUR 750 million, we assume that the MNC in our model is sufficiently large to incur the fixed costs of a tax-haven structure.

[16] In many countries, large taxpayers are audited routinely, implying a fixed component of tax audit costs. However, the intensity and intrusiveness of audits vary substantially. In this sense, higher tax

Tax audit costs depend crucially on the information available to the domestic tax authority and on how this information is used in audit decisions. In the absence of CbC reporting, the tax authority i observes only the affiliate located in country i and has access solely to its domestic tax file, which reports local economic activity and cross-border payments. With CbC reporting, tax authorities additionally obtain information on the MNC's total activity and reported profits across all affiliates, allowing them to assess whether the local affiliate's profitability appears unusual. We summarize the set-up of our model and the different information sets available with and without CbC reporting, respectively, in Figure 2.1.

Figure 2.1: Graphical Representation of CbC reporting



Note: The left panel shows the information available to the tax authority in the high-tax country without CbC reporting. In this case, the authority only observes the high-tax affiliate. The right panel shows the information available with CbC reporting. Here, the authority observes the complete group structure.

We model the completeness of CbC reporting by a country-specific parameter $\alpha_i \in [0, 1]$, with $i \in \{H, L\}$. When $\alpha_i = 0$, there is no CbC reporting and the tax authority

audit costs associated with CbC reporting stem from increased audit intensity rather than from the mere occurrence of audits. Introducing a baseline audit cost in the model would not affect our results qualitatively, but would add notation, so we abstract from it.

in country i has no information about the MNC's foreign affiliates. When $\alpha_i = 1$, CbC reporting is complete and the tax authority has full information on the MNC's reported profits worldwide. Intermediate values of α_i capture partial access to CbC information and allow for asymmetric cases in which countries differ in the extent to which such information is available.[17]

Equivalently, α_i can be interpreted as capturing how strongly a tax authority incorporates CbC information into its audit strategy. This second interpretation allows us to capture discretionary choices in how intensively tax authorities use CbC information. In the model, a marginal change in α_i then represents a shift in audit strategy toward placing more weight on CbC-based red flags. Thus, our model also informs about the consequences of tax authorities' choices. An example would be the choice to not use CbC reporting to its full extent.

CbC reporting provides tax authorities with additional signals to decide which firms to audit and how intensively to deploy scarce enforcement resources. Tax authorities are more likely to target firms for which they expect large adjustments in taxable income and, consequently, higher additional tax revenue.[18] We assume that tax audit intensity is based on a weighted measure combining information from domestic tax filings with selected indicators derived from CbC reports. Without CbC reporting ($\alpha_i = 0$), audit decisions rely solely on deviations of domestic profits from benchmark levels, proxied by P_i. With CbC reporting ($\alpha_i > 0$), tax authorities can better assess the overall tax aggressiveness of an MNC and identify suspicious cases (see also the IRS quote in footnote 7).

Tax authorities may use two closely related red flags derived from CbC reports to identify aggressive profit shifting. The first is the absolute level of profits reported in tax-haven affiliates. High haven profits are a strong signal of potential tax revenue that can be recovered through a detailed and intensive audit.[19] A second indicator emphasized in the academic literature is haven profits relative to measures of economic

[17] Imperfect CbC reporting ($0 < \alpha_i < 1$) may reflect incomplete information exchange, limited participation in multilateral information sharing agreements, or insufficient verification of reported data, allowing firms to submit incomplete or inaccurate reports.

[18] Tørsløv et al. (2023a) argue that tax authorities in high-tax countries do not target transactions with tax havens, but instead focus on correcting transfer prices to other high-tax countries, as firms are less likely to challenge such corrections and better dispute-settlement mechanisms are in place with other high-tax countries. Nevertheless, they report that 18% of the transactions that Danish tax authorities targeted were with tax havens. In addition, their data ends in 2016, i.e., before tax authorities had good information on which tax haven transactions to target.

[19] Officials from two national Ministries of Finance confirmed in private discussions that the primary information extracted from CbC reports is the level of profits reported in tax-haven affiliates, as this information is particularly easy to identify and operationalize in audit decisions.

substance, such as employment (see, e.g., Tørsløv et al., 2023b; Joshi et al., 2025). Unusually high profits per employee signal a misalignment between reported profits and real activity and are therefore indicative of aggressive tax planning. Both absolute haven profits and profit–substance ratios are discussed by the OECD as key tax risk indicators enabled by CbC reporting (OECD, 2017, pp. 35-44).

Our model captures both red flags. The substance-based indicator is represented by $\frac{\pi_1}{L_1} = \frac{R_H+P_H+R_L+P_L}{L_1}$. Setting $L_1 = 1$ corresponds to the case in which tax authorities base audit decisions on the absolute level of profits reported in the tax haven.

In our model, tax audit costs in country i depend on the audit signal that the tax authority uses to assess the MNC's tax aggressiveness. This signal combines (i) the domestically observable deviation in reported profits, indicated by P_i, and (ii) a CbC-based red flag X_i reflecting misaligned profits in tax havens. We capture the relative weight placed on the CbC-based information by $\alpha_i \in [0, 1]$. Accordingly, the relevant audit signal in country i is

$$S_i = (1 - \alpha_i)P_i + \alpha_i X \quad \text{with} \quad X = \frac{\pi_1}{L_1} = \frac{R_H + P_H + R_L + P_L}{L_1}.$$

A higher value of either component signals more aggressive tax planning; hence, tax audit costs increase and are convex in S_i. For tractability, we assume a quadratic specification

$$C_i^A = \frac{\theta_i^A}{2} S_i^2 = \frac{\theta_i^A}{2} \Big[(1 - \alpha_i)P_i + \alpha_i X\Big]^2, \qquad i \in \{H, L\},$$

where θ_i^A captures how costly tax audits in country i are for the MNC. Given all our assumptions, global after-tax profits of the MNC are

$$\begin{aligned} \Pi \;=\; & (1 - t_H)\pi_H + (t_H - t_1)(R_H + P_H) - \frac{\theta_H^C}{2} P_H^2 - \frac{\theta_H^A}{2} \left[(1 - \alpha_H)P_H + \alpha_H X\right]^2 \\ & + (1 - t_L)\pi_L + (t_L - t_1)(R_L + P_L) - \frac{\theta_L^C}{2} P_L^2 - \frac{\theta_L^A}{2} \left[(1 - \alpha_L)P_L + \alpha_L X\right]^2 \\ & - w_1 L_1, \end{aligned} \tag{2.1}$$

where the first term in the first two lines represents exogenous after-tax profits from business operations, the second term gives the tax savings from the arm's-length payments R_i and the shifting of profits P_i to the tax haven, and the last two terms in the first two lines capture tax planning and tax audit costs of profit shifting in an affiliate. The last line represents the costs from employment in the haven affiliate. The MNC only decides how much income P_i to shift from each productive affiliate to the tax

haven in country 1. Maximizing global after-tax profits implies the following first-order conditions

$$\begin{aligned}\frac{\partial \Pi}{\partial P_H} &= (t_H - t_1) - \theta_H^C P_H - \theta_H^A \left(1 - \alpha_H + \frac{\alpha_H}{L_1}\right)[(1-\alpha_H)P_H + \alpha_H X] \\ &\quad -\theta_L^A [(1-\alpha_L)P_L + \alpha_L X] \frac{\alpha_L}{L_1} = 0, \qquad (2a)\\ \frac{\partial \Pi}{\partial P_L} &= (t_L - t_1) - \theta_L^C P_L - \theta_L^A \left(1 - \alpha_L + \frac{\alpha_L}{L_1}\right)[(1-\alpha_L)P_L + \alpha_L X] \\ &\quad -\theta_H^A [(1-\alpha_H)P_H + \alpha_H X] \frac{\alpha_H}{L_1} = 0. \qquad (2b)\end{aligned}$$

In the optimum, the MNC balances marginal tax savings $(t_i - t_1)$ against the marginal tax planning and tax audit costs.

Profit shifting without CbC reporting. In the absence of CbC reporting ($\alpha_i = 0$ for all i), profit-shifting decisions across affiliates are independent of each other. The optimal level of shifted profits in country i is given by

$$P_i = \frac{t_i - t_1}{\theta_i^C + \theta_i^A}, \qquad i \in \{H, L\}, \qquad \text{for } \alpha_H = \alpha_L = 0.$$

Without CbC reporting, profit shifting increases in the domestic tax differential vis-à-vis the tax haven and decreases in marginal tax planning and tax audit costs, $\theta_i^C + \theta_i^A$. If the tax rate differential $t_H - t_L$ is sufficiently large relative to cross-country differences in tax planning and tax audit costs, the higher-taxed affiliate shifts more profits as it faces larger incentives. We assume this condition holds and thus focus on the case $P_H > P_L$ for $t_H > t_L$.[20]

As soon as domestic tax authorities start using information from CbC reporting ($\alpha_i > 0$), national profit-shifting decisions become interlinked through the tax audit cost function. We now turn to the effects of introducing CbC reporting.

[20]This assumption is less restrictive than it may appear. A prominent stylized fact is that developing countries on average have higher statutory corporate tax rates (Bachas et al., 2024; Hohmann et al., 2024, Figure 8.2), but simultaneously feature weaker tax enforcement capacity (Johannesen et al., 2020; Hohmann et al., 2024, Figure 8.1). Haufler et al. (2025, Proposition 2) rationalize this pattern as the outcome of tax competition, where countries set high statutory rates to tax immobile domestic firms while allowing profit shifting to reduce effective tax burdens on mobile MNCs. Similar mechanisms may also arise in tax competition among developed countries.

2.4 The Effects of CbC Reporting

In this section, we analyze the effects of CbC reporting on corporate tax avoidance. We proceed in three steps. First, in Section 2.4.1, we provide an intuitive preview of the mechanisms at work. Second, in Section 2.4.2, we study the effects of unilateral use of CbC information by one country and show that, perhaps surprisingly, the country that does *not* rely on CbC information may benefit. Finally, in Section 2.4.3, we analyze the multilateral case in which all countries implement CbC reporting and symmetrically use the available information.

2.4.1 An Intuitive Preview

To build intuition, we highlight two channels through which CbC reporting affects profit-shifting behavior. First, CbC reporting raises the expected costs of profit shifting by improving transparency. Second, by linking tax audit costs across affiliates, it changes how firms allocate profit shifting across countries. This latter channel gives rise to two related but distinct effects: A *rebalancing effect* in response to tax changes and a *substitution effect* in response to changes in the use of CbC information.

First, CbC reporting makes profit shifting costlier by increasing the visibility of profits booked in tax havens. With CbC reporting, tax authorities observe the global distribution of profits and economic activity and can condition audit intensity on this previously unavailable information. In particular, high profits in tax havens—especially when they are large relative to measures of economic substance—are widely viewed as red flags for aggressive tax planning. This direct effect raises expected tax audit costs and discourages profit shifting from all non-haven affiliates, all else equal.

Second, CbC reporting interlinks profit-shifting decisions across affiliates because now tax audit costs depend on the *total* amount of profits booked in the tax haven rather than on profits shifted from each affiliate in isolation. As a result, shifting an additional unit of profit from one country raises expected tax audit costs for the MNC as a whole. This linkage is the key force behind both the rebalancing and substitution effects.

When CbC reporting is in place, we observe *rebalancing effects* when tax rates change. Because marginal tax audit costs associated with total haven profits are shared across affiliates, a change in tax incentives in one country affects optimal profit shifting elsewhere. Under CbC reporting, firms respond to tax changes by reallocating profit

shifting toward countries where tax savings per shifted unit are higher.[21] We relegate the formal analysis and an elaborate discussion of the responses to tax incentives to Appendix 2.B.

When countries change the extent to which they use CbC information in audit decisions, we observe a *substitution effect*. Since the marginal tax audit cost associated with total haven profits is the same regardless of where the shifted profits originate, but the tax savings differ across countries, it becomes optimal to concentrate profit shifting in affiliates with higher tax rates. Firms therefore reduce profit shifting from low-tax countries and shift relatively more from high-tax countries, where each unit of shifted profit yields larger tax savings. In this way, CbC reporting can reduce total profit shifting while simultaneously increasing profit shifting from high-tax affiliates. The importance of this effect increases with CbC reporting becoming more comprehensive (i.e., with α_i). If this substitution effect becomes sufficiently strong, it can even happen that the low-tax affiliate stops being an outward-shifting entity and the MNC effectively starts shifting from the high-tax to the low-tax affiliate: It saves tax audit costs by eliminating profits in the 'official' tax haven (while still shifting profits to save taxes).

The strength of the rebalancing and substitution effects depends on economic substance in the tax haven. If profits are evaluated relative to measures of real activity, such as employment, sufficiently high or easily inflated substance weakens the informativeness of haven profits and dampens the increase in tax audit costs (*substance channel*). Next, we formalize these mechanisms and study their implications under unilateral and multilateral CbC reporting.

2.4.2 Unilateral CbC Reporting and Shifting Decisions

What happens if only one country has access to, or is willing to use, information from CbC reporting? A natural candidate for unilateral use of CbC information is the high-tax country, which suffers more from profit shifting. In our model, this corresponds to a situation in which the low-tax country does not utilize CbC information ($\alpha_L = 0$), while the high-tax country starts relying on it ($\alpha_H > 0$). The effects on profit shifting can then be characterized by comparative statics of the first-order conditions (2a) and (2b); see Appendix 2.C.1.

To ensure that we analyze a meaningful policy reform, we impose two assumptions throughout the paper. First, we assume that placing some (partial) weight on

[21] This mechanism is similar to balancing overall bankruptcy costs on the parent level and external debt shifting to optimize the capital structure in MNCs' affiliates for which the parent guarantees part of their external debt (Huizinga et al., 2008).

misaligned profits in the tax haven (i.e., X) provides better information for tax audits than relying solely on domestic transfer pricing rules and domestically inferred profit shifting (i.e., P_i). Second, we assume that a unilateral increase in the use of CbC information raises expected tax audit costs. Formally, this implies that the partial derivatives of the first-order conditions with regard to α need to be positive ($F_{i\alpha} > 0$); see Appendix 2.C.1.[22]

Assumption 1 *To ensure that using CbC information increases tax audit costs, we assume:*

$$(i)\ X - P_i = \tfrac{\pi_1}{L_1} - P_i = \tfrac{R_H + P_H + R_L + P_L}{L_1} - P_i > 0,\ i = H, L,$$

$$(ii)\ F_{i\alpha} = \left(1 - \alpha_i + \tfrac{\alpha_i}{L_1}\right)(X - P_i) - [(1-\alpha_i)P_i + \alpha_i X]\tfrac{L_1 - 1}{L_1} > 0,\ \ i = H, L.$$

We proceed in two steps. First, we analyze how unilateral use of CbC reporting in one country affects profit shifting in the other country. Second, we study the effect on profit shifting in the country that adopts CbC reporting. Being agnostic about which non-haven country adopts CbC reporting, we assume that country i increases its reliance on the CbC-based audit measure ($d\alpha_i > 0$), while the other non-haven country j does not use this information ($\alpha_j = d\alpha_j = 0$). We obtain

$$\frac{dP_j}{d\alpha_i}\bigg|_{\alpha_j=0} = -\frac{\theta_i^A \theta_i^C \left\{\frac{(1-\alpha_i)P_i + \alpha_i X}{L_1} + \frac{\alpha_i (X - P_i)}{L_1}\right\} + (\theta_i^A)^2 \left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right)\frac{(1-\alpha_i)P_i + \alpha_i X}{L_1}}{|\mathcal{H}|} < 0, \tag{2.3}$$

where $|\mathcal{H}| > 0$ is the determinant of the Hessian matrix, which is positive by the second-order conditions of the maximization problem.

Unilateral CbC reporting in country i unambiguously reduces profit shifting out of the other country j. The reason is that CbC reporting interlinks profit-shifting decisions across affiliates. Given Assumption 1, using CbC information in country i adds an additional audit-cost component to shifting from country j. To mitigate tax audit costs in the country that adopts CbC reporting, the MNC reduces profit shifting from the non-participating country.[23]

[22] Effectively, these assumptions require that building up economic substance in tax havens is sufficiently expensive. Then, incorporating CbC information into audit strategies increases the expected costs of profit shifting. If (inflating) 'haven substance' was cheap to costless, using CbC information would not raise expected tax audit costs and tax authorities would have no incentive to rely on it: CbC reporting would be irrelevant as an enforcement tool.

[23] For unilateral CbC reporting, this mitigation mechanism is one-sided: Reducing shifting in country i does not affect tax audit costs in country j, as country j does not use information on haven profits.

We now turn to the effect of unilateral CbC reporting on profit shifting from the participating country itself. This effect is generally ambiguous with

$$|\mathcal{H}|\frac{dP_i}{d\alpha_i}\Big|_{\alpha_j=0} = -\theta_j^A(\theta_i^C+\theta_i^A)\left(1-\alpha_i+\frac{\alpha_i}{L_1}\right)(X-P_i)+(\theta_j^A)^2\frac{\alpha_i}{L_1}\frac{(1-\alpha_i)P_i+\alpha_i X}{L_1}$$
$$+\theta_j^A(\theta_i^C+\theta_i^A)[(1-\alpha_i)P_i+\alpha_i X]\frac{L_1-1}{L_1}\gtrless 0. \tag{2.4}$$

By shifting the audit focus from domestically inferred profit shifting to total profits booked in the tax haven, CbC reporting raises expected tax audit costs, all else equal, see the first term in the first line in equation (2.4). This force works toward lower profit shifting from country i. However, there is an offsetting effect. As profit shifting from country j declines, total haven profits fall, which reduces marginal tax audit costs for shifting from country i. This reallocation of audit-cost pressure incentivizes higher profit shifting from country i, see the second term in the first line in equation (2.4).

In addition, economic substance in the tax haven creates a further offsetting channel. While total haven profits enter the tax audit cost function, they are discounted by real activity in the haven. Higher substance $L_1 > 1$ therefore weakens the increase in tax audit costs associated with CbC reporting and allows for more profit shifting, all else equal. These offsetting forces imply that the net effect on profit shifting from country i cannot be signed.

In sum, unilateral CbC reporting always reduces profit shifting from the *non-participating* country, as transparency adds tax audit costs to shifting from that country. The effect on profit shifting from the participating country is ambiguous, reflecting a trade-off between higher tax audit costs and the reallocation of shifting across affiliates.

2.4.3 Multilateral CbC Reporting and Shifting Decisions

We now analyze the case in which *both* non-haven countries introduce CbC reporting simultaneously (as, for example, the EU countries did in 2016) and use the information symmetrically ($\alpha_H = \alpha_L = \alpha$). We consider a marginal increase $d\alpha_H = d\alpha_L = d\alpha$, while keeping all other sources of heterogeneity in the model. As in the previous sections, we characterize firms' responses using comparative statics of the first-order conditions (2a) and (2b); see Appendix 2.C.1. We also maintain Assumption 1.

Total profit shifting. Under multilateral CbC reporting, a first result is that an increase in the use of CbC information reduces total profit shifting to the tax haven,

provided that economic substance in the haven is sufficiently low (note again that $|\mathcal{H}| > 0$):

$$\begin{aligned}|\mathcal{H}|\frac{d(P_H+P_L)}{d\alpha} = &-\left\{\theta_L^C F_{H\alpha}+\theta_H^C F_{L\alpha}+(1-\alpha)\frac{\alpha}{L_1}\left[(\theta_H^A)^2(X-P_H)+(\theta_L^A)^2(X-P_L)\right]\right\}\\ &-\frac{1-\alpha}{L_1}\left[(\theta_H^A)^2P_H+(\theta_L^A)^2P_L\right]\\ &-\theta_L^A\theta_H^A(1-\alpha)\left\{\left[(1-\alpha)^2+2\frac{\alpha^2}{L_1^2}+\frac{\alpha}{L_1}(2-3\alpha)\right](2X-P_H-P_L)-\frac{\alpha}{L_1}(P_H+P_L)\right\}\\ &+\left(\theta_L^A+\theta_H^A\right)(1-\alpha)^2\left[2\alpha X+(1-\alpha)(P_H+P_L)\right]\frac{L_1-1}{L_1}<0. \qquad (2.5)\end{aligned}$$

For sufficiently low levels of economic substance in the tax haven—and in particular in the limit $L_1 \to 1$—the expression in equation (2.5) is strictly negative. Intuitively, when both countries use CbC information, audit decisions increasingly rely on total profits booked in the tax haven. This raises expected tax audit costs at the group level and discourages profit shifting in the aggregate.

When profits are evaluated relative to real activity, higher haven employment weakens the informativeness of haven profits as a tax risk indicator. As reflected in the last line of equation (2.5), sufficiently large values of L_1 even overturn the negative effect of CbC reporting on total profit shifting.

Proposition 1 *If economic substance in the tax haven is sufficiently limited ($L_1 \to 1$), an increase in the use of Country-by-Country reporting reduces total profit shifting by MNCs, that is,*

$$\frac{d(P_H+P_L)}{d\alpha}<0.$$

In this case, profits reported in tax-haven affiliates fall unambiguously.

Proof: See Appendix 2.C.2.

Low-tax country. We now turn to the implications of multilateral CbC reporting for profit shifting from the *low-tax country*. The comparative static result is given by

$$\begin{aligned}|\mathcal{H}|\frac{dP_L}{d\alpha} = &-\theta_H^C F_{L\alpha}-(\theta_H^A)^2(1-\alpha)\frac{\alpha}{L_1}(X-P_H)\\ &+\theta_L^A\theta_H^A\frac{\alpha}{L_1}\left\{\frac{\alpha}{L_1}\left[(1-\alpha)\frac{L_1-1}{L_1}+\left(1-\alpha+\frac{\alpha}{L_1}\right)\right]+(1-\alpha)^2\right\}(P_L-P_H)\\ &+\theta_H^A\frac{1-\alpha}{L_1}\left(\theta_L^A\alpha P_L-\theta_H^A P_H\right)+\frac{\alpha}{L_1}\left[(\theta_L^A)^2\frac{(1-\alpha)P_L+\alpha X}{L_1}-(\theta_H^A)^2\frac{(1-\alpha)P_H+\alpha X}{L_1}\right]\\ &-\theta_L^A\theta_H^A(1-\alpha)\left\{\frac{\alpha^2}{L_1^2}(2X-P_H-P_L)+\left[(1-\alpha)^2+\frac{\alpha}{L_1}(2-3\alpha)\right](X-P_L)\right\}\\ &+\theta_L^A\theta_H^A(1-\alpha)^2[(1-\alpha)P_L+\alpha X]\frac{L_1-1}{L_1}\gtrless 0. \qquad (2.6)\end{aligned}$$

In general, the effect of increasing the use of CbC information on profit shifting from the low-tax country is ambiguous, even under Assumption 1. Three forces are at work: A direct audit-cost effect, a substitution effect, and a substance channel.

The direct effect of CbC reporting again raises expected tax audit costs, making profit shifting more expensive and reducing shifting from the low-tax country.[24] In addition, CbC reporting induces a substitution effect that parallels the rebalancing effect discussed earlier. Since shifting from the high-tax country generates larger tax savings for the same marginal tax audit cost, it is optimal to reduce shifting from the low-tax country to maximize the 'bang for the buck.' This substitution effect reinforces the direct audit-cost effect and pushes toward lower profit shifting from country L.[25]

Finally, the substance channel works in the opposite direction. When profits are evaluated relative to real activity in the tax haven, higher substance ($L_1 \gg 1$) weakens the informativeness of haven profits as a tax-risk indicator. In this case, increasing reliance on CbC reporting can raise profit shifting even in the low-tax country. When economic substance in the tax haven is sufficiently limited ($L_1 \to 1$), the substance channel vanishes and the total effect becomes unambiguous.

High-tax country. The effects of multilateral CbC reporting on profit shifting from the *high-tax country* mirror those for the low-tax country, with one crucial difference: The substitution effect now works in favor of *more* profit shifting. Formally, we obtain

$$\begin{aligned}
|\mathcal{H}|\frac{dP_H}{d\alpha} = & -\theta_L^C F_{H\alpha} - (\theta_L^A)^2(1-\alpha)\frac{\alpha}{L_1}(X-P_L) \\
& + \theta_H^A\theta_L^A\frac{\alpha}{L_1}\left\{\frac{\alpha}{L_1}\left[(1-\alpha)\frac{L_1-1}{L_1} + \left(1-\alpha+\frac{\alpha}{L_1}\right)\right] + (1-\alpha)^2\right\}(P_H-P_L) \\
& + \theta_L^A\frac{1-\alpha}{L_1}\left(\theta_H^A\alpha P_H - \theta_L^A P_L\right) + \frac{\alpha}{L_1}\left[(\theta_H^A)^2\frac{(1-\alpha)P_H+\alpha X}{L_1} - (\theta_L^A)^2\frac{(1-\alpha)P_L+\alpha X}{L_1}\right] \\
& - \theta_H^A\theta_L^A(1-\alpha)\left\{\frac{\alpha^2}{L_1^2}(2X-P_H-P_L) + \left[(1-\alpha)^2 + \frac{\alpha}{L_1}(2-3\alpha)\right](X-P_H)\right\} \\
& + \theta_L^A\theta_H^A(1-\alpha)^2[(1-\alpha)P_H+\alpha X]\frac{L_1-1}{L_1} \gtrless 0. \qquad (2.7)
\end{aligned}$$

As in the low-tax country, increasing the use of CbC information raises expected tax audit costs, reducing profit shifting. This direct tax-audit-cost effect is counteracted by two forces. First, the substance channel dampens tax audit costs when profits

[24] This effect is visible in the first line of equation (2.6) and gets reinforced by the fourth line as long as economic activity L_1 is not too high or the weight on CbC reporting does not exceed $\alpha = 2/3$.

[25] The substitution effect is captured in line 2 of equation (2.6), which is unambiguously negative for $P_L - P_H < 0$. As long as the difference in tax audit costs across countries is not too large, i.e., $\theta_H^A \approx \theta_L^A$, this substitution effect also shows up in the third line.

are evaluated relative to real activity in the tax haven, thereby fostering profit shifting for sufficiently large L_1. Second, the substitution effect (second and third line of equation 2.7) now works in the opposite direction compared to the low-tax country. If profit shifting is initially larger from the high-tax country ($P_H > P_L$), reallocating profit shifting toward country H yields larger tax savings for the same marginal tax audit cost.

Consequently, our analysis highlights an additional response margin under CbC reporting. Beyond adjustments in real activity (De Simone and Olbert, 2022; Joshi et al., 2025), MNCs may reallocate reported profits across affiliates. Reduced profit shifting from the low-tax affiliate can coincide with increased profit shifting from the high-tax country, where the tax incentives are stronger.

Proposition 2 *Under Assumption 1, greater use of Country-by-Country reporting affects profit shifting through three partial effects. First, the direct tax-audit-cost effect increases expected audit costs and reduces profit shifting from all affiliates. Second, when tax audits rely on profit–substance ratios ($L_1 > 1$), the substance channel weakens the audit signal and increases profit shifting from all affiliates. Third, CbC reporting creates a substitution effect that reallocates profit shifting toward affiliates where shifting yields larger tax savings. If the high-tax affiliate initially shifts more profit ($P_H > P_L$) and tax audit cost parameters are similar ($\theta_H^A \approx \theta_L^A$), this substitution effect increases profit shifting from the high-tax affiliate and reduces profit shifting from the low-tax affiliate.*

Therefore, the country that benefits the most from multilateral CbC reporting is the country that initially suffered less from profit shifting, i.e., the low-tax country. In the next section, we analyze a simplified version of the model without a substance channel and with less heterogeneity to isolate and highlight the substitution effect more sharply.

2.5 Illustrating the Substitution Effect: Multilateral CbC Reporting and Homogeneous Shifting Costs

In this section, we simplify the model to isolate the substitution effect. To this end, we eliminate the substance channel by setting $L_1 = 1$, which is equivalent to assuming that tax authorities base audit decisions on the absolute level of profits booked in the tax haven. We also assume that the arm's-length payments are equal to zero, i.e.,

$R_H = R_L = 0$. In addition, we assume homogeneous cost parameters for tax planning, $\theta_H^C = \theta_L^C = \theta^C$, and for tax audits, $\theta_H^A = \theta_L^A = \theta^A$.

These simplifications allow us to focus exclusively on how CbC reporting reshapes profit-shifting incentives through the substitution effect. We first discuss the general implications of this effect. We then derive conditions under which the high-tax country not only benefits less than the low-tax country from CbC reporting, but experiences an absolute loss in tax revenues.

2.5.1 The Substitution Effect at Work

As predicted by Proposition 1, eliminating the substance channel implies that any symmetric use of CbC reporting unambiguously reduces total profit shifting to the tax haven. In this case, as shown in Appendix 2.D, equation (2.5) simplifies to

$$\frac{d(P_H + P_L)}{d\alpha} = -\frac{2\theta^A \left[\theta^C(1+\alpha)(P_H + P_L) + 2\theta^A(1-\alpha^2)(1-\alpha)(P_H + P_L)\right]}{|\mathcal{H}|} < 0. \tag{2.8}$$

The effects of CbC reporting differ across affiliates. Subtracting the simplified first-order conditions (2.D.2) and (2.D.3)—see Appendix 2.D—and imposing homogeneous cost parameters, θ^C and θ^A, yields

$$P_H - P_L = \frac{t_H - t_L}{\theta^C + \theta^A(1-\alpha)^2} > 0. \tag{2.9}$$

As expected, more profit is always shifted from the high-tax affiliate than from the low-tax affiliate. Moreover, the gap $P_H - P_L$ increases with the use of CbC reporting (i.e., with any $\alpha < 1$). This widening reflects the substitution effect. Importantly, the difference in shifting between affiliates is maximized under full use of CbC reporting ($\alpha = 1$). Hence, while total profit shifting declines, the low-tax country gains relatively more tax base from CbC reporting than the high-tax country.

The simplified setting also allows us to solve explicitly for optimal profit shifting in both affiliates, see Appendix 2.D.3 for formal details. It is straightforward to show that the optimal shifting from the low-tax affiliate, P_L^*, is positive in absence of CbC reporting (i.e., for $\alpha = 0$). Furthermore, if marginal tax audit costs θ^A are sufficiently large, P_L^* becomes negative for some $\alpha > 0$ and remains negative as α increases further. This result illustrates the substitution effect in its strongest form. Under CbC reporting, the MNC reduces shifting from the low-tax affiliate and concentrates profit shifting in the high-tax affiliate. If tax audit costs are sufficiently important, it can

even become optimal to shift profits from the high-tax affiliate to the low-tax affiliate, rather than to the tax haven. In this case, the MNC sacrifices some tax savings $(t_L - t_1)$ to reduce overall tax audit costs. The smaller the tax differential between the low-tax affiliate and the tax haven, the more attractive this inverted structure becomes, see equation (2.D.12).

We can now sharpen Proposition 1 as follows.

Proposition 3 *If there is no substance channel and cost parameters are homogeneous, the introduction of Country-by-Country reporting can induce MNCs to shift profits to less-scrutinized low-tax affiliates rather than to tax havens. As a result, traditional tax havens are gradually phased out, while low-tax affiliates emerge as the new 'havens'.*

This result implies that MNCs use tax havens less intensively, and haven affiliates may eventually report little or no income. It therefore provides a theoretical mechanism for the empirical findings of De Simone and Olbert (2022), who document that MNCs close subsidiaries in tax havens and reallocate profits toward affiliates in countries with preferential (low-)tax regimes following the introduction of CbC reporting (see Section 2.6 for further discussion).[26]

In Appendix 2.D.3, we also solve for optimal shifting P_H^* in the high-tax affiliate. When we compare the case of full CbC reporting to no CbC reporting, we obtain

$$P_H^*(\alpha = 1) - P_H^*(\alpha = 0) = \frac{(t_H - t_1)}{\theta^C + 4\theta^A} + \frac{2\theta^A(t_H - t_L)}{\theta^C\left[\theta^C + 4\theta^A\right]} - \frac{(t_H - t_1)}{\theta^C + \theta^A} \gtrless 0. \tag{2.10}$$

Hence, the effect of CbC reporting on P_H is ambiguous. Whenever the tax audit cost parameter θ^A is sufficiently large, full CbC reporting induces *higher* profit shifting from the high-tax affiliate than in the absence of CbC reporting.

We can summarize the implications of the substitution effect and the strategic adjustment of paper profit shifting as follows. Introducing CbC reporting always reduces total profit shifting to the tax haven. However, the resulting gains in taxable income are distributed asymmetrically across countries. Low-tax countries unambiguously gain from CbC reporting, as their tax bases increase. By contrast, high-tax countries gain less and potentially lose tax base, as MNCs rebalance profit shifting toward high-tax affiliates to maximize tax savings for a given level of tax audit costs. Even when both countries experience an increase in taxable income, the low-tax country benefits more, since CbC reporting widens the gap in shifted profits, $P_H - P_L$.

[26] Importantly, this result does not rely on the absence of economic substance in tax havens, but on the assumption that building or inflating such substance is sufficiently costly.

Proposition 4 *Introducing Country-by-Country reporting has asymmetric effects on profit shifting and tax revenues across countries. In the absence of a substance channel and under homogeneous cost parameters:*

(i) Tax havens unambiguously lose tax base under Country-by-Country reporting.

(ii) Low-tax countries unambiguously gain tax base. The substitution effect reallocates profit shifting away from them.

(iii) High-tax countries gain less than low-tax countries and may even experience a reduction in their tax base, because the substitution effect makes profit shifting from high-tax affiliates more attractive for a given level of tax audit costs.

2.5.2 When Does CbC Reporting Harm the High-Tax Country?

As shown in the previous subsection, high-tax countries always benefit less from CbC reporting than low-tax countries. They may even experience an increase in profit shifting relative to the case without CbC reporting. In the simplified setting, this occurs when equation (2.10) is positive, implying a cutoff value for relative costs of

$$\frac{\theta^A}{\theta^C} > \frac{t_H - t_1}{2(t_H - t_L)} + \frac{t_L - t_1}{t_H - t_L}. \tag{2.11}$$

Using recent statutory corporate tax rates as guidance (OECD, 2023, Figure 2.1), a reasonable calibration is $t_H = 30\%$, $t_L = 15\%$, and $t_1 = 5\%$. Under these values, the cutoff becomes $\theta^A/\theta^C > 1.5$. Hence, if tax audit costs are sufficiently large relative to tax planning costs, the model predicts that a high-tax country loses tax base when complete CbC reporting is introduced.

Equation (2.11) highlights two relevant margins. The first term on the right-hand side captures the opportunity cost of shifting profits from the high-tax country to the low-tax country instead of to the tax haven. A larger differential vis-a-vis the tax haven ($t_H - t_1$) increases this cost and therefore raises the cutoff. By contrast, a larger differential vis-a-vis the low-tax country ($t_H - t_L$) increases the tax savings from shifting profits from the high-tax to the low-tax affiliate, lowering the cutoff.

The second term reflects the forgone tax savings from no longer shifting profits from the low-tax affiliate to the tax haven. A larger differential ($t_L - t_1$) makes this loss more important and thus raises the required level of tax audit costs. Again, a larger gap

$(t_H - t_L)$ amplifies the profitability of reallocating profit shifting toward the low-tax affiliate and mitigates the critical tax-audit-cost threshold.

Our findings have implications for the implementation of CbC reporting. Our analysis suggests that high-tax countries may formally implement CbC reporting but credibly commit not to use the information intensively in tax audits. Consistent with this interpretation, tax administrations differ markedly in how they use CbC reports for risk assessment. The OECD notes that "[t]he specific approaches adopted vary depending upon each tax administration's general approach to risk assessment," (OECD, 2022, p. 33) and the European Commission documents that CbC information is underused within the EU, partly due to insufficient risk-analysis systems (European Court of Auditors, 2021). Taken together, the substitution effect identified in this paper may help explain why CbC reporting has not become the initially expected game changer.

Our analysis is based on the assumption that CbC reporting primarily serves a red-flagging purpose. Under the current framework, tax authorities receive only aggregated country-level information through CbC reports, which limits the scope for targeted audits. More detailed information is contained in the master file submitted to the HQ host country, but this file is not exchanged across jurisdictions. The master file includes information on group structure, value creation, and transfer pricing policies, which would allow tax authorities to target transfer pricing arrangements more directly. A natural extension of the current CbC framework would therefore be to exchange master files as well. It is, however, not clear whether tax authorities have the capacity to use such vast information to effectively target audits more precisely. To alleviate this issue, the master file should additionally be standardized.[27]

2.6 Bringing the Model to the Data

Our theoretical analysis connects to the existing empirical literature in several ways. The mechanism of tax audit costs driving effects on profit shifting corresponds well to the tax-enforcement channels that are suggested in previous literature (Overesch and Wolff, 2021). Furthermore, the empirical findings fit well with our theoretical results: CbC reporting increases the consolidated ETRs of MNCs (Joshi, 2020; Hugger, 2025), which is in line with our finding that overall profit shifting (to tax havens) decreases.

Turning to public CbC reporting, our substitution effect argument also puts the results in Joshi et al. (2020) into perspective, who do not find a robust increase in

[27]For example, Germany and the Netherlands have standardized master-file requirements largely based on the OECD BEPS Action 13 framework.

ETRs. Their finding that affiliates in EU countries report higher income is in line with our predictions if one interprets the (receiving) EU countries as—relatively—low-tax countries. An explicit test of the substitution effect, however, is still missing.[28]

There are also close parallels with De Simone and Olbert (2022). They document a reallocation of real activity from higher-tax EU affiliates to affiliates in EU countries with preferential tax regimes, which can be interpreted as low-tax countries or disguised tax havens. Our model provides a theoretical underpinning by highlighting a substance channel: Relocating economic activity mitigates tax audit costs under CbC reporting.

In addition, our model stresses that the optimal adjustment to CbC reporting also includes a reallocation of paper profits from high-tax to low-tax countries. Joshi et al. (2025) find that outbound shifting affiliates with low income and high activity adjust their misalignment after the introduction of CbC reporting. The adjustment happens by reducing fixed assets, income does not change. This is consistent with our theory when the direct cost effect and the substitution effect (plus the substance channel) offset each other in magnitude.

Turning to tax havens, De Simone and Olbert (2022) find that MNCs close tax-haven affiliates after the introduction of CbC reporting, which they interpret as an attempt to reduce the appearance of tax aggressiveness. Our model provides a complementary explanation. CbC reporting makes the use of tax havens costly because shifting profits to low-tax countries—rather than to havens—reduces both audit likelihood and audit costs. As a result, tax-haven affiliates lose relevance or become mere conduit entities for rerouting profits from high-tax to low-tax countries.[29] This interpretation is also consistent with earlier evidence on reduced tax-haven presence following geographic earnings disclosure (Hope et al., 2013).

Taken together, our model predicts that CbC reporting reshapes profit-shifting patterns between high-tax and low-tax countries. Much of the existing empirical literature analyzes non-haven countries jointly, which makes it difficult to directly identify such reallocation mechanisms.[30] We therefore turn to the data to test our model predictions more directly. Before doing so, we briefly summarize these predictions by country type.

[28] Note that Joshi et al. (2020) do not differentiate between high-tax and low-tax EU countries in their analyses of pre-tax income.

[29] In a richer framework with fixed costs of transfer pricing, firms would optimally relocate intangibles and potentially split them across multiple low-tax affiliates. This keeps tax audit costs in check and can rationalize the disappearance of tax-haven affiliates documented by De Simone and Olbert (2022).

[30] An exception is Hugger (2025), who splits affiliates by tax rates in the appendix; however, his design does not allow identifying absolute profitability changes across country types. De Simone and Olbert (2022) distinguish between countries with and without preferential tax regimes.

Tax havens. Our analysis predicts that under CbC reporting both the direct tax audit cost effect and the substitution effect work against tax havens. At the same time, CbC reporting opens a substance channel that can foster total profit shifting. If the substance channel is sufficiently weak, CbC reporting reduces reported profits in tax-haven affiliates of treated MNCs relative to haven affiliates of untreated MNCs.

Low-tax countries. In the presence of a muted substance channel, firms shift less profit out of low-tax countries after the introduction of CbC reporting, because the direct effect and the substitution effect operate in the same direction. We therefore expect that affiliates in low-tax countries report higher taxable profits after CbC reporting if they belong to treated MNCs, relative to comparable affiliates of untreated MNCs.

High-tax countries. For affiliates in high-tax countries, the profit-shifting response is a priori ambiguous, regardless of the substance channel. The substitution effect works in the opposite direction of the direct tax audit cost effect. Equation (2.11) shows that if tax audit costs are sufficiently large relative to tax planning costs, profit shifting from high-tax countries increases. In this case, treated affiliates in high-tax countries should report lower taxable profits than comparable untreated affiliates. If tax audit costs do not sufficiently exceed tax planning costs, the substitution effect remains weaker than the direct effect, and treated high-tax affiliates will not report lower taxable profits. Even then, however, their profit increase should be smaller than that observed for treated affiliates in low-tax countries.[31]

2.7 Empirical Analysis

2.7.1 Identification

To test the hypotheses stated in the previous section, we conduct several difference-in-differences analyses at the affiliate level. We compare affiliates of MNCs that have to submit CbC reports ('treatment group') with affiliates of MNCs not subject to CbC

[31] Importantly, the substitution effect—rather than the substance channel—generates asymmetric responses between high-tax and low-tax countries.

reporting ('control group'), before and after CbC reporting was in place in a difference-in-differences analysis.[32]

Treatment definition. As treatment group, we use affiliates of MNCs that are subject to CbC reporting. An MNC becomes subject to CbC reporting if it reports total consolidated revenues above the CbC reporting threshold and the global ultimate owner is located in a country that has implemented CbC reporting legislation. For all countries in the sample, we specify the CbC reporting at the applicable threshold. For most countries, the threshold is EUR 750 million in consolidated revenue, but some countries specify the threshold in local currency.[33] To avoid bias from potential manipulation around the reporting threshold, we exclude MNCs whose consolidated revenue lies within 10 million above or below the applicable threshold in any year. We include these affiliates as a robustness check in Section 2.7.4. Furthermore, the EU-wide implementation of CbC reporting requires that if an EU affiliate is part of an MNC that exceeds the EUR 750 million revenue threshold but is not subject to CbC reporting in its HQ country, the MNC has to assign an EU-based affiliate the status of 'Surrogate Parent Entity'. The surrogate parent entity has to file the CbC report for the MNC in the EU. Therefore, we include such corporate groups with a surrogate parent entity in the treatment group.[34]

Treatment timing. Most countries introduced CbC reporting in 2016, including all EU countries.[35] In 2017, Iceland, Malaysia, Singapore, and Venezuela introduced CbC reporting; followed in 2018 by Switzerland, Curaçao, Hong Kong, the Marshall

[32]We do not implement a Regression Discontinuity Design (RDD), because the median of consolidated revenue among the treated MNCs in the sample is EUR 3.5 billion (mean EUR 11.2 billion), indicating that most treated MNCs in our sample are far above the EUR 750 million threshold. An RDD only yields a local average treatment effect (LATE) around the threshold, whereas we are interested in the average treatment effect on the treated. Furthermore, we find evidence of bunching below the threshold of EUR 750 million, which biases the estimate of the LATE.

[33]The countries with a different threshold than EUR 750 million include Australia (ASD 672 million), Brazil (BRL 2.26 billion), Cayman Islands (USD 850 million), China (RMB 5.5 billion), Curacao (ANG 1.5 billion), Hong Kong (HKD 6.8 billion), Iceland (ISK 100 billion), India (INR 55 billion), Japan (JPY 100 billion), Malaysia (MYR 3 billion), Mexico (MXN 12 billion), New Zealand (NZD 1.3 billion), Norway (NOK 6.5 billion), Singapore (SGD 1.125 billion), South Africa (ZAR 10 billion), South Korea (KRW 1 trillion), Switzerland (CHF 900 million), Taiwan (NTD 27 billion), United States (USD 850 billion), and Vietnam (VND 18 trillion).

[34]In our sample, 48.6% of the observations that ever receive treatment have a global ultimate owner in the EU, but 95.7% belong to MNCs with at least one affiliate in the EU. Thus, the revenue threshold is often decisive for whether a group is required to file CbC reports or not, not where the HQs are.

[35]In addition to the EU countries, Australia, Bermuda, Brazil, Canada, Chile, India, Japan, South-Korea, the Cayman Islands, Mexico, Norway, New Zealand, Taiwan, the U.K., the U.S., and South-Africa introduced CbC reporting in 2016.

Islands, and the British Virgin Islands; in 2019 by Turkey; and in 2021 by Thailand. Our sample period 2012–2021 covers four to nine years before and one to six years after the introduction of CbC reporting. 90.6% of our observations that ever receive treatment are treated in 2016.

High-tax vs. low-tax split. We split the sample into high-tax, low-tax and tax-haven affiliates. To define high-tax and low-tax affiliates, we calculate the median statutory corporate tax rate among all affiliates within an MNC on a year-by-year basis.[36] Then, we define low-tax affiliates as affiliates that face a tax rate in a given year below or equal to the median tax rate within the MNC. High-tax affiliates are affiliates that face a tax rate in a given year above the median tax rate within the MNC. The average within-MNC median tax rate decreases over time (2012: 30.10%; 2021: 25.13%). High-tax or low-tax status is highly stable over time: in only 3.11% of affiliate-year observations does an affiliate's classification switch between the low-tax and high-tax group relative to the previous year. We define affiliates as tax-haven affiliates if they are located in a country classified as a tax haven by Tørsløv et al. (2023b). Our results are also robust to excluding Belgium from the tax-haven group and to using the most recent tax-haven list of Dharmapala (2024) instead, see Appendix Table 2.E.5.[37]

Estimation equation. We implement two main regression specifications. First, we split the sample into high-tax, low-tax and tax-haven affiliates and estimate

$$\left(\frac{EBT}{Assets}\right)_{i,m,c,t} = \gamma_1 \cdot CbCR_{m,t} + \text{Firm FE}_i + \text{Country-Year FE}_{c,t} + \epsilon_{i,m,c,t}, \quad (2.12)$$

where $\left(\frac{EBT}{Assets}\right)_{i,m,c,t}$ denotes the profit before taxes divided by total assets of affiliate i of the MNC m in country c in year t. To ensure that the denominator is not driving the estimated coefficients, we use the number of total assets in 2015 to scale profit before taxes. Using $EBT/Assets$ as the main dependent variable has the advantage that affiliates with negative or zero profit remain in the sample. Zero profit may reflect profit shifting in its most aggressive form (Bilicka, 2019).

$CbCR_{m,t}$ is a dummy variable that equals one if the affiliate is part of an MNC that is subject to CbC reporting in a given year. Hence, γ_1 identifies our estimated

[36] We use the full list of affiliates listed for each global ultimate owner in Orbis, which includes affiliates for which no financial information is available in Orbis.

[37] In our sample, tax-haven affiliates are located in Belgium (23,195 affiliate-year observations), Switzerland (59), Ireland (3,450), Luxembourg (367), Malta (40), and the Netherlands (3,015).

coefficient of interest as the effect of CbC reporting on an affiliate's profitability. For low-tax affiliates, we expect γ_1 to be positive, indicating that these affiliates shift less profit after the introduction of CbC reporting. For high-tax affiliates, we expect γ_1 to be close to zero or negative, indicating that CbC reporting is not effective against profit shifting or—in the case of a negative γ_1—even implies higher profit shifting due to the substitution effect identified in the model. For tax-haven affiliates, we expect γ_1 to be negative, as CbC reporting reduces total profit shifting to tax havens.

We add affiliate fixed effects to control for affiliate-level time-invariant characteristics such as the home country, industry, size of the affiliate, and the cost parameters in the tax planning and tax audit cost function. Country-year fixed effects control for macroeconomic trends and time-varying country characteristics such as tax rates.

Second, we estimate a more flexible specification in the whole sample (low- and high-tax affiliates),

$$\left(\frac{EBT}{Assets}\right)_{i,m,c,t} = \gamma_2 \cdot CbCR_{m,t} + \delta \cdot CbCR_{m,t} \cdot TaxRate_{c,t} + \psi \cdot TaxRate_{c,t} + \text{Firm FE}_i + \text{Year FE}_t + \epsilon_{i,m,c,t}. \quad (2.13)$$

The effect of CbC reporting is now given by $\gamma_2 + \delta \cdot TaxRate_{c,t}$, where $TaxRate_{c,t}$ denotes the statutory corporate income tax rate in the country where affiliate i is located.[38] In this specification, we exclude tax-haven affiliates from the main sample. We include affiliate and year fixed effects and, in additional specifications, time-varying affiliate- and country-level controls. We cannot include country-year fixed effects as these would subsume the variation in the tax rate.

We expect that γ_2 is positive and δ negative, i.e., that introducing CbC reporting increases profitability of low-tax affiliates, but only has a weak effect on or even decreases profitability (implying more profit shifting) in high-tax affiliates. The regression equation (2.13) imposes that profit shifting changes linearly with the tax rate. Note that also in our model, this relationship is linear if the tax planning costs are identical across countries.[39]

[38] Consistent with the model, we use statutory corporate income tax rates, as these represent the marginal rate against which profits are shifted. Alternative measures such as forward-looking effective tax rates (Devereux and Griffith, 2003) capture investment incentives rather than the taxation of shifted profits, while backward-looking effective tax rates are endogenous to firms' profit-shifting behavior.

[39] More formally, $\frac{\partial P_H}{\partial t_H} = \frac{\partial P_L}{\partial t_L} = \frac{\theta_A + \alpha^2 \theta_A + \theta}{(\alpha^2-1)^2 \theta_A^2 + \theta^2 + 2(1+\alpha^2)\theta_A \theta}$.

We estimate our regressions using two-way fixed effects. In our setting, there is little heterogeneity in treatment timing, as most countries introduced CbC reporting in 2016 and only few MNCs cross the EUR 750 million threshold in later years. Therefore, in the main analysis, we use the standard fixed effects estimator, as 90.6% of our observations that ever receive treatment are treated in 2016. We cluster standard errors at the level of the MNC interacted with year because being subject to CbC reporting is determined yearly by the consolidated revenue threshold of EUR 750 million.

2.7.2 Data

We use data from Bureau van Dijk's Orbis database from 2012–2021 at both the affiliate– and the global ultimate owner–levels. In line with our model, we select global ultimate owners—HQs in our model—that are located anywhere in the world and have at least two foreign affiliates, which are each located in different countries. We only include MNCs with consolidated revenues above EUR 100 million. At the global ultimate owner–level, we use consolidated data on total revenues and information on the location of subsidiaries.

We include affiliates in the sample if the global ultimate owner owns (directly or indirectly) more than fifty percent. We construct ownership links as follows: We take the latest available information from Historical Orbis Data and update the ownership structure if there is historical ownership data available. We exclude financial and extractive industries (based on NACE Rev. 2 core codes) because these industries face different regulations and tax incentives. We also exclude affiliates that have global ultimate owners from the U.S., because these might be affected by the Tax Cuts and Jobs Act (TCJA) around the time of the introduction of CbC reporting, and because the U.S. has not signed up to the CbC MCAA.[40] At the affiliate-level, we use unconsolidated data on profit before tax (EBT), total and fixed assets, and the number of employees. In addition, we collect country-level data on corporate statutory tax rates from the Tax Foundation and GDP data from the World Bank.[41]

We drop affiliates and global ultimate owners with negative total assets and negative turnover. Thus, a negative value of $EBT/Assets$ indicates loss-making affiliates. We also drop affiliates of global ultimate owners for which we do not observe consolidated revenue of the MNC in one of the sample years. We drop an affiliate from all sample years if we do not observe its profit before tax or total assets in one (or more)

[40] In robustness analyses, we include U.S. MNCs (see Table 2.3) and find similar results.

[41] For Taiwan, we obtain GDP data directly from the National Statistics of the Republic of Taiwan.

sample years. Our final sample for analysis includes 467,552 affiliate-years, consisting of 48,428 unique affiliates that are part of 6,040 MNCs. Appendix Table 2.E.1 compares our sample coverage in terms of countries, years, and number of observations to the most closely related studies using Orbis data.

Table 2.1: Descriptives

Panel A: Full Sample

	Obs.	Mean	SD	1st	50th	99th
CbCR	467,552	0.38	0.48	0.00	0.00	1.00
EBT/Assets	467,552	0.07	0.22	-0.88	0.04	1.07
EBT (ths. EUR)	467,552	7,623	161,809	-22,542	348	133,525
Total Assets (ths. EUR)	467,552	158,094	1,884,842	27	11,286	2,434,828
Fixed Assets (ths. EUR)	467,487	94,881	1,487,618	0	2,270	1,337,765
Employees (number)	338,911	286	2,291	0	51	3,689
GDP (bln. EUR)	467,552	1.69	1.37	0.05	1.39	5.21
Tax Rate (%)	467,552	26	6	10	25	38

Panel B: Low-Tax vs. High-Tax vs. Tax Haven

	Low-Tax		High-Tax		Tax Haven	
	Treatment	Control	Treatment	Control	Treatment	Control
EBT/Assets	0.10	0.07	0.07	0.05	0.08	0.06
EBT (ths. EUR)	14,950	5,281	8,651	3,729	28,270	3,857
Total Assets (ths. EUR)	313,353	113,589	178,943	93,658	287,727	120,528
Fixed Assets (ths. EUR)	203,158	70,910	94,701	51,482	182,289	72,779
Employees (number)	437	193	404	243	214	130
GDP (bln. EUR)	1.25	1.20	2.59	2.18	0.53	0.52
Tax Rate (%)	20	22	30	31	26	30
Observations	77,960	144,362	85,255	129,849	12,212	17,914

Note: Affiliate-level data from Orbis for 2012–2021. Panel A reports the full sample including tax-haven affiliates. Panel B reports means by group and treatment status. Low-tax (high-tax) affiliates are non-haven affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC; tax havens follow Tørsløv et al. (2023b). Treatment affiliates belong to MNCs subject to CbC reporting.

Table 2.1, Panel A shows descriptive statistics for the full sample. We winsorize values of *EBT/Assets* at the 1% and 99% level. The 1st percentile of affiliates reports an *EBT/Assets* of -0.88, and the 99th percentile reports an *EBT/Assets* of 1.07. With

a mean of 0.07 and a standard deviation of 0.22, there is large variability in our main variable *EBT/Assets*, including a substantial number of loss-making firms.[42]

Table 2.1, Panel B shows that on average, affiliates in the control group are smaller than affiliates that do become subject to CbC reporting. Tax rates are comparable between treatment and control affiliates within both the low-tax and high-tax groups. Table 2.1, Panel B further shows that on average, low-tax affiliates are more profitable and larger than high-tax affiliates, except for employee numbers. Low-tax countries are smaller than high-tax countries, as indicated by GDP.

Appendix Figure 2.E.2 plots percentiles of affiliate size, measured by total assets and by the cost of employees. Appendix Figure 2.E.3 compares the cumulative shares of EBT and total assets across affiliates ranked by total assets, separately for low-tax and high-tax affiliates. Together, the two figures show that affiliate size is highly right-skewed and that profits are similarly concentrated among the largest affiliates. Profit concentration broadly tracks asset concentration, with profits somewhat less concentrated than assets, so that *EBT/Assets* is broadly similar across the size distribution. Finally, Appendix Table 2.E.2 reports the distribution of affiliate-year observations across countries and tax groups.

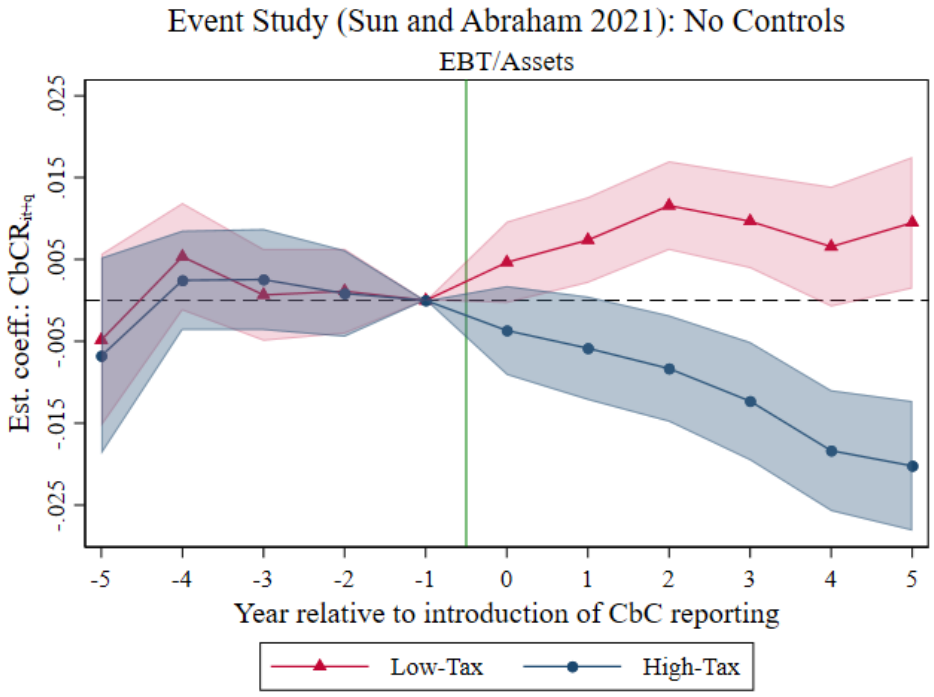
The differences between treatment and control groups do not threaten our identification strategy as long as treated and non-treated affiliates in each group develop similarly. Our identifying assumption is that in the absence of the introduction of CbC reporting, treated and non-treated low-tax (high-tax) affiliates would develop similarly with respect to their profitability. We cannot directly test this assumption, but we can assess whether reported profitability—as measured by EBT/Assets—develops similarly in treatment and control affiliates before the introduction of CbC reporting.

2.7.3 Results

To confirm that treated and control groups developed similarly before the introduction of CbC reporting, and to obtain a first set of results, we estimate an event study. We use the estimator by Sun and Abraham (2021). Figure 2.2 shows the results. There is no significant difference between treatment and control groups before the introduction of CbC reporting. After becoming subject to CbC reporting, low-tax affiliates become more profitable whereas high-tax affiliates become less profitable, compared to the respective control group. This pattern aligns well with our hypotheses.

[42]Before winsorizing, *EBT/Assets* ranges from a minimum of −61,010 to a maximum of 272,143. Winsorizing at the 1% and 99% level thus removes the influence of these extreme outliers.

Figure 2.2: EBT/Assets over Time: Event Study, Sun and Abraham (2021)



Note: Affiliate-level data from Orbis for 2012–2021. Event Study coefficients and 90% confidence intervals based on standard errors clustered by MNC interacted with year. Estimated using Sun and Abraham (2021) dynamic difference-in-differences with affiliate and year fixed effects. Low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC.

Table 2.2 presents our main regression results. Panel A splits the sample into low-tax affiliates, high-tax affiliates, and tax-haven affiliates. Columns (1) to (3) report the baseline specification (2.12), which includes affiliate and country-year fixed effects. Following the introduction of CbC reporting, low-tax affiliates exhibit significantly higher profitability, while high-tax affiliates become significantly less profitable; tax-haven affiliates also experience a decline in profitability. In economic terms, low-tax (high-tax) affiliates increase (decrease) profitability by 5.6% (16.0%) relative to baseline EBT/Assets levels of 0.07 (0.05). Taken together, these patterns are consistent with the substitution mechanism derived in the model: As CbC reporting raises the audit costs associated with profits reported in tax havens, MNCs reduce shifting to havens and reallocate reported profits across non-haven affiliates.

Table 2.2: Main Regressions

Panel A: Sample Split

	(1) Low-Tax	(2) High-Tax	(3) Tax Haven	(4) Low-Tax	(5) High-Tax	(6) Tax Haven
CbCR	0.0039*	-0.0080***	-0.0144***	0.0070***	-0.0092***	-0.0088**
	(0.0021)	(0.0022)	(0.0043)	(0.0018)	(0.0021)	(0.0044)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	No	No	No
Year FE	No	No	No	Yes	Yes	Yes
Obs.	222,322	215,104	30,126	222,374	215,116	30,126
R^2	0.51	0.52	0.48	0.50	0.52	0.47

Panel B: Flexible Specification

	(1) Full Sample, Excl. Controls	(2) Full Sample, Incl. Controls	(3) MNCs With Tax Havens Only
CbCR X Tax Rate	-0.0013***	-0.0013***	-0.0014***
	(0.0001)	(0.0001)	(0.0001)
CbCR	0.0317***	0.0320***	0.0312***
	(0.0036)	(0.0038)	(0.0040)
Tax Rate	0.0012***	0.0014***	0.0017***
	(0.0002)	(0.0002)	(0.0003)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm Ctrs.	No	Yes	Yes
Country Ctrs.	No	Yes	Yes
Obs.	437,490	314,783	244,135
R^2	0.49	0.54	0.54

Note: Affiliate-level data from Orbis for 2012–2021. Data excludes U.S. MNCs. The dependent variable is *EBT/Assets*, defined as the affiliate's yearly *Profit Before Tax* divided by *Total Assets* in 2015. Low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC. *CbCR* is a dummy variable equal to one if the affiliate is part of an MNC that is subject to CbC reporting in that year. Firm-level control variables comprise the number of employees and fixed assets; country-level control variables comprise GDP. Tax havens are defined according to Tørsløv et al. (2023b). Panel B, column (3) includes only MNCs with at least one tax-haven subsidiary in their group structure. We cluster standard errors by multinational, interacted with year. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Columns (4) to (6) of Table 2.2 show the same sample but include year fixed effects only, because Berg et al. (2021) show that fixed effects can bias difference-in-differences estimates in case of heterogeneous spillovers between treated and control observations. Even though the estimated differences in profitability are insignificant pre-treatment (see Figure 2.2), it may still be that control affiliates experience changes in profitability as a result of CbC reporting. If this is the case, adding country-year fixed effects might bias the estimates. We therefore also report year fixed effects in Table 2.2. The results are similar to baseline.

Panel A of Table 2.E.4 in the Appendix replicates Table 2.2 including control variables. The pattern of profit shifting is robust to the inclusion of affiliate-level and country-level control variables for tax-haven affiliates. For low-tax and high-tax affiliates, however, the estimates lose significance in columns (1) and (2).[43] Nevertheless, the point estimates retain their expected signs—positive for low-tax and negative for high-tax affiliates. Importantly, even the insignificant high-tax estimate rules out a large positive effect of CbC reporting on high-tax profitability and is thus in line with the substitution effect.

In Panel B of Table 2.2, we show results of estimating the flexible specification in equation (2.13).[44] We observe the expected signs: CbC reporting implies higher profitability in low-tax countries, but the effect decreases as the tax rate increases. Based on the specification with control variables in column (2), the effect of introducing CbC reporting turns negative if the tax rate is above 24.6%.[45] This suggests that the substitution effect identified in our theory model dominates the direct effect of introducing CbC reporting for affiliates that face a tax rate of 24.6% or higher. This critical value is close to the median tax rates used in the split sample in Panel A of Table 2.2.

The flexible specification also puts the size of the estimated decline for high-tax affiliates into perspective. The implied effect of CbC reporting, $\gamma_2 + \delta \cdot TaxRate_{c,t}$, is

[43] A reason for the loss of significance might be that only larger affiliates are required to report on the control variables. Furthermore, such extensive reporting rules are more prevalent in countries with higher enforcement capacity (e.g., France and Norway). This limits the sample to affiliates which may already be experiencing more scrutiny from tax authorities and thus might not be engaging in profit shifting to the same extent.

[44] Note that the number of observations in Panel B is the sum of the number of low-tax and high-tax affiliates in Panel A, columns (4) and (5). We exclude tax haven affiliates in Panel B, because there is no common support for the tax rate of tax haven affiliates.

[45] The critical tax rate at which CbC reporting does not affect profitability is obtained by differentiating equation (2.13) with respect to $CbCR_{m,t}$. Doing so leads to the condition $\gamma_2 + \delta \cdot TaxRate_{i,t} = 0$ such that $t^{critical} = -\frac{\gamma_2}{\delta} = -\frac{0.0320}{-0.0013} = 24.6$. Here and for the implied effects below, we compute derived quantities from the coefficients as displayed in Table 2.2, i.e., rounded to four decimals.

close to zero for affiliates just above the critical tax rate and reaches −0.007 at 30%, the mean statutory rate in the high-tax group. This is closely in line with the sample-split estimate in Panel A of Table 2.2. The decline for high-tax affiliates is thus concentrated among affiliates facing the highest tax rates, where the tax savings from profit shifting are largest, exactly as the substitution effect predicts.

2.7.4 Robustness Tests and Back-of-the-Envelope Calculation

We next provide robustness tests for our main results on high-tax and low-tax countries.[46] In columns (1) and (2) of Table 2.3, we first show the event study estimates using Sun and Abraham (2021) from Figure 2.2. We estimate the ATT for all post-treatment periods, and obtain results that are similar to baseline. Furthermore, we test whether the estimates for high-tax versus low-tax affiliates differ significantly, which yields a Z-statistic with a P-value of 0.000. Appendix Figure 2.E.1 shows results for the estimators of Callaway and Sant'Anna (2021), De Chaisemartin and D'Haultfœuille (2024), and a standard two-way fixed-effects event study; all reproduce the baseline pattern.

In the remainder of Table 2.3, we show that our results are robust to different samples. We base these tests on our main specification from columns (1) and (2) of Table 2.2. First, in columns (3) and (4), we restrict the sample to affiliates of MNCs with at least one subsidiary in a tax-haven country (based on the tax haven list in Tørsløv et al., 2023b). This measure is imperfect, as Orbis has incomplete coverage of tax haven affiliates (Tørsløv et al., 2023b) and does not include branches (Langenmayr and Reiter, 2022). At the same time, this restriction focuses the analysis on MNCs that are more likely to engage in profit shifting. Consistent with the model, the estimated coefficients for both low-tax and high-tax affiliates increase in magnitude.[47]

Second, in columns (5) and (6), we exclude HQ affiliates from the sample, because Dischinger et al. (2014) show that MNCs might be hesitant to shift profits away from their HQ. Furthermore, because HQs have to provide local files with detailed transfer-pricing documentation (see footnote 8), they might be subject to more scrutiny. Excluding them from the sample therefore focuses our analysis on subsidiaries only. The estimates are similar to baseline, suggesting that HQs are not driving the estimates.

[46] Appendix Table 2.E.6 provides corresponding robustness tests for tax haven affiliates.

[47] As a placebo exercise, we also estimate the specification for MNCs without observable tax haven affiliates in Orbis (results available upon request). In this subsample, we find no statistically significant effects.

Table 2.3: Robustness

	Event Study		MNCs With Tax Havens		Non-HQs		Incl. U.S. MNCs	
	(1) Low-Tax	(2) High-Tax	(3) Low-Tax	(4) High-Tax	(5) Low-Tax	(6) High-Tax	(7) Low-Tax	(8) High-Tax
CbCR	0.0082***	-0.0114***	0.0061**	-0.0113***	0.0067***	-0.0096***	0.0067***	-0.0073***
	(0.0027)	(0.0028)	(0.0024)	(0.0027)	(0.0019)	(0.0022)	(0.0017)	(0.0020)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ctrs.	No	No	No	No	No	No	No	No
Obs.	222,322	215,104	157,790	181,469	214,985	206,406	262,604	240,535
R^2	0.50	0.52	0.50	0.52	0.51	0.53	0.50	0.52

	Incl. Threshold		Excl. 2020-2021		Excl. 2016	
	(9) Low-Tax	(10) High-Tax	(11) Low-Tax	(12) High-Tax	(13) Low-Tax	(14) High-Tax
CbCR	0.0076***	-0.0089***	0.0037**	-0.0084***	0.0085***	-0.0112***
	(0.0018)	(0.0020)	(0.0018)	(0.0021)	(0.0020)	(0.0023)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Ctrs.	No	No	No	No	No	No
Obs.	230,739	221,374	175,301	171,066	198,032	194,207
R^2	0.50	0.52	0.54	0.57	0.50	0.52

Note: Affiliate-level data from Orbis for 2012–2021. The dependent variable is *EBT/Assets*, defined as the affiliate's yearly *Profit Before Tax* divided by *Total Assets* in 2015. Columns (1) and (2) show an event study using Sun and Abraham (2021). The rest of the table shows robustness regarding the sample. Compared to the main analysis, columns (3) and (4) only include MNCs with at least one tax-haven subsidiary in their group structure. Columns (5) and (6) exclude HQ entities. Columns (7) and (8) include U.S. MNCs. Columns (9) and (10) exclude MNCs around the CbC reporting threshold. Columns (11) and (12) exclude the years 2020 and 2021. Columns (13) and (14) exclude the year 2016. Low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC. *CbCR* is a dummy variable equal to one if the affiliate is part of an MNC that is subject to CbC reporting in that year. We cluster standard errors by multinational, interacted with year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Third, in columns (7) and (8), we include affiliates with U.S. HQs, which we excluded from the main sample as they may have been affected by the Tax Cuts and Jobs Act (TCJA) around the time of the introduction of CbC reporting. These results are also comparable to the baseline estimates.

Fourth, in columns (9) and (10), we include affiliates from MNCs that report consolidated revenue within EUR 10 million around the threshold in any year. The results are similar to the main results, showing that manipulation around the threshold is not driving our findings. Fifth, in columns (11) and (12) we exclude the years 2020 and 2021 from our sample to ensure that the pandemic does not drive the estimates. Sixth, we exclude the year 2016 in columns (13) and (14) to account for MNCs not using the calendar year as their accounting year and countries that introduced CbC reporting halfway through the year. Results are again similar.

Table 2.4 repeats the robustness tests above for the flexible specification in equation (2.13). All results are similar to baseline.

We include two further robustness tests in Table 2.E.3 in the Appendix. First, in Panel A, we estimate the effect of CbCR on aggregate profits of an MNC in each country where it has affiliates. The dependent variable is country-level aggregated profitability, defined as the sum of all non-HQ affiliates' profit before tax divided by all affiliates' total assets of the same MNC in one country. The estimates are smaller and insignificant, but have the correct signs. A reason for the smaller coefficients might be that we do not observe all affiliates of an MNC in each country, for example because accounting regulations only require larger affiliates to publish their financial statements.[48]

Panel B of Table 2.E.3 shows the analysis restricted to affiliate-years with positive earnings before taxes only. This restriction addresses concerns that subsidiaries with operating losses or net operating losses may face very low effective marginal tax rates and therefore different shifting incentives, and that the prevalence of loss firms may affect profitability-based outcome measures more generally (De Simone et al., 2017). In this restricted sample, the estimates for low-tax affiliates are insignificant and close to zero, while the estimates for high-tax affiliates and tax-haven affiliates remain in line with the baseline results. The loss of precision for low-tax affiliates likely reflects the substantial reduction in sample size and the exclusion of affiliate-years with near-zero profits, which may be very active profit shifters.

[48]Our results are not driven by small affiliates: In untabulated analysis, we exclude the smallest tercile of affiliates in terms of total assets. The results are similar, albeit less significant in the sample split. The flexible specification remains highly significant and implies that the substitution effect dominates for tax rates above 22.8%.

Table 2.4: Robustness for Flexible Specification

	(1) With Tax Havens	(2) Non-HQs	(3) Incl. U.S.	(4) Incl. Threshold	(5) Excl. 2020- 2021	(6) Excl. 2016
CbCR X Tax Rate	-0.0013***	-0.0013***	-0.0012***	-0.0013***	-0.0011***	-0.0014***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
CbCR	0.0305***	0.0307***	0.0292***	0.0323***	0.0251***	0.0348***
	(0.0038)	(0.0036)	(0.0032)	(0.0035)	(0.0036)	(0.0038)
Tax Rate	0.0014***	0.0011***	0.0013***	0.0012***	0.0006***	0.0014***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Ctrs.	No	No	No	No	No	No
Country Ctrs.	No	No	No	No	No	No
Obs.	341,951	425,204	507,450	456,209	351,371	396,219
R^2	0.50	0.50	0.49	0.49	0.53	0.49

Note: Affiliate-level data from Orbis for 2012–2021. The dependent variable is *EBT/Assets*, defined as the affiliate's yearly *Profit Before Tax* divided by *Total Assets* in 2015. Column (1) only includes MNCs with at least one tax-haven subsidiary in their group structure. Column (2) excludes HQs. Column (3) includes U.S. MNCs. Column (4) includes MNCs around the CbC reporting threshold. Column (5) excludes observations from 2020 and 2021. Column (6) excludes observations from 2016. *CbCR* is a dummy variable equal to one if the affiliate is part of an MNC that is subject to CbC reporting in that year. We cluster standard errors by multinational, interacted with year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

To ensure that real responses do not drive our results (De Simone and Olbert, 2022), we re-estimate our main specifications in two untabulated robustness checks, where we scale EBT by (i) yearly total assets and (ii) 2021 total assets. The results are in line with baseline—profitability per unit of assets falls in high-tax affiliates and rises in low-tax affiliates. In an untabulated robustness check, we also find no significant effect of CbC reporting on fixed-asset investment. Accordingly, the changes in reported profitability are not driven by a reallocation of real activity across country groups in our sample.

In addition, we include robustness tests on the definition of high-tax versus low-tax affiliates in Panel B of Table 2.E.4 in the Appendix. In columns (1) and (2), we define low-tax (high-tax) affiliates as affiliates below or equal to (above) the worldwide median tax rate on a yearly level. In columns (3) and (4), we define low-tax (high-tax) as affiliates below or equal to (above) the critical tax rate of 24.6% as estimated in Table 2.2, Panel B, Column (2).

Lastly, we use our estimates for a back-of-the-envelope calculation of the revenue implications of CbC reporting.[49] For each non-haven country, we evaluate the country-specific profitability effect of CbC reporting implied by the flexible specification (Table 2.2, Panel B, Column 2) at the country's average statutory tax rate over 2016–2021 and denote it by β_c.[50] We multiply β_c by the country's tangible assets reported in the OECD CbC data for 2018 to obtain the implied change in reported profits. Then, we multiply this change by the average tax rate. Table 2.5 reports the resulting change in corporate tax revenue as a percentage of each country's 2015 corporate tax revenue from the OECD Revenue Statistics. We restrict the calculation to non-haven countries.

We find that countries with a statutory rate below the critical rate of 24.6% gain revenue, and countries above it lose. Low-tax countries gain between 1.2% (Bulgaria) and 4.2% (Hungary) of their corporate income tax revenue. High-tax countries lose. For example, Germany loses 5.3% and Japan 2.9% of pre-CbCR corporate tax revenues. The losses grow with the statutory rate, consistent with the substitution effect concentrating the remaining profit shifting where the tax savings are largest.

[49] Because we do not observe the universe of MNC affiliates in Orbis—which has less coverage of smaller firms (Kalemli-Özcan et al., 2024)—we base this calculation on the aggregate CbC reporting data published by the OECD (2016), rather than on our own sample.

[50] Formally, we set $\beta_c = \gamma_2 + \delta \cdot \text{AvgTaxRate}_c$ for any country c.

Table 2.5: Back-of-the-Envelope Calculation: Tax Revenue Effects by Country

Country	% Avg. Tax Rate 2016–21	β_c	Profits (USD m)	Assets (USD m)	Lost / Gained Profits (USD m)	CIT Revenue (USD m)	Lost / Gained CIT (USD m)	% CIT
High-Tax								
France	33.0	−0.0109	121,649	888,614	−9,714	47,424	−3,208	−6.76
Germany	30.0	−0.0070	239,123	1,472,650	−10,279	57,721	−3,082	−5.34
Japan	29.8	−0.0068	513,964	2,355,213	−15,925	166,107	−4,748	−2.86
Low-Tax								
Bulgaria	10.0	0.0190	1,414	7,012	133	1,105	13	1.21
Czechia	19.0	0.0073	19,504	78,960	576	6,711	110	1.63
Finland	20.0	0.0060	21,759	61,406	368	5,045	74	1.46
Hungary	10.7	0.0181	10,193	46,423	842	2,153	90	4.17
Poland	19.0	0.0073	27,044	203,091	1,483	8,782	282	3.21
Romania	16.0	0.0112	6,071	35,106	393	4,176	63	1.51
United Kingdom	19.2	0.0071	263,464	1,777,256	12,589	66,956	2,413	3.60

Notes: Back-of-the-envelope calculation for the change in corporate income tax revenue as a result of CbC reporting. Sample restricted to countries with at least 3,000 affiliate-years and an imbalance in the within-MNE qualification as high-tax versus low-tax (or vice versa) of maximum 90% versus 10%. Countries are grouped by majority tax status (Tax Haven, High-Tax, Low-Tax). Columns are constructed the following way: *Avg. tax rate* is each country's statutory corporate income tax rate averaged over 2016–2021. The country-specific effect is $\beta_c = \gamma_2 + \delta \cdot \text{AvgTaxRate}_c$, with $\gamma_2 = 0.0320$ and $\delta = -0.0013$ from the flexible specification (Table 2.2, Panel B, column 2; equation (2.13)). *Profits* and *Assets* are 2018 sums from the OECD Aggregate CbCR Statistics; *Assets* is tangible assets other than cash and cash equivalents. *Lost / Gained Profits* = $\beta_c \times$ Assets. *CIT revenue* is 2015 total corporate income tax revenue. *Lost / Gained CIT* = Lost / Gained Profits × Avg. tax rate. *% CIT* expresses lost or gained CIT as a percentage of CIT revenue.

2.8 Conclusion

We model the effects of CbC reporting and identify a substitution effect in addition to the direct profit-shifting effect. The substitution effect incentivizes MNCs to shift (relatively) more profit from high-tax affiliates than from low-tax affiliates. The intuition is that CbC reporting interlinks and increases the cost of shifting to the tax haven at the MNC group level. Thus, to save on overall tax audit costs, it is optimal to focus remaining profit shifting on high-tax affiliates and to reduce shifting from low-tax affiliates, where tax savings are smaller. In sum, MNCs sacrifice some tax savings to reduce overall tax audit costs by effectively shifting profits from high-tax to low-tax affiliates and reducing tax-haven exposure. Importantly, this effect remains present even if there is an additional channel via economic substance in tax havens.

For a sufficiently weak substance channel, our theory model shows that CbC reporting reduces overall profit shifting (to tax havens). Furthermore, remaining profit shifting follows a pattern: (1) Tax havens lose tax base. (2) Low-tax countries gain from CbC reporting due to the substitution effect that leads to a restructuring of overall profit shifting. (3) Due to the substitution effect, high-tax countries benefit less from a decrease in overall profit shifting and can even lose tax base.

Our theoretical model helps reconcile mixed empirical evidence on whether CbC reporting addresses base erosion and profit shifting on consolidated vs. affiliate level. Our empirical analysis supports the model's predicted reallocation of profit shifting. It suggests that profit shifting from high-tax countries increased after MNCs became subject to CbC reporting, whereas profit shifting from low-tax countries decreased. This pattern helps explain why CbC reporting did not become the expected game changer for tax enforcement.

Our findings imply that transparency instruments need to identify not only the aggregate exposure of the group, but also the units or transactions from which the regulated activity originates. CbC reports reveal profits in tax havens, but they do not directly reveal from which affiliates these profits were shifted. Tax authorities should therefore combine CbC-based risk flags with audit strategies that trace the corresponding deductions in high-tax affiliates. More broadly, our results show that transparency instruments can reduce the targeted activity in the aggregate while reallocating the remaining activity toward units where private gains are highest. This mechanism is not specific to taxation. It can also arise under other group-level policies, such as fleet-wide CO_2 emission standards, where firms can meet an aggregate target while reallocating remaining emissions across products.

2.A Alternative Tax Audit Cost Specification

To keep the model more tractable, we assume that there is no substance channel and set employment in the tax haven to $L_1 = 1$. Furthermore, we focus on a symmetric use of the information from CbC reporting ($\alpha_H = \alpha_L = \alpha$). Then, the audit measure under full CbC reporting turns into $X = \pi_1 = R_H + P_H + R_L + P_L$ and the linear combination of the standard measure with purely national profit manipulation and focusing on tax haven profits implies

$$(1-\alpha)P_i + \alpha X = P_i + \alpha[R_H + R_L + P_j] \quad \forall i = H, L,\ j = L, H.$$

As an alternative to our tax audit cost specification in the main text, we can model the tax audit costs as the probability that the MNC needs to pay profit-shifting costs C_i^C because the MNC's profit-shifting behavior is detected during the tax audit, and the MNC has to provide additional documentation or has to pay a fine. In that case, we can write the tax audit costs as a probability p that is defined over the linear combination of the audit measures, i.e., $C_i^A = p(P_i + \alpha[R_H + R_L + P_j])$. We assume that the probability increases in that measure, that is, effectively with the total amount of profits shifted. Hence, $p'(P_i + \alpha[R_H + R_L + P_j]) > 0$. Then, the total (expected) costs for tax planning become $C_i = p(P_i + \alpha[R_H + R_L + P_j])C_i^C(P_i) = p(P_i + \alpha[R_H + R_L + P_j])\ \frac{\theta_i}{2}P_i^2$.

In that case, the maximization problem of the MNC becomes

$$\begin{aligned}\max_{P_H, P_L} \Pi \;=\; & (1-t_H)\pi_H + (t_H - t_1)P_H - p(P_H + \alpha[R_H + R_L + P_L])\ \frac{\theta_H^C}{2}P_H^2 \\ & +(1-t_L)\pi_L + (t_L - t_1)P_L - p(P_L + \alpha[R_H + R_L + P_H])\ \frac{\theta_L^C}{2}P_L^2, \quad (2.A.1)\end{aligned}$$

and the corresponding first-order conditions are

$$\begin{aligned}\frac{\partial \Pi}{\partial P_H} \;=\; & (t_H - t_1) - p(P_H + \alpha[R_H + R_L + P_L])\theta_H^C P_H - p'(P_H + \alpha[R_H + R_L + P_L])\frac{\theta_H^C}{2}P_H^2 \\ & -p'(P_L + \alpha[R_H + R_L + P_H])\frac{\theta_L^C}{2}P_L^2\alpha = 0, \quad (2.A.2) \\ \frac{\partial \Pi}{\partial P_L} \;=\; & (t_L - t_1) - p(P_L + \alpha[R_H + R_L + P_H])\theta_L^C P_L - p'(P_L + \alpha[R_H + R_L + P_H])\frac{\theta_L^C}{2}P_L^2 \\ & -p'(P_H + \alpha[R_H + R_L + P_L])\frac{\theta_H^C}{2}P_H^2\alpha = 0. \quad (2.A.3)\end{aligned}$$

In absence of CbC reporting, i.e., for $\alpha = 0$, tax savings in one affiliate are balanced against the local shifting costs in that affiliate only. The profit-shifting decisions across affiliates are independent of each other. The result is effectively identical to our reduced-

form approach in the main text. For (partial) CbC reporting, i.e., $\alpha > 0$, the shifting decisions become interlinked. Reducing profit shifting in one affiliate reduces total shifting costs in the other affiliate and allows for more shifting there, all else equal. Although the formal terms are more complicated in the alternative specification, this relationship identifies exactly the substitution effect that drives our findings under the approach in the main text. Qualitatively, the results and driving forces remain unchanged.

Importantly, the substitution effect also remains when the probability (or rather detection-risk function) linearly increases in the amount of profits shifted. Formally, applying $p(P_i + \alpha[R_H + R_L + P_j]) = P_i + \alpha[R_H + R_L + P_j]$ simplifies the first-order conditions, but does not eliminate the substitution effect:

$$\frac{\partial \Pi}{\partial P_H} = (t_H - t_1) - (P_H + \alpha[R_H + R_L + P_L])\theta_H^C P_H - \frac{\theta_H^C}{2} P_H^2 - \frac{\theta_L^C}{2} P_L^2 \alpha = 0, \quad (2.A.4)$$

$$\frac{\partial \Pi}{\partial P_L} = (t_L - t_1) - (P_L + \alpha[R_H + R_L + P_H])\theta_L^C P_L - \frac{\theta_L^C}{2} P_L^2 - \frac{\theta_H^C}{2} P_H^2 \alpha = 0. \quad (2.A.5)$$

2.B CbC Reporting and Responses to Tax Incentives

In this appendix, we analyze how CbC reporting affects the tax sensitivity of profit-shifting decisions. Doing a comparative-static analysis with the first-order conditions and applying Cramer's Rule (see Appendix 2.C.1) allows identifying the rebalancing effect in response to changes in tax rates.

Affiliate-level profit shifting. A higher tax burden t_1 in the tax haven always reduces profit shifting in the absence of CbC reporting ($\alpha_H = \alpha_L = 0$). With CbC reporting, this is not necessarily the case:

$$\frac{dP_i}{dt_1} = -\frac{\theta_j^C + \theta_j^A[(1-\alpha_j)^2 + \frac{\alpha_j}{L_1}(1-\alpha_j)] - \theta_i^A \frac{\alpha_i}{L_1}(1-\alpha_i)}{|\mathcal{H}|} \gtrless 0, \quad (2.A.6)$$

where $i = H, L$, $j = L, H$. $|\mathcal{H}| > 0$ is the determinant of the Hessian matrix, which is positive by the second-order conditions of the maximization problem.

While a higher tax rate in the tax haven reduces the marginal tax incentive to shift profits and therefore tends to lower profit shifting in each affiliate, this effect can be overturned under asymmetric use of CbC reporting. When a country relies on CbC information only to a limited extent, a reduction in overall shifting to the tax haven

lowers expected tax audit costs, partially offsetting the reduction in tax incentives. This second-round effect can make it optimal for the MNC to increase profit shifting from that affiliate despite the higher haven tax rate. The resulting rebalancing effect arises only for intermediate values of α_i and disappears when CbC reporting is either not used ($\alpha_i \to 0$) or fully used ($\alpha_i \to 1$).[51]

Total profit shifting. Independently of the use of CbC reporting across countries, a higher tax rate in the tax haven reduces total profit shifting:

$$\frac{d(P_H + P_L)}{dt_1} = -\frac{\sum_{k=H,L}\left[\theta_k^C + \theta_k^A(1-\alpha_k)^2\right]}{|\mathcal{H}|} < 0. \tag{2.A.7}$$

Thus, although CbC reporting can reallocate profit shifting across affiliates, the direct effect of reduced profit shifting incentives dominates in the aggregate.

We now turn to the effect of a *foreign* tax change on profit shifting decisions. Here, the rebalancing effect becomes particularly transparent. In a standard environment without CbC reporting (i.e., $\alpha_H = \alpha_L = 0$), profit shifting depends only on the tax differential between the shifting affiliate and the tax-haven affiliate, not on foreign tax rates.[52] This independence breaks down as soon as CbC reporting is used ($\alpha > 0$):

$$\frac{dP_i}{dt_j} = -\frac{\sum_{k=H,L}\theta_k^A\left(1-\alpha_k+\frac{\alpha_k}{L_1}\right)\frac{\alpha_k}{L_1}}{|\mathcal{H}|} \leq 0. \tag{2.A.8}$$

A higher tax rate in one affiliate reduces profit shifting in the other affiliate whenever there is CbC reporting. This reflects the rebalancing of profit shifting across affiliates in response to interlinked tax audit costs: Shifting becomes concentrated in higher-tax affiliates where tax savings are larger. Because CbC reporting introduces group-level audit costs, the MNC reduces profit shifting from the other affiliate to contain total audit costs. This mechanism mirrors the reallocation channel identified by Huizinga et al. (2008) in MNCs' capital-structure choices and coexists with internal and parental debt-shifting channels (Goldbach et al., 2021).

Lastly, how does profit shifting from an affiliate change when its own tax rate

[51] It also disappears when both countries use CbC reporting equivalently ($\alpha_H = \alpha_L = \alpha$) and the difference in tax audit cost parameters is sufficiently small, as $\frac{dP_i}{dt_1} = -\frac{\theta_j^C + \theta_j^A(1-\alpha)^2 + (\theta_j^A - \theta_i^A)\frac{\alpha}{L_1}(1-\alpha)}{|\mathcal{H}|} < 0$ if $\theta_j^A \approx \theta_i^A$. In this case, the direct effect of a reduced tax differential dominates.

[52] The weighted tax rate differential identified as the 'C measure' in Huizinga and Laeven (2008) does not apply to profit shifting via intangibles to a tax haven (Hopland et al., 2021).

changes? We find

$$\frac{dP_i}{dt_i} = \frac{\theta_j^C + \theta_j^A \left(1 - \alpha_j + \frac{\alpha_j}{L_1}\right)^2 + \theta_i^A \frac{\alpha_i^2}{L_1^2}}{|\mathcal{H}|} > 0. \tag{2.A.9}$$

A higher domestic tax rate raises marginal tax savings and, under CbC reporting, additionally increases the relative attractiveness of shifting from that affiliate, as reducing shifting elsewhere frees up audit-cost capacity, see the last term in the numerator of equation (2.A.9).

Beyond these tax-rate-driven rebalancing effects, CbC reporting also introduces a direct substitution effect on profit-shifting choices. We turn to this effect in the following subsection.

2.C Derivations in the General Model

2.C.1 Comparative Statics in the General Model

To derive the comparative-static results used in the main text, recall

$$X \equiv \frac{\pi_1}{L_1} = \frac{R_H + P_H + R_L + P_L}{L_1} \quad \text{so that} \quad \frac{\partial X}{\partial P_H} = \frac{\partial X}{\partial P_L} = \frac{1}{L_1}. \tag{2.C.1}$$

and define the auxiliary term

$$S_i \equiv (1 - \alpha_i) P_i + \alpha_i X > 0. \tag{2.C.2}$$

Throughout, let $i \in \{H, L\}$, $j \in \{L, H\}$ and $j \neq i$.

Totally differentiating the first-order conditions (2a) and (2b) delivers

$$\begin{aligned} A_H dP_H + B dP_L &= -dt_H + dt_1 - \theta_H^A \left[\frac{L_1 - 1}{L_1} S_H - \left(1 - \alpha_H + \frac{\alpha_H}{L_1}\right)(X - P_H)\right] d\alpha_H \\ &\quad + \theta_L^A \left[\frac{S_L}{L_1} + (X - P_L)\frac{\alpha_L}{L_1}\right] d\alpha_L, \end{aligned} \tag{2.C.3}$$

$$\begin{aligned} B dP_H + A_L dP_L &= -dt_L + dt_1 + \theta_H^A \left[\frac{S_H}{L_1} + (X - P_H)\frac{\alpha_H}{L_1}\right] d\alpha_H \\ &\quad - \theta_L^A \left[\frac{L_1 - 1}{L_1} S_L - \left(1 - \alpha_L + \frac{\alpha_L}{L_1}\right)(X - P_L)\right] d\alpha_L, \end{aligned} \tag{2.C.4}$$

where

$$\begin{aligned}\mathcal{H}_{ii} &= A_i = -\left[\theta_i^C + \theta_i^A\left(1-\alpha_i+\frac{\alpha_i}{L_1}\right)^2 + \theta_j^A\frac{\alpha_j^2}{L_1^2}\right] < 0,\\ \mathcal{H}_{ij} &= B = -\sum_i \theta_i^A\left(1-\alpha_i+\frac{\alpha_i}{L_1}\right)\frac{\alpha_i}{L_1} < 0,\ i\neq j.\end{aligned}$$

We can summarize these expressions in a linear system in (dP_H, dP_L):

$$\underbrace{\begin{pmatrix} A_H & B\\ B & A_L\end{pmatrix}}_{\equiv\mathcal{H}}\begin{pmatrix} dP_H\\ dP_L\end{pmatrix} = \begin{pmatrix} -dt_H+dt_1\\ -dt_L+dt_1\end{pmatrix} + \begin{pmatrix} -\theta_H^A\left[\frac{L_1-1}{L_1}\,S_H-\left(1-\alpha_H+\frac{\alpha_H}{L_1}\right)(X-P_H)\right]\\ \theta_H^A\left[\frac{S_H}{L_1}+(X-P_H)\frac{\alpha_H}{L_1}\right]\end{pmatrix}d\alpha_H + \begin{pmatrix} \theta_L^A\left[\frac{S_L}{L_1}+(X-P_L)\frac{\alpha_L}{L_1}\right]\\ -\theta_L^A\left[\frac{L_1-1}{L_1}\,S_L-\left(1-\alpha_L+\frac{\alpha_L}{L_1}\right)(X-P_L)\right]\end{pmatrix}d\alpha_L. \tag{2.C.5}$$

The second-order conditions imply that $A_i < 0$ and that the determinant of the Hessian matrix $\mathcal{H}$ is positive definite, i.e.,

$$|\mathcal{H}| \equiv \det(\mathcal{H}) = A_H A_L - B^2 > 0. \tag{2.C.6}$$

Comparative statics with respect to the tax rates. From equation (2.C.5) and Cramer's Rule, the effects of a tax-rate change in the haven affiliate under CbC reporting follow as

$$\begin{aligned}\frac{\partial P_i}{\partial t_1} &= \frac{\begin{vmatrix}1 & B\\ 1 & A_j\end{vmatrix}}{|\mathcal{H}|} = \frac{A_j-B}{|\mathcal{H}|} = -\frac{\left[\theta_j^C+\theta_j^A\left(1-\alpha_j+\frac{\alpha_j}{L_1}\right)^2+\theta_i^A\frac{\alpha_i^2}{L_1^2}\right]-\sum_i\theta_i^A\left(1-\alpha_i+\frac{\alpha_i}{L_1}\right)\frac{\alpha_i}{L_1}}{|\mathcal{H}|}\\ &= -\frac{\theta_j^C+\theta_j^A[(1-\alpha_j)^2+\frac{\alpha_j}{L_1}(1-\alpha_j)]-\theta_i^A\frac{\alpha_i}{L_1}(1-\alpha_i)}{|\mathcal{H}|}\gtrless 0,\end{aligned} \tag{2.C.7}$$

which gives equation (2.A.6).

From this equation and $|\mathcal{H}| > 0$, it is straightforward to show that

$$\frac{\partial(P_H+P_l)}{\partial t_1} = \frac{\partial P_H}{\partial t_1}+\frac{\partial P_L}{\partial t_1} = -\frac{\sum_{i=H,L}\left[\theta_i^C+\theta_i^A(1-\alpha_i)^2\right]}{|\mathcal{H}|} < 0. \tag{2.C.8}$$

Following equivalent procedures, a tax-rate change in country j affects profit shifting in country i by

$$\frac{\partial P_i}{\partial t_j} = \frac{\begin{vmatrix}0 & B\\ -1 & A_j\end{vmatrix}}{|\mathcal{H}|} = \frac{B}{|\mathcal{H}|} = -\frac{\sum_{i=H,L}\theta_i^A\left(1-\alpha_i+\frac{\alpha_i}{L_1}\right)\frac{\alpha_i}{L_1}}{|\mathcal{H}|} \leq 0, \tag{2.C.9}$$

whereas a tax rate change in the same country triggers

$$\frac{\partial P_i}{\partial t_i} = \frac{\begin{vmatrix} -1 & B \\ 0 & A_j \end{vmatrix}}{|\mathcal{H}|} = \frac{-A_j}{|\mathcal{H}|} = \frac{\theta_j^C + \theta_j^A \left(1 - \alpha_j + \frac{\alpha_j}{L_1}\right)^2 + \theta_i^A \frac{\alpha_j^2}{L_1^2}}{|\mathcal{H}|} > 0. \tag{2.C.10}$$

Comparative statics with respect to unilateral CbC reporting. Suppose that country j does not use CbC reporting ($\alpha_j = d\alpha_j = 0$). Then, the comparative static effects of country i unilaterally increasing its weight on CbC information ($d\alpha_i > 0$), reported in equations (2.3) and (2.4) in the main text, follow from equation (2.C.5) and Cramer's Rule as

$$\begin{aligned} \frac{dP_j}{d\alpha_i}\Big|_{\alpha_j=0} &= \frac{\begin{vmatrix} -\left[\theta_i^C + \theta_i^A \left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right)^2\right] & -\theta_i^A \left[\frac{L_1-1}{L_1} S_i - \left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right)(X - P_i)\right] \\ -\theta_i^A \left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right) \frac{\alpha_i}{L_1} & \theta_i^A \left[\frac{S_i}{L_1} + (X - P_i)\frac{\alpha_i}{L_1}\right] \end{vmatrix}}{|\mathcal{H}|} \\ &= -\frac{\theta_i^A \theta_i^C \left[\frac{S_i}{L_1} + (X - P_i)\frac{\alpha_i}{L_1}\right] + (\theta_i^A)^2 \left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right) \frac{S_i}{L_1}}{|\mathcal{H}|} < 0 \end{aligned} \tag{2.C.11}$$

and

$$\begin{aligned} \frac{dP_i}{d\alpha_i}\Big|_{\alpha_j=0} &= \frac{\begin{vmatrix} -\theta_i^A \left[\frac{L_1-1}{L_1} S_i - \left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right)(X - P_i)\right] & -\theta_i^A \left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right) \frac{\alpha_i}{L_1} \\ \theta_i^A \left[\frac{S_i}{L_1} + (X - P_i)\frac{\alpha_i}{L_1}\right] & -\left[\theta_j^C + \theta_j^A + \theta_i^A \frac{\alpha_i^2}{L_1^2}\right] \end{vmatrix}}{|\mathcal{H}|} \\ &= -\frac{\theta_i^A(\theta_j^C + \theta_j^A)\left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right)(X - P_i) - \theta_i^A(\theta_j^C + \theta_j^A)\frac{L_1-1}{L_1} S_i - (\theta_i^A)^2 \frac{\alpha_i}{L_1}\frac{S_i}{L_1}}{|\mathcal{H}|} \gtrless 0, \end{aligned} \tag{2.C.12}$$

where $|\mathcal{H}| > 0$ from second-order conditions, $X - P_i > 0$ from Assumption 1(i), and where we used $\left(1 - \alpha_i + \frac{\alpha_i}{L_1}\right)^2 = (1 - \alpha_i)^2 + \frac{2\alpha_i(1-\alpha_i)}{L_1} + \frac{\alpha_i^2}{L_1^2}$ to consolidate terms.

Comparative statics with respect to symmetric multilateral CbC reporting. For the multilateral case assume a symmetric use of CbC reporting, $\alpha_H = \alpha_L = \alpha$, and a simultaneous adjustment of the weight on CbC reporting, that is, $d\alpha_H = d\alpha_L = d\alpha$. Then, the relevant linear system of a simultaneous change in the use of CbC reporting turns into

$$\begin{pmatrix} A_H & B \\ B & A_L \end{pmatrix} \begin{pmatrix} dP_H \\ dP_L \end{pmatrix} = \begin{pmatrix} \mathcal{H}_{H\alpha} \\ \mathcal{H}_{L\alpha} \end{pmatrix} d\alpha, \tag{2.C.13}$$

where

$$\begin{aligned} \mathcal{H}_{H\alpha} &= -\theta_H^A \left[\frac{L_1 - 1}{L_1} S_H - \left(1 - \alpha + \frac{\alpha}{L_1}\right)(X - P_H)\right] + \theta_L^A \left[\frac{S_L}{L_1} + (X - P_L)\frac{\alpha}{L_1}\right], \\ \mathcal{H}_{L\alpha} &= -\theta_L^A \left[\frac{L_1 - 1}{L_1} S_L - \left(1 - \alpha + \frac{\alpha}{L_1}\right)(X - P_L)\right] + \theta_H^A \left[\frac{S_H}{L_1} + (X - P_H)\frac{\alpha}{L_1}\right]. \end{aligned}$$

The effect of (symmetric multilateral) CbC reporting on profit shifting in the high-tax country, see equation (2.7) in the main text, results from

$$\frac{dP_H}{d\alpha} = \frac{\begin{vmatrix} \mathcal{H}_{H\alpha} & B \\ \mathcal{H}_{L\alpha} & A_L \end{vmatrix}}{|\mathcal{H}|} = \frac{\mathcal{H}_{H\alpha}A_L - \mathcal{H}_{L\alpha}B}{|\mathcal{H}|}. \tag{2.C.14}$$

As an intermediary step, we obtain

$$\begin{aligned}
\frac{dP_H}{d\alpha}|\mathcal{H}| \;=\;& -\theta_L^C\mathcal{H}_{H\alpha} \\
&+\theta_L^A\theta_H^A\left[(1-\alpha)\left(1-\alpha+\frac{\alpha}{L_1}\right)+\frac{\alpha}{L_1}-\frac{\alpha^2}{L_1}+\frac{\alpha^2}{L_1^2}\right]\left\{\frac{L_1-1}{L_1}S_H-\left(1-\alpha+\frac{\alpha}{L_1}\right)(X-P_H)\right\} \\
&-(\theta_L^A)^2\left[(1-\alpha)\left(1-\alpha+\frac{\alpha}{L_1}\right)+\frac{\alpha}{L_1}-\frac{\alpha^2}{L_1}+\frac{\alpha^2}{L_1^2}\right]\left\{\frac{S_L}{L_1}+(X-P_L)\frac{\alpha}{L_1}\right\} \\
&+(\theta_H^A)^2\frac{\alpha^2}{L_1^2}\left\{\frac{L_1-1}{L_1}S_H-\left(1-\alpha+\frac{\alpha}{L_1}\right)(X-P_H)\right\} \\
&-\theta_H^A\theta_L^A\frac{\alpha^2}{L_1^2}\left\{\frac{S_L}{L_1}+(X-P_L)\frac{\alpha}{L_1}\right\} \\
&+(\theta_H^A)^2\left(\frac{\alpha}{L_1}-\frac{\alpha^2}{L_1}+\frac{\alpha^2}{L_1^2}\right)\left\{\frac{S_H}{L_1}+(X-P_H)\frac{\alpha}{L_1}\right\} \\
&+\theta_H^A\theta_L^A\left(\frac{\alpha}{L_1}-\frac{\alpha^2}{L_1}+\frac{\alpha^2}{L_1^2}\right)\left\{\frac{S_H}{L_1}+(X-P_H)\frac{\alpha}{L_1}\right\} \\
&-\theta_H^A\theta_L^A\left(\frac{\alpha}{L_1}-\frac{\alpha^2}{L_1}+\frac{\alpha^2}{L_1^2}\right)\left\{\frac{L_1-1}{L_1}S_L-\left(1-\alpha+\frac{\alpha}{L_1}\right)(X-P_L)\right\} \\
&-(\theta_L^A)^2\left(\frac{\alpha}{L_1}-\frac{\alpha^2}{L_1}+\frac{\alpha^2}{L_1^2}\right)\left\{\frac{L_1-1}{L_1}S_L-\left(1-\alpha+\frac{\alpha}{L_1}\right)(X-P_L)\right\}.
\end{aligned}$$

When we consolidate terms and collected expressions across rows, the equation simplifies to equation (2.7) in the text:

$$\begin{aligned}
\frac{dP_H}{d\alpha}|\mathcal{H}| \;=\;& -\theta_L^C\mathcal{H}_{H\alpha}-(\theta_L^A)^2(1-\alpha)\frac{\alpha}{L_1}(X-P_L) \\
&+\theta_H^A\theta_L^A\frac{\alpha}{L_1}\left\{\frac{\alpha}{L_1}\left[(1-\alpha)\frac{L_1-1}{L_1}+\left(1-\alpha+\frac{\alpha}{L_1}\right)\right]+(1-\alpha)^2\right\}(P_H-P_L) \\
&+\theta_L^A\frac{1-\alpha}{L_1}\left(\theta_H^A\alpha P_H-\theta_L^A P_L\right)+\frac{\alpha}{L_1}\left[(\theta_H^A)^2\frac{(1-\alpha)P_H+\alpha X}{L_1}-(\theta_L^A)^2\frac{(1-\alpha)P_L+\alpha X}{L_1}\right] \\
&-\theta_H^A\theta_L^A(1-\alpha)\left\{\frac{\alpha^2}{L_1^2}(2X-P_H-P_L)+\left[(1-\alpha)^2+\frac{\alpha}{L_1}(2-3\alpha)\right](X-P_H)\right\} \\
&+\theta_L^A\theta_H^A(1-\alpha)^2[(1-\alpha)P_H+\alpha X]\frac{L_1-1}{L_1}\gtrless 0,
\end{aligned}\tag{2.C.15}$$

where $|\mathcal{H}|>0$ from second-order conditions, $\mathcal{H}_{H\alpha}>0$ and $X-P_i>0$ from Assumption 1, and $L_1\geq 1$.

The effect on profit shifting in the low-tax country, see equation (2.6) in the main

text, equivalently follows from

$$\frac{dP_L}{d\alpha} = \frac{\begin{vmatrix} A_H & \mathcal{H}_{H\alpha} \\ B & \mathcal{H}_{L\alpha} \end{vmatrix}}{|\mathcal{H}|} = \frac{\mathcal{H}_{L\alpha}A_H - \mathcal{H}_{H\alpha}B}{|\mathcal{H}|}. \tag{2.C.16}$$

As the structure of the model is symmetric (i.e., the countries differ in tax rates and the values of the cost parameters only), the equivalent steps to the previous derivation lead to the final term in equation (2.6):

$$\begin{aligned}
\frac{dP_L}{d\alpha}|\mathcal{H}| \;=\; & -\theta_H^C\mathcal{H}_{L\alpha} - (\theta_H^A)^2(1-\alpha)\frac{\alpha}{L_1}(X-P_H) \\
& +\theta_L^A\theta_H^A\frac{\alpha}{L_1}\left\{\frac{\alpha}{L_1}\left[(1-\alpha)\frac{L_1-1}{L_1} + \left(1-\alpha+\frac{\alpha}{L_1}\right)\right] + (1-\alpha)^2\right\}(P_L-P_H) \\
& +\theta_H^A\frac{1-\alpha}{L_1}\left(\theta_L^A\alpha P_L - \theta_H^A P_H\right) + \frac{\alpha}{L_1}\left[(\theta_L^A)^2\frac{(1-\alpha)P_L+\alpha X}{L_1} - (\theta_H^A)^2\frac{(1-\alpha)P_H+\alpha X}{L_1}\right] \\
& -\theta_L^A\theta_H^A(1-\alpha)\left\{\frac{\alpha^2}{L_1^2}(2X-P_H-P_L) + \left[(1-\alpha)^2 + \frac{\alpha}{L_1}(2-3\alpha)\right](X-P_L)\right\} \\
& +\theta_L^A\theta_H^A(1-\alpha)^2[(1-\alpha)P_L+\alpha X]\frac{L_1-1}{L_1} \gtrless 0.
\end{aligned} \tag{2.C.17}$$

Finally, we obtain the effect on total profit shifting, see equation (2.5) in the main text, from aggregating equations (2.C.15) and (2.C.17). Consolidating terms delivers

$$\begin{aligned}
\frac{d(P_H+P_L)}{d\alpha}|\mathcal{H}| \;=\; & \left(\frac{dP_H}{d\alpha} + \frac{dP_L}{d\alpha}\right)|\mathcal{H}| \\
=\; & -\left\{\theta_L^C\mathcal{H}_{H\alpha} + \theta_H^C\mathcal{H}_{L\alpha} + (1-\alpha)\frac{\alpha}{L_1}\left[(\theta_H^A)^2(X-P_H) + (\theta_L^A)^2(X-P_L)\right]\right\} \\
& -\frac{1-\alpha}{L_1}\left[(\theta_H^A)^2P_H + (\theta_L^A)^2P_L\right] \\
& -\theta_L^A\theta_H^A(1-\alpha)\left\{\left[(1-\alpha)^2 + 2\frac{\alpha^2}{L_1^2} + \frac{\alpha}{L_1}(2-3\alpha)\right](2X-P_H-P_L) - \frac{\alpha}{L_1}(P_H+P_L)\right\} \\
& +\left(\theta_L^A+\theta_H^A\right)(1-\alpha)^2\left[2\alpha X + (1-\alpha)(P_H+P_L)\right]\frac{L_1-1}{L_1}.
\end{aligned} \tag{2.C.18}$$

2.C.2 Proof of Proposition 1

For $L_1 \to 1$, we have $\mathcal{H}_{i\alpha} = \theta_i^A(X-P_i) + \theta_j^A\left[S_j + \alpha(X-P_j)\right] > 0$, $X = \pi_1$, and $X - P_i = R_H + R_L + P_j > 0$ such that Assumption 1 is always fulfilled. The comparative-static term (2.5) in the main text—equivalent to equation (2.C.18)—simplifies to

$$\begin{aligned}
\frac{d(P_H+P_L)}{d\alpha} \;=\; & -\left\{\theta_L^C\mathcal{H}_{H\alpha} + \theta_H^C\mathcal{H}_{L\alpha} + (1-\alpha)\alpha\left[(\theta_H^A)^2(X-P_H) + (\theta_L^A)^2(X-P_L)\right]\right\} \\
& -(1-\alpha)\left[(\theta_H^A)^2P_H + (\theta_L^A)^2P_L\right] \\
& -\theta_L^A\theta_H^A(1-\alpha)\left[2(R_H+R_L) + (1-\alpha)(P_H+P_L)\right] < 0.
\end{aligned} \tag{2.C.19}$$

As $\pi_1 = R_H + P_H + R_L + P_L$, $\frac{d(P_H+P_L)}{d\alpha} < 0$ unambiguously implies that profits in the haven affiliate decrease with (the use of) information under CbC reporting, that is, $\frac{d\pi_1}{d\alpha} < 0$.

2.D Calculating the Simplified Model

In this appendix, we focus on the case where employment in the tax haven is equal to $L_1 = 1$ and there is no substance channel. Moreover, we assume homogenous tax audit costs $\theta_H^A = \theta_L^A = \theta^A$ and a symmetric use of information from CbC reporting $\alpha_H = \alpha_L = \alpha$. We maintain heterogeneous tax planning costs for this appendix, that is, there are differences in the parameter for tax planning costs, $\theta_H^C \neq \theta_L^C$. All results in Section 2.5 result by setting $\theta_H^C = \theta_L^C = \theta^C$.

2.D.1 Optimal MNC Behavior under Heterogeneous Tax Planning Costs

For general costs parameters $\theta_H^C \neq \theta_L^C$, but homogeneous tax audit costs and a symmetric use of CbC reporting, the optimization problem of the MNC in equation (2.1) simplifies to

$$\begin{aligned}\max_{P_H,P_L} \Pi \;=\; & (1-t_H)\pi_H + (t_H - t_1)P_H - \frac{\theta_H^C}{2}P_H^2 - \frac{\theta^A}{2}\left[P_H + \alpha P_L\right]^2 \\ & +(1-t_L)\pi_L + (t_L - t_1)P_L - \frac{\theta_L^C}{2}P_L^2 - \frac{\theta^A}{2}\left[P_L + \alpha P_H\right]^2, \qquad (2.D.1)\end{aligned}$$

and the first-order conditions result as

$$\frac{\partial \Pi}{\partial P_H} = (t_H - t_1) - \left[\theta_H^C + \theta^A(1+\alpha^2)\right]P_H - 2\alpha\theta^A P_L = 0, \qquad (2.D.2)$$

$$\frac{\partial \Pi}{\partial P_L} = (t_L - t_1) - \left[\theta_L^C + \theta^A(1+\alpha^2)\right]P_L - 2\alpha\theta^A P_H = 0. \qquad (2.D.3)$$

In the absence of CbC reporting ($\alpha = 0$), the profit-shifting decisions across affiliates are still fully independent of each other and given by

$$P_i = \frac{t_i - t_1}{\theta_i + \theta^A} \quad i = H, L, \quad \text{for} \quad \alpha = 0. \qquad (2.D.4)$$

As an additional assumption, we restrict the scope of the cost parameters for tax planning, θ_H^C and θ_L^C, such that $\theta_H^C < \frac{(t_H - t_1)\theta_L^C + \theta^A(t_H - t_1)}{t_L - t_1}$. Under this assumption, the higher-taxed affiliate always shifts more profits, $P_H > P_L$, in the optimum. For homogeneous cost parameters $\theta_H^C = \theta_L^C = \theta^C$, this assumption is always fulfilled.

2.D.2 Comparative-Static Analysis

Fully differentiating the first-order conditions (2.D.2) and (2.D.3) leads to

$$-[\theta_H^C + (1+\alpha^2)\theta^A]dP_H - 2\alpha\theta^A dP_L = [2\theta^A(\alpha P_H + P_L)]d\alpha - dt_H + dt_1, \quad (2.D.5)$$
$$-2\alpha\theta^A dP_H - [\theta_L^C + (1+\alpha^2)\theta^A]dP_L = [2\theta^A(P_H + \alpha P_L)]d\alpha - dt_L + dt_1, \quad (2.D.6)$$

which can be rearranged to find

$$\begin{pmatrix} -[\theta_H^C + (1+\alpha^2)\theta^A] & -2\alpha\theta^A \\ -2\alpha\theta^A & -[\theta_L^C + (1+\alpha^2)\theta^A] \end{pmatrix} \begin{pmatrix} dP_H \\ dP_L \end{pmatrix} = \begin{pmatrix} 2\theta^A(\alpha P_H + P_L) \\ 2\theta^A(P_H + \alpha P_L) \end{pmatrix} d\alpha + \begin{pmatrix} -dt_H \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ -dt_L \end{pmatrix} + \begin{pmatrix} dt_1 \\ dt_1 \end{pmatrix}. \quad (2.D.7)$$

The second-order conditions of the MNC optimization problem imply that the determinant of the Hessian on the left-hand side of equation (2.D.7) is positive, that is

$$|\mathcal{H}| = [\theta_H^C + (1+\alpha^2)\theta^A][\theta_L^C + (1+\alpha^2)\theta^A] - 4\alpha^2(\theta^A)^2 > 0. \quad (2.D.8)$$

Applying Cramer's Rule delivers

$$\frac{\partial P_H}{\partial \alpha} = -\frac{2\theta^A[\theta_L^C(\alpha P_H + P_L) - \theta^A(1-\alpha^2)(\alpha P_H - P_L)]}{|\mathcal{H}|} \lesseqgtr 0, \quad (2.D.9)$$
$$\frac{\partial P_L}{\partial \alpha} = -\frac{2\theta^A[\theta_H^C(\alpha P_L + P_H) + \theta^A(1-\alpha^2)(P_H - \alpha P_L)]}{|\mathcal{H}|} < 0. \quad (2.D.10)$$

Aggregating the two comparative-static effects, (2.D.9) + (2.D.10), results in

$$\frac{d(P_H + P_L)}{d\alpha} = -\frac{2\theta^A\left[\theta_L^C(\alpha P_H + P_L) + \theta_H^C(P_H + \alpha P_L) + 2\theta^A(1-\alpha^2)(1-\alpha)(P_H + P_L)\right]}{|\mathcal{H}|} < 0, \quad (2.D.11)$$

and setting homogeneous cost parameters for tax planning costs as well, $\theta_H^C = \theta_L^C = \theta^C$, simplifies the expression to equation (2.8) in the main text.

2.D.3 Solving for Explicit Solutions

The simplified setting also allows us to solve explicitly for optimal profit shifting in both affiliates. From equation (2.9),

$$P_H - P_L = \frac{t_H - t_L}{\theta^C + \theta^A(1-\alpha)^2} > 0,$$

we obtain

$$P_H = P_L + \frac{t_H - t_L}{\theta^C + (1-\alpha)^2\theta^A},$$

which we substitute into the simplified first-order condition (2.D.3) to yield optimal profit shifting in the low-tax affiliate as

$$P_L^* = \frac{\left[\theta^C + (1-\alpha)^2\theta^A\right](t_L - t_1) - 2\alpha\theta^A(t_H - t_L)}{\left[\theta^C + (1+\alpha)^2\theta^A\right]\left[\theta^C + (1-\alpha)^2\theta^A\right]}. \tag{2.D.12}$$

The numerator N in equation (2.D.12) decreases monotonically in α,

$$\frac{\partial N}{\partial \alpha} = -2\theta^A\left[(1-\alpha)(t_L - t_1) + (t_H - t_L)\right] < 0,$$

and is positive at $\alpha = 0$. Hence, if marginal tax audit costs θ^A are sufficiently large, P_L^* becomes negative for some $\alpha > 0$ and remains negative as α increases further.

Turning to profit shifting in the high-tax affiliate, we use equation (2.9) in a similar way as before and substitute for P_L in the first-order condition (2.D.2). Doing so, we can solve for the optimal shifting in the high-tax affiliate

$$P_H^* = \frac{[\theta^C + (1-\alpha)^2\theta^A](t_H - t_1) + 2\alpha\theta^A(t_H - t_L)}{\left[\theta^C + (1+\alpha)^2\theta^A\right]\left[\theta^C + (1-\alpha)^2\theta^A\right]}. \tag{2.D.13}$$

Without CbC reporting ($\alpha = 0$), optimal profit shifting in the high-tax affiliate is

$$P_H^*(\alpha = 0) = \frac{(t_H - t_1)}{\theta^C + \theta^A}. \tag{2.D.14}$$

Under complete CbC reporting and full use of the information exchange ($\alpha = 1$), optimal profit shifting becomes

$$P_H^*(\alpha = 1) = \frac{(t_H - t_1)}{\theta^C + 4\theta^A} + \frac{2\theta^A(t_H - t_L)}{\theta^C\left[\theta^C + 4\theta^A\right]}. \tag{2.D.15}$$

Deducting equation (2.D.14) from equation (2.D.15) leads to condition (2.10) in the main text:

$$P_H^*(\alpha = 1) - P_H^*(\alpha = 0) = \frac{(t_H - t_1)}{\theta^C + 4\theta^A} + \frac{2\theta^A(t_H - t_L)}{\theta^C\left[\theta^C + 4\theta^A\right]} - \frac{(t_H - t_1)}{\theta^C + \theta^A} \gtrless 0.$$

2.E Additional Tables and Figures

Table 2.E.1: Comparison of existing papers on CbC reporting

Reference	Countries (period)	Method	Sample size
This Paper	MNCs worldwide (2012–2021)	DiD	48,428 affiliates 467,552 affiliate-years
Joshi (2020)	EU MNCs (2010–2018)	RDD DiD	14,530 affiliates 117,258 affiliate-years
Hugger (2025)	MNCs worldwide (2010–2019)	RDD DiD	61,073 affiliates 225,862 affiliate-years
De Simone and Olbert (2022)	MNCs with EU aff. (2012–2018)	RDD DiD	344,550 affiliates 687,406 affiliate-years
Nessa et al. (2025)	U.S. MNCs (2011–2018)	RDD DiD	2,585 MNC-years
Joshi et al. (2025)	EU MNCs (2013–2018)	RDD	12,715 affiliates 12,628 affiliate-years

Note: Comparison of most closely related research on CbC reporting that uses Orbis data.

Table 2.E.2: Sample Composition by Country and Group

Country	Low-Tax	High-Tax	Tax Haven	Total obs.	Unique aff.	Percent (%)
Australia	16	2,397	0	2,413	245	0.52
Austria	2,923	3,378	0	6,301	651	1.35
Belgium	0	0	23,195	23,195	2,388	4.96
Bosnia and Herzegovina	448	0	0	448	46	0.10
Bulgaria	3,615	0	0	3,615	366	0.77
Colombia	1,093	1,990	0	3,083	315	0.66
Croatia	2,288	184	0	2,472	254	0.53
Czech Republic	8,441	115	0	8,556	871	1.83
Estonia	1,102	78	0	1,180	120	0.25
Finland	8,888	362	0	9,250	958	1.98
France	4,723	65,689	0	70,412	7,264	15.06
Germany	117	10,275	0	10,392	1,081	2.22
Greece	911	2,387	0	3,298	343	0.71
Hungary	6,411	61	0	6,472	663	1.38
India	0	2,773	0	2,773	281	0.59
Ireland	0	0	3,450	3,450	353	0.74
Italy	4,667	43,168	0	47,835	4,978	10.23
Japan	572	28,504	0	29,076	2,925	6.22
Latvia	108	12	0	120	12	0.03
Lithuania	538	0	0	538	55	0.12
Luxembourg	0	0	367	367	38	0.08
Malaysia	362	68	0	430	45	0.09
Malta	0	0	40	40	4	0.01
Morocco	0	16	0	16	2	0.00
Netherlands	0	0	3,015	3,015	313	0.64
New Zealand	0	771	0	771	78	0.16
North Macedonia	110	0	0	110	11	0.02
Norway	16,117	15,926	0	32,043	3,257	6.85
Philippines	0	248	0	248	26	0.05
Poland	13,813	374	0	14,187	1,467	3.03
Portugal	2,167	9,786	0	11,953	1,347	2.56
Romania	8,249	54	0	8,303	854	1.78
Russia	6,179	518	0	6,697	688	1.43
Serbia	1,367	0	0	1,367	139	0.29
Slovakia	2,686	338	0	3,024	312	0.65
Slovenia	1,510	121	0	1,631	166	0.35
South Korea	1,425	968	0	2,393	241	0.51
Spain	29,377	13,946	0	43,323	4,462	9.27
Sweden	41,216	7,898	0	49,114	5,307	10.50
Switzerland	0	0	59	59	6	0.01
United Kingdom	50,883	2,699	0	53,582	5,496	11.46
Total	222,322	215,104	30,126	467,552	48,428	100.00

Note: Affiliate-year observations by country, split into low-tax, high-tax, and tax-haven groups. Because the high-/low-tax split is defined relative to the within-MNC median tax rate and is time-varying, the same country can appear in both the low-tax and high-tax columns. Tax havens follow Tørsløv et al. (2023b).

Table 2.E.3: Further Robustness Tests

Panel A: Aggregated EBT/Assets

	(1) Low-Tax	(2) High-Tax	(3) Tax Haven	(4) Flexible
CbCR	0.0021	-0.0006	-0.0118***	0.0119***
	(0.0018)	(0.0017)	(0.0044)	(0.0033)
CbCR X Tax Rate				-0.0004***
				(0.0001)
Tax Rate				-0.0011***
				(0.0001)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm Ctrs.	No	No	No	No
Obs.	88,920	69,495	13,082	160,051
R^2	0.37	0.41	0.47	0.34

Panel B: Profitable Affiliates Only

	(1) Low-Tax	(2) High-Tax	(3) Tax Haven	(4) Flexible
CbCR	0.0002	-0.0060***	-0.0068*	0.0116***
	(0.0017)	(0.0016)	(0.0041)	(0.0030)
CbCR X Tax Rate				-0.0006***
				(0.0001)
Tax Rate				0.0008***
				(0.0002)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm Ctrs.	No	No	No	No
Obs.	167,388	158,550	23,126	329,954
R^2	0.64	0.67	0.60	0.64

Note: Affiliate-level data from Orbis for 2012–2021. In Panel A, the dependent variable is country-level aggregated *EBT/Assets*, defined as the sum of all non-HQ affiliates' *Profit Before Tax* divided by all affiliates' *Total Assets* of the same MNC in one country. Panel B shows the analysis including affiliate-years with positive earnings before taxes only. Low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC. *CbCR* is a dummy variable equal to one if the affiliate is part of an MNC that is subject to CbC reporting in that year. We cluster standard errors by multinational, interacted with year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 2.E.4: Robustness Control Variables and Sample Split Definitions

Panel A: Including Control Variables

	(1) Low-Tax	(2) High-Tax	(3) Tax Haven	(4) Low-Tax	(5) High-Tax	(6) Tax Haven
CbCR	0.0019	-0.0013	-0.0151***	0.0040*	-0.0063***	-0.0144***
	(0.0024)	(0.0021)	(0.0047)	(0.0021)	(0.0021)	(0.0046)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	No	No	No
Firm Ctrs.	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	166,330	147,265	23,464	166,349	147,288	23,470
R^2	0.55	0.58	0.50	0.54	0.58	0.50

Panel B: High-Tax Versus Low-Tax Definitions

	Country Median Tax Rate		Flexible Tax Rate	
	(1) Low-Tax	(2) High-Tax	(3) Low-Tax	(4) High-Tax
CbCR	0.0059***	-0.0106***	0.0059***	-0.0084***
	(0.0018)	(0.0021)	(0.0021)	(0.0018)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm Ctrs.	No	No	No	No
Obs.	248,415	192,601	186,312	250,071
R^2	0.48	0.53	0.50	0.52

Note: Affiliate-level data from Orbis for 2012–2021. Data excludes U.S. MNCs. The dependent variable is *EBT/Assets*, defined as the affiliate's yearly *Profit Before Tax* divided by *Total Assets* in 2015. Panel A replicates our baseline analysis in Table 2.2 including control variables. Columns (1)-(3) include country-year fixed effects and columns (4)-(6) include year fixed effects. Firm-level control variables comprise the number of employees and fixed assets. Tax havens are defined according to Tørsløv et al. (2023b). Panel B varies the definition of high-tax versus low-tax affiliates. In columns (1)-(2), low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median worldwide tax rate. In columns (3)-(4), low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the tipping point tax rate in our flexible specification. *CbCR* is a dummy variable equal to one if the affiliate is part of an MNC that is subject to CbC reporting in that year. We cluster standard errors by multinational, interacted with year. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Table 2.E.5: Belgium Not Classified as Tax Haven, Dharmapala 2025

Panel A: Belgium Not Classified as Tax Haven

	(1) Low-Tax	(2) High-Tax	(3) Tax Haven	(4) Flexible
CbCR	0.0038*	-0.0078***	-0.0261***	0.0316***
	(0.0020)	(0.0021)	(0.0095)	(0.0037)
CbCR X Tax Rate				-0.0013***
				(0.0001)
Tax Rate				0.0013***
				(0.0002)
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	No
Year FE	No	No	No	Yes
Firm Ctrs.	No	No	No	Yes
Obs.	226,904	233,527	6,931	336,709
R^2	0.51	0.52	0.52	0.54

Panel B: Dharmapala (2024) List

	(1) Low-Tax	(2) High-Tax	(3) Tax Haven	(4) Flexible
CbCR	0.0032	-0.0078***	-0.0189	0.0312***
	(0.0020)	(0.0021)	(0.0180)	(0.0037)
CbCR X Tax Rate				-0.0013***
				(0.0001)
Tax Rate				0.0013***
				(0.0002)
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	No
Year FE	No	No	No	Yes
Firm Ctrs.	No	No	No	Yes
Obs.	229,173	234,243	3,916	339,468
R^2	0.51	0.52	0.52	0.54

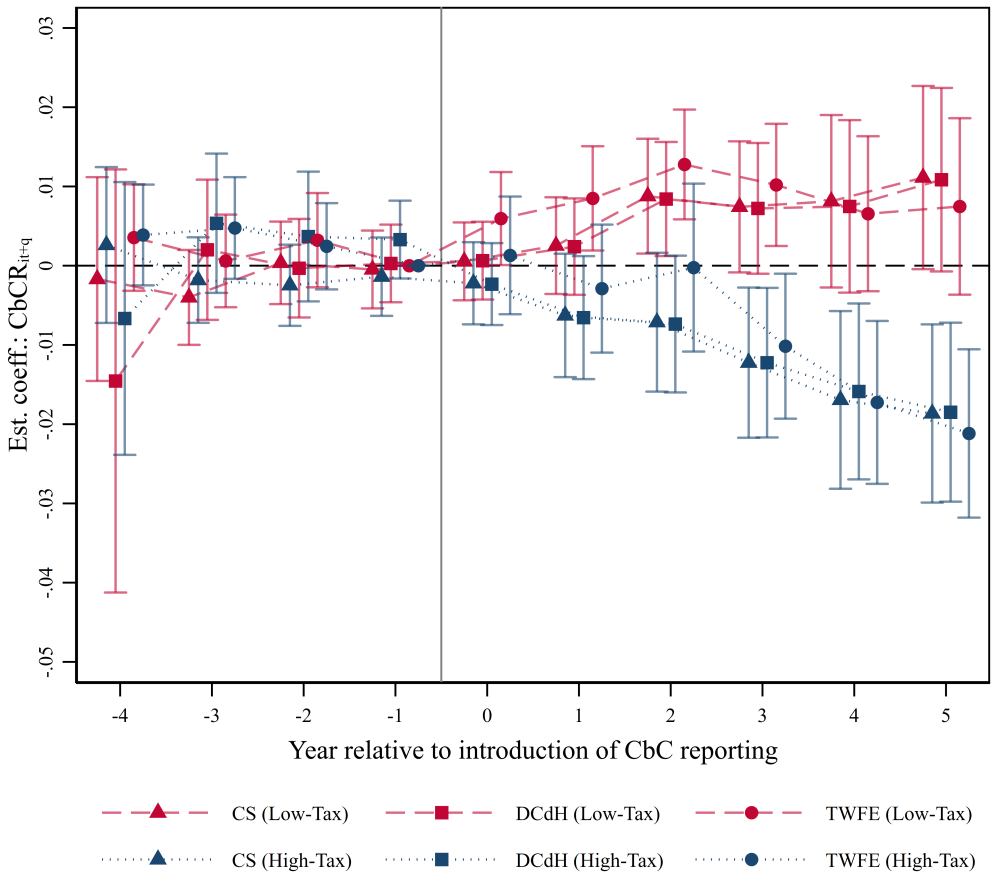
Note: Affiliate-level data from Orbis for 2012–2021. The dependent variable is *EBT/Assets*, defined as the affiliate's *Profit Before Tax* divided by *Total Assets* in 2015, winsorized at the 1%-level. In column (4), the regression additionally includes firm-level controls (the number of employees and fixed assets) and GDP. In Panel A, Belgian affiliates are re-classified out of the tax-haven group and into the low-/high-tax split. In Panel B, tax havens are defined based on Dharmapala (2024). Low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC. *CbCR* is a dummy variable equal to one if the affiliate is part of an MNC that is subject to CbC reporting in that year. We cluster standard errors by multinational, interacted with year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 2.E.6: Robustness of the Tax-Haven Effect

	(1) Event Study	(2) MNCs With Tax Havens	(3) Non-HQs	(4) Incl. U.S. MNCs	(5) Incl. Thresh-old	(6) Excl. 2020–2021	(7) Excl. 2016
CbCR	−0.0069	−0.0088**	−0.0079*	−0.0089**	−0.0065	−0.0048	−0.0079
	(0.0066)	(0.0044)	(0.0046)	(0.0041)	(0.0044)	(0.0045)	(0.0048)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	30,126	30,126	29,182	37,859	30,956	23,988	27,046
R^2	0.47	0.47	0.47	0.46	0.46	0.49	0.47

Note: Affiliate-level data from Orbis for 2012–2021. The sample is restricted to tax-haven affiliates. The dependent variable is *EBT/Assets*, defined as the affiliate's *Profit Before Tax* divided by *Total Assets* in 2015. *CbCR* is a dummy variable equal to one if the affiliate is part of an MNC that is subject to CbC reporting in that year. Column (1) reports the average post-treatment effect (ATT) from the Sun and Abraham (2021) event study; columns (2)–(7) repeat the sample robustness checks of Table 2.3 for tax-haven affiliates only. Column (2) restricts to MNCs with at least one tax-haven affiliate (which, for this subsample, is the full sample); column (3) excludes headquarter entities; column (4) includes U.S. MNCs; column (5) includes MNCs around the CbC reporting threshold; column (6) excludes the years 2020 and 2021; column (7) excludes the year 2016. All specifications include affiliate (firm) and year fixed effects. Standard errors, clustered by multinational interacted with year, in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

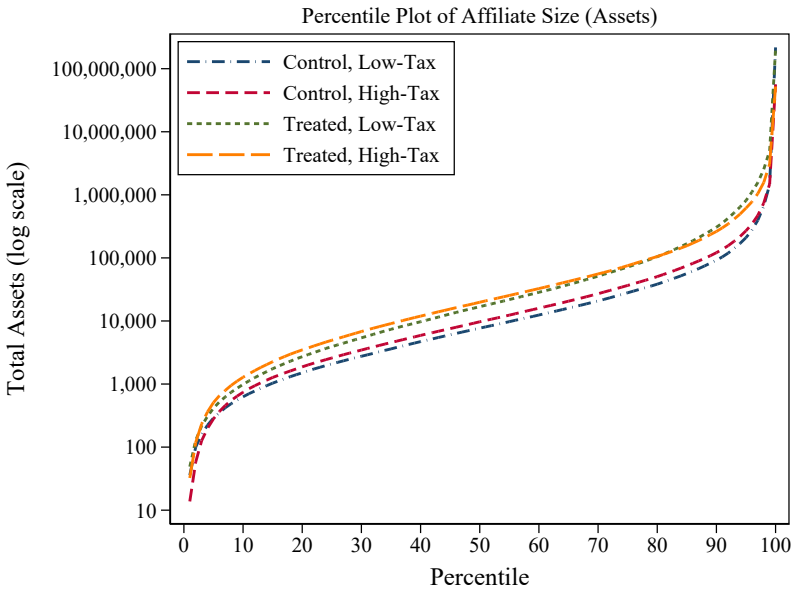
Figure 2.E.1: Alternative Event Study Estimators



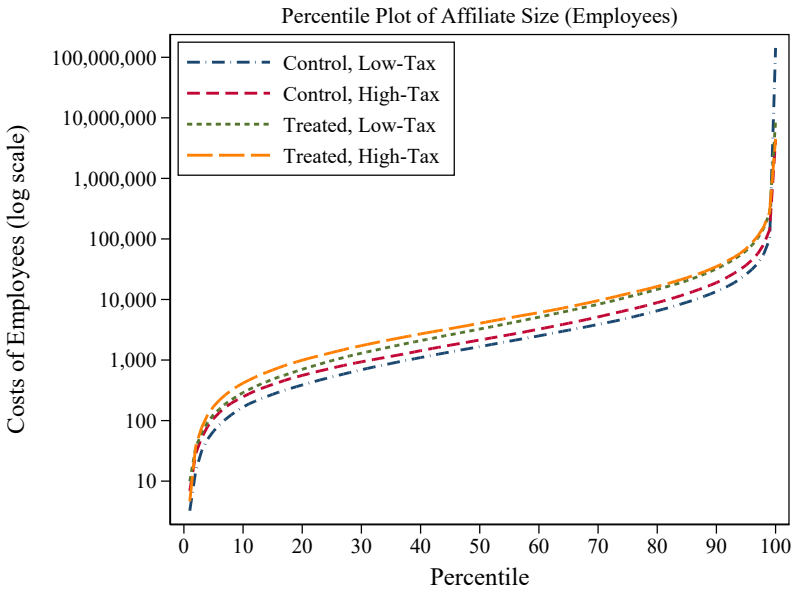
Note: Event studies based on affiliate-level data from Orbis for 2012–2021, using the estimator by Callaway and Sant'Anna (2021), De Chaisemartin and D'Haultfœuille (2024), and regular two-way fixed effects. The dependent variable is *EBT/Assets*, defined as the affiliate's *Profit Before Tax* divided by *Total Assets* in 2015. Low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC. Figures include 90% confidence intervals, estimated using affiliate and year fixed effects. Standard errors clustered by MNC.

Figure 2.E.2: Percentile Plots With Size Distribution

(a) Panel A: Affiliate-Level Total Assets



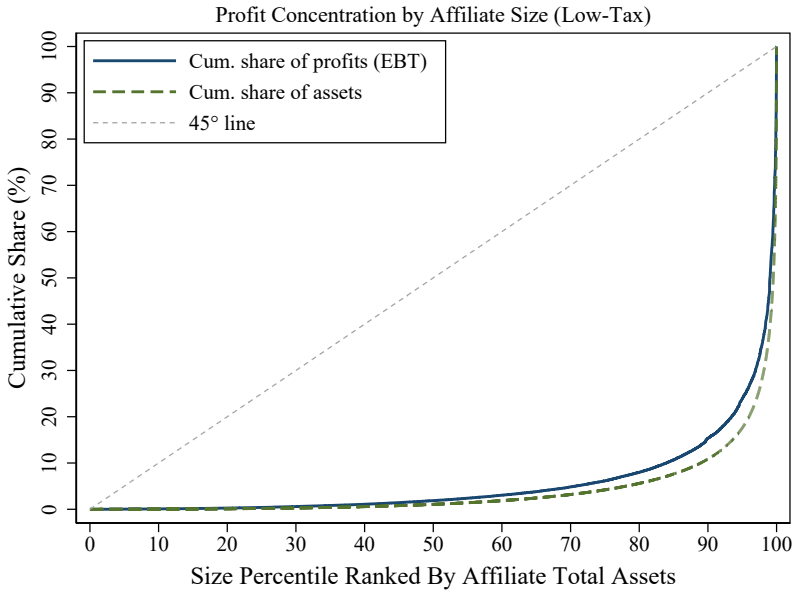
(b) Panel B: Affiliate-Level Costs of Employees



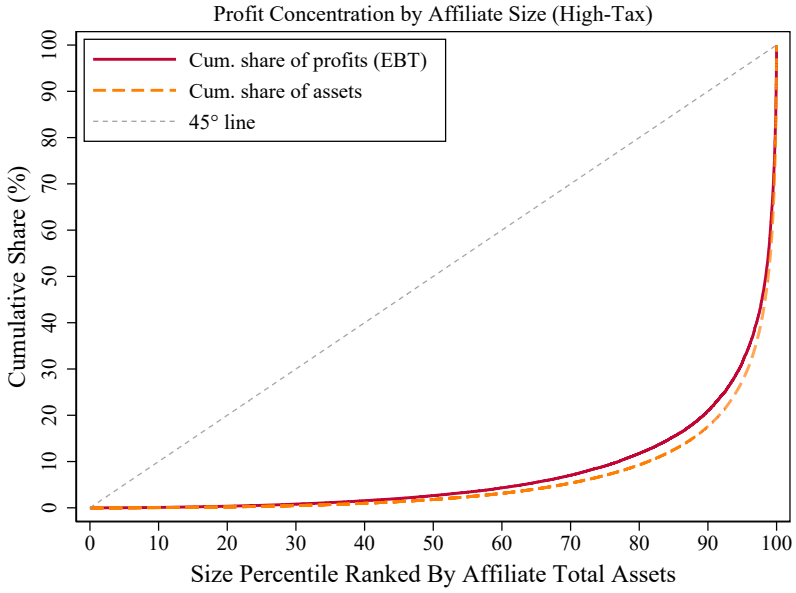
Note: Percentile plots based on affiliate-level data from Orbis for 2012–2021. For each percentile $p \in \{0, \ldots, 100\}$, the corresponding line reports the within-group p-th percentile of affiliate size on a logarithmic scale, measured by total assets (Panel A) and the cost of employees (Panel B). Low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC. Sample excludes tax-haven affiliates.

Figure 2.E.3: Cumulative Distribution of Profits Across Affiliates

(a) Panel A: Distribution of Profits for Low-Tax Affiliates



(b) Panel B: Distribution of Profits for High-Tax Affiliates



Note: Cumulative distribution of profits and total assets across affiliates ranked by size based on affiliate-level data from Orbis for 2012–2021. Affiliates are collapsed to a single observation using the affiliate-level mean of profits (EBT) and total assets over their years in the sample, then ranked from smallest to largest by mean total assets and assigned a size percentile from 0 (smallest) to 100 (largest). EBT is winsorized at the 1st and 99th percentile. In Panel A (B), low-tax (high-tax) affiliates are affiliates that face a tax rate in a given year below or equal to (above) the median tax rate within the MNC. Sample excludes tax haven affiliates.

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Chapter 3

(Mis)measurement of Income Shifting[1]

Harald Amberger, Ruby Doeleman, and Stefanie Pendl

Abstract. We examine the reliability of financial statement data for measuring cross-border income shifting. Using a novel dataset of Austrian corporate tax returns matched with financial statement data, we estimate a tax semi-elasticity of taxable income reported on tax returns of -0.9. When we use financial statement profits instead of taxable income, the semi-elasticity decreases by more than 50%. This result suggests that financial statement profits understate the extent of income shifting observed in tax return data. As a result, studies that rely on financial statement data are likely to underestimate income shifting at the firm level. We offer practical guidance on how to correct for biases arising from the disparity between financial statement profits and taxable income.

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3.1 Introduction[2]

Notwithstanding its importance for policy and society, the magnitude of tax-motivated income shifting remains contested.[3] Macro-level estimates of income shifting vary widely. For example, Tørsløv et al. (2023) estimate that MNEs shift up to one-third of their global profits to tax havens, whereas Fuest et al. (2022) find that German MNEs shift only about 9% of profits. Studies based on U.S. FDI data report even greater dispersion, with implied annual corporate tax revenue losses ranging from 4% to 45% (Blouin and Robinson, 2023; Clausing, 2016). In contrast, micro-level studies typically use publicly available data from unconsolidated (i.e., single-entity) financial statements to proxy taxable income. These studies yield comparatively smaller income-shifting estimates at the entity level that vary with firm characteristics (e.g., Huizinga and Laeven, 2008; Markle, 2016; Heckemeyer and Overesch, 2017).[4]

A related stream of research investigates the strategies through which MNEs shift income to low-tax jurisdictions. While some studies emphasize internal debt as highly tax-sensitive and therefore a primary income-shifting strategy (Huizinga et al., 2008; Reiter et al., 2021), others point to transfer pricing and intra-firm royalty payments as the dominant strategies (Heckemeyer and Overesch, 2017; Davies et al., 2018). Hence, the relative importance of these strategies remains unsettled in prior work.

Our study contributes to these literature streams in two key ways. First, we construct a novel dataset that links financial statement data with confidential tax-return data. This dataset allows us to produce micro-level estimates of tax-motivated income shifting using tax-return data and to benchmark them against estimates based on unconsolidated financial statement data. Doing so enables us to assess the reliability of

[2]My contribution to this chapter is as follows. Harald developed the initial idea as part of a grant proposal; he was in charge of managing the grant and the contacts with the data provider. Stefanie collected existing literature and wrote the literature overview and the institutional background. I had a primary role in the early stages of the empirical analysis, including requesting access, data collection, cleaning, empirical design, and coding. Stefanie and I shared running the empirical analysis. All three of us shared in the conceptual development of the chapter as well as in writing and re-writing the draft. Core strategic decisions about the chapter regarding submission and revision were made together.

[3]Income shifting refers to the relocation of taxable income from high-tax to low-tax jurisdictions to reduce a multinational enterprise's (MNE's) overall tax burden. Common strategies include transfer pricing for intra-group trade, intra-group interest related to debt financing, and intra-group royalty payments for the use of intangible assets.

[4]The availability of granular entity-level financial statement data in the EU and several non-EU countries (e.g., the UK and Canada) enables researchers to estimate income shifting at the entity level. Because comparable data are not available in the U.S., studies in that setting rely on consolidated financial statements and typically distinguish income shifting between the U.S. and foreign operations, rather than among an MNE's foreign affiliates (e.g., Collins et al., 1998; Dyreng et al., 2023; Dyreng and Markle, 2016). Our study focuses on and contributes to research that uses unconsolidated financial statement data to examine income shifting among MNE entities.

financial statement data for measuring income shifting at the entity level. We identify tax-exempt dividend income as a key tax-return item that drives the disparity between financial statement profits and taxable income. We then show that this item attenuates income-shifting estimates derived from financial statement data. Second, we demonstrate that reliance on financial statement data affects inferences about the relative importance of different income-shifting strategies. In particular, the tax-return item identified previously helps explain why prior studies often understate the role of intra-firm debt financing.

The empirical setting for our study is Austria, which offers several advantages for cleanly measuring income shifting and parsing specific shifting strategies. First, Austria is a small, open economy with substantial MNE activity. In 2022, MNEs accounted for one-third of total private-sector revenue despite representing only 2% of firms (Statistik Austria, 2024). These statistics emphasize the importance of MNEs for the Austrian economy and the potentially broad impact of their income-shifting activities. Second, during our sample period from 2012 to 2019, Austria maintained a corporate tax rate of 25%, which was close to the OECD average (Tax Foundation, 2019). For Austrian entities, this constant tax rate created incentives for both inward and outward shifting (Adams et al., 2024; Hopland et al., 2018).[5] Third, Austria's constant corporate tax rate and the relative stability of MNE group structures in our sample over time imply that our identifying variation primarily arises from changes in *foreign* corporate tax rates. We exploit this tax rate variation using entity fixed effects, which helps mitigate concerns about endogeneity. Finally, at the entity level, Austria applies a modified one-book system, characterized by a close link between financial accounting and tax rules, similar to that in many EU and non-EU countries.[6] As a result, our findings from the Austrian setting likely generalize to a broader set of countries and institutional environments.

Our analyses leverage data from three distinct sources. First, we use administrative corporate tax-return data provided by the Austrian Ministry of Finance through the Austrian Micro Data Center (AMDC). These data cover the universe of corporate tax returns filed in Austria from 2005 to 2019 and are available to researchers upon application. Austrian corporations generally file single-entity tax returns, without consolidation of intra-group transactions.[7] Second, we obtain unconsolidated financial statement

[5]For example, affiliated MNE entities located in Germany (Ireland) faced a 30% (12.5%) tax rate and thus had tax incentives to shift income *into* (*out of*) Austria.

[6]In Table A2 in the Online Appendix, we compare the most relevant tax and financial accounting rules in Austria with those of other EU countries.

[7]The Austrian corporate tax code provides an option to file a consolidated return where taxable

data from Bureau van Dijk's Orbis Historical Database and merge these data with the tax-return data using entities' trade register numbers. The combined dataset allows us to directly compare financial statement profits with taxable income.[8] Third, we use administrative affiliate statistics on inward (IFATS) and outward investment relationships (OFATS). These data identify the location of an Austrian entity's shareholders and its subsidiaries, which we use to compute entity-specific tax incentives to shift income into or out of Austria (Huizinga et al., 2008).

We first estimate the tax semi-elasticity of taxable income Austrian MNE entities report on their tax returns using a model in the spirit of Hines and Rice (1994) and Huizinga et al. (2008). To capture entity-specific incentives to shift income, we compute the difference between Austria's statutory corporate tax rate and the *lowest* foreign corporate tax rate within the MNE group. This tax rate differential represents the net tax savings of moving one euro of income into or out of a given Austrian entity (Beer et al., 2020; Ortmann and Schindler, 2023). Because Austria's corporate tax rate remains constant over the sample period and we use entity fixed effects to control for time-invariant entity characteristics, our identification comes from *within-entity* variation in foreign statutory corporate tax rates.

We estimate a baseline tax semi-elasticity of taxable income of -0.9. This estimate, which is comparable to prior estimates (Heckemeyer and Overesch, 2017; Beer et al., 2020), indicates that the average Austrian MNE entity reduces (increases) its taxable income by 0.9% in response to a one percentage point increase (decrease) in the incentive to shift income. For the mean tax rate differential in our sample, this estimate implies that the average entity shifts roughly 2% of its taxable income *out* of Austria. Additional tests highlight substantial heterogeneity in the estimated tax semi-elasticity. For example, for entities with tax-haven ties, the semi-elasticity amounts to -4, which is more than four times as large as our baseline estimate.

We next use financial statement profits (i.e., pre-tax profits) as a proxy for taxable income and re-estimate the tax semi-elasticity. The resulting estimate is more than 50% smaller in magnitude (-0.4) than the baseline estimate based on taxable income. Such

income of individual entities is consolidated at the group level. We exclude these observations from our primary sample because Austrian financial accounting rules require corporations to disclose unconsolidated financial statements. We obtain qualitatively and quantitatively similar income-shifting estimates when including corporations with a consolidated tax return in the sample.

[8]The resulting dataset is unique in the context of entity-level analysis of tax-motivated income shifting. In the U.S. context, similar datasets have been used to reconcile financial statement profits and taxable income (Bokulic et al., 2012), improve forecasts of corporate taxable income (Green et al., 2022), and examine the evolution of book-tax differences over time (Green and Plesko, 2016). These studies focus on consolidated (i.e., group-level) financial statements and tax returns without reconciling financial statement profits and taxable income at the individual entity level.

a pattern is consistent with financial statement profits attenuating income-shifting estimates. To investigate *why* such attenuation occurs, we reconcile profits reported in financial statements with income reported on tax returns and identify the specific tax-return items that account for the divergence between the two measures. A Shapley decomposition shows that 35% of the difference is explained by tax-exempt intra-group dividend income, which increases financial statement profits without affecting taxable income.[9] When we adjust financial statement profits for tax-exempt *foreign* dividend income, the estimated tax semi-elasticity is close to our baseline estimate based on taxable income. Adjustments for other tax-return items, such as non-deductible expenses, have limited effects on income-shifting estimates.

A plausible explanation for the central role of foreign dividend income is that entities with incentives to shift profits out of Austria earn tax-exempt dividend income when foreign affiliates distribute these profits back to the Austrian entity (Kohlhase and Pierk, 2020; Markle, 2016; Langenmayr and Liu, 2023). Without adjusting for tax-exempt dividend income, financial statement profits overstate the tax base and the resulting income-shifting estimates are smaller in magnitude compared to those based on taxable income. While prior work finds that the accounting treatment of intra-group dividends in U.S. FDI data can result in macro-level estimates of income shifting to be overstated (Blouin and Robinson, 2023), our results highlight that specific interactions between tax and accounting rules attenuate income-shifting estimates at entity level. Importantly, when we adjust financial statement profits for dividend income reported in *financial statements*, the resulting tax semi-elasticities also align closely with those obtained when using confidential tax-return data. Hence, even without access to administrative tax records, researchers can use information in Orbis to mitigate the downward bias in income-shifting estimates induced by financial statement data.

In our final analysis, we examine whether dividend income affects inferences about the relevance of specific income-shifting strategies. Prior research finds that an entity's earnings before interest and taxes (EBIT) contribute more strongly to income-shifting estimates than pre-tax financial statement profits (Heckemeyer and Overesch, 2017). These results are typically interpreted as evidence that internal debt financing plays a minor role for income shifting, because interest expenses reduce pre-tax profits but not EBIT.[10] However, tax-exempt dividend income similarly affects pre-tax profits while

[9] Similar to other EU countries, entities in Austria apply the cost method to account for intra-group shareholdings in their unconsolidated financial statements while dividend income is generally exempt from corporate taxation. See Table A2 in the Appendix for details.

[10] Buettner and Wamser (2013) show similar results. However, Davies et al. (2018) find that transfer pricing is a key income-shifting strategy.

leaving EBIT unchanged and might therefore also account for the smaller income-shifting estimates obtained when using pre-tax profits instead of EBIT.

To examine the impact of tax-exempt dividend income on inferences about income-shifting strategies, we re-estimate our baseline model after adjusting financial statement profits for such income. The resulting estimate is nearly identical to our baseline results. In contrast, adjusting financial statement profits for interest expenses reported in financial statements substantially attenuates the estimated tax semi-elasticity. Taken together, these findings suggest that tax-exempt dividend income, rather than a low relevance of debt financing, drives the attenuation of income-shifting estimates based on pre-tax financial statement profits, consistent with tax-exempt dividend income affecting inferences about the relative importance of income-shifting strategies.

Our study contributes to research on tax-motivated income shifting by constructing a novel entity-level dataset that links confidential tax-return data with public financial statement information. Using this dataset, our study makes two primary contributions. First, we inform research on the use of financial accounting data to measure income shifting. Blouin and Robinson (2023) show that the accounting treatment of intra-group dividends in U.S. FDI statistics can lead macro-level estimates of income shifting to be overstated. We show that, at the entity level, financial statement profits also do not reliably capture taxable income. In particular, tax-exempt foreign dividend income recorded in unconsolidated financial statements can systematically inflate financial statement profits relative to taxable income and attenuate income-shifting estimates. Second, our study contributes to research on specific income-shifting strategies. Prior work concludes that debt financing plays a limited role in income shifting (Heckemeyer and Overesch, 2017). Our findings suggest that this inference could partly reflect measurement issues arising from tax-exempt dividend income, rather than a limited importance of debt financing as a shifting strategy. Importantly, we show that researchers can use line-item information from financial statements to adjust financial statement profits for dividend income and thereby mitigate both biases.

3.2 Austria as a Setting

The Austrian setting combines (i) comprehensive firm-level corporate tax-return and financial statement data, (ii) time-series variation in income-shifting incentives, and (iii) a substantial presence of MNEs. At the same time, Austria's institutional environment, particularly its corporate tax and financial accounting systems are comparable to that of other EU and non-EU countries. As outlined below, these features make Austria a

well-suited setting for measuring income shifting and for evaluating the reliability of unconsolidated financial statement data.

3.2.1 Austria's Financial Accounting and Tax Systems

Austrian corporations are required to prepare and disclose unconsolidated (i.e., single-entity) financial statements, with disclosure requirements varying by firm size. Small corporations may file an abbreviated balance sheet without an income statement (Bernard et al., 2018), whereas medium-sized and large corporations must disclose both statements, albeit at different levels of detail (Beuselinck et al., 2023). Financial statements are prepared under Austrian GAAP, which is based on EU Directive 2013/34/EU.[11] This directive establishes the regulatory framework for the preparation and disclosure of unconsolidated financial statements across EU countries, making their accounting principles and the resulting financial statements comparable within the EU.

Consistent with the directive, Austrian GAAP follows accrual accounting and prescribes rules for the recognition and measurement of assets and liabilities. Of particular relevance for this study is the financial accounting treatment of dividend income. Corporations must account for shareholdings in other corporations using the cost method, classifying shares as financial assets and recognizing income only upon dividend distributions. We provide additional background on the cost method and discuss its relevance for Austria and other EU countries in Sections 3.A.2 and 3.A.3 in the Appendix.

For tax purposes, Austria operates a modified one-book system in which taxable income is derived from profits reported in unconsolidated financial statements, subject to several tax adjustments. Specifically, certain expenses, such as write-downs of financial assets, are not deductible for tax purposes and must be added back to financial statement profits. Dividend income, in contrast, is generally exempt from corporate tax and is therefore deducted from financial statement profits when computing the tax base. All corporations with their seat or place of effective management in Austria are required to apply this procedure and are taxed based on their own worldwide income (single-entity regime).[12]

[11] Directive 2013/34/EU of the European Parliament and of the Council of 26 June 2013 on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC and 83/349/EEC Text with EEA relevance.

[12] Corporate groups can opt for tax consolidation (group taxation). Moreover, corporations can carry forward tax losses indefinitely and offset up to 75% of taxable income in a given year. Austria does not permit loss carrybacks. In line with the EU Parent-Subsidiary Directive (Council Directive 2011/96/EU) and the Interest & Royalties Directive (Council Directive 2003/49/EC), Austria does

The last major reform of the Austrian corporate tax system occurred seven years before our sample period, when the country reduced its tax rate from 34% to 25% in 2005. This rate remained unchanged throughout our entire sample period (2012-2019). Nonetheless, income-shifting incentives for Austrian MNE entities evolved over time due to changes in foreign corporate tax rates. At the time of the 2005 reform, Austria's 25% tax rate was below EU and OECD averages, likely incentivizing shifting income *into* Austria.[13] By 2019, international tax competition had reduced average corporate tax rates to 21.7% (EU) and 24% (OECD), respectively, diminishing Austria's tax attractiveness and potentially inducing both outward- and inward-shifting incentives.

3.2.2 MNE Activity in Austria

Foreign direct investment (FDI) plays a central role for Austria's economy, both in terms of inbound flows (i.e., investment into Austria) and outbound flows (i.e., investment from Austria abroad). Inbound FDI stocks relative to GDP highlight Austria's attractiveness for foreign investors. Between 2005 and 2019, the ratio consistently exceeded the global average (2005: Austria: 27%, Global: 23%; 2019: Austria: 46%, Global: 45%). Outbound FDI is even more pronounced, with Austria's outbound stock rising from 24% of GDP in 2005 (Global: 24%) to 56% in 2019 (Global: 42%).[14]

The number of foreign affiliates further underscores Austria's integration into the global economy. Outward foreign affiliates (OFATS), i.e., entities abroad owned by Austrian parents, remained stable at around 6,000 between 2013 and 2019. Inward foreign affiliates (IFATS), i.e., Austrian entities ultimately owned by foreign parents, increased from 10,160 in 2013 to 11,718 in 2019.[15] Collectively, these statistics underscore the importance of MNE activity for the Austrian economy and the potentially broad impact of their income-shifting activities.

3.3 Prior Literature

MNEs can use a variety of strategies to relocate income across affiliates to minimize their overall tax burden. The most prominent strategies identified in prior work in-

not levy withholding taxes on dividends, interest, or royalties paid to affiliated companies resident in other EU countries (Amberger and Kohlhase, 2023).

[13]In 2005, the average corporate income tax rates in the EU and the OECD were 25.2% and 28%, respectively. We collect data on corporate income tax rates from the Tax Foundation.

[14]Data are obtained from OECD (2024).

[15]We obtain statistics of foreign affiliates from Statistik Austria (2025).

clude (i) intra-group debt financing (e.g., Newberry and Dhaliwal, 2001; Huizinga and Laeven, 2008; Buettner et al., 2012; Egger et al., 2014), (ii) transfer pricing for intra-group trade (e.g., Jacob, 1996; Clausing, 2003), (iii) royalty payments for the use of intangible assets (e.g., Dischinger and Riedel, 2011; Griffith et al., 2014; De Simone et al., 2020; Deng and Rane, 2024), (iv) the exploitation of double tax treaty networks ("treaty shopping") (Weyzig, 2013), (v) risk transfer (Becker et al., 2020), and (vi) the shifting of income to loss affiliates (De Simone et al., 2017; Hopland et al., 2018). Beyond cross-border settings, prior research also finds evidence for local tax planning within countries (Beuselinck and Pierk, 2024) and domestic income shifting within specific industries (Beer and Loeprick, 2017).

Over the past three decades, a large body of research has tried to quantify tax-motivated income shifting. Much of this work builds on the seminal model by Hines and Rice (1994), which uses a Cobb-Douglas production function to estimate "true" (i.e., pre-shifting) taxable income as a function of capital and labor inputs. The key variable to identify and measure income shifting is a tax incentive, typically defined as the tax rate differential between the parent p and affiliate i: $\tau_p - \tau_i$. If $\tau_p - \tau_i > 0$, the parent has an incentive to shift income to the lower-tax affiliate, and vice versa. All else equal, MNEs shift income as long as the expected tax benefit exceeds the associated costs (e.g., concealment and dispute costs). Huizinga et al. (2008) extend this framework by introducing a profit-weighted tax rate differential across all MNE entities, which accounts for the full group structure as well as group-wide income-shifting incentives.[16]

Estimates of income shifting vary substantially. Synthesizing 203 estimates from 27 studies based on entity-level data, Heckemeyer and Overesch (2017) report an average tax semi-elasticity of reported pre-tax accounting profits of about -0.8, implying that a one percentage point increase (decrease) in the shifting incentive lowers (raises) reported affiliate profits by 0.8%. Extending this evidence, Beer et al. (2020) analyze 402 estimates from 37 micro-level studies and find an average semi-elasticity of -1, corresponding to aggregate (i.e., country-level) corporate tax revenue losses of about 4%. In stark contrast, macro-level studies based on aggregated data suggest that MNEs shift up to one-third of their global profits to tax havens (Tørsløv et al., 2023). This gap between micro- and macro-level estimates is often attributed to measurement problems in aggregate data, such as double counting or misattribution of profits across jurisdic-

[16] Alternative approaches to measure income shifting at the entity level exploit profitability shocks to the parent entity (Dharmapala and Riedel, 2013) while prior work at the consolidated (i.e., group) level focuses on discrepancies between reported income and sales (Dyreng and Markle, 2016) and average foreign tax rates of U.S. MNEs (Collins et al., 1998; Klassen and Laplante, 2012).

tions, that tend to inflate income-shifting estimates at the macro level (Blouin and Robinson, 2023).

Evidence based on administrative tax-return data typically yields the largest entity-level semi-elasticities with respect to income-shifting incentives (Heckemeyer and Overesch, 2017). Such data allow researchers to observe taxable income directly and to identify specific income-shifting strategies (e.g., Mills and Newberry, 2004; Grubert, 2012; Hopland et al., 2018; Coles et al., 2022). For example, using UK corporate tax returns, Bilicka (2019) documents that MNE subsidiaries report taxable income that is approximately one-third lower than that of otherwise comparable domestic firms, with a substantial share of MNE subsidiaries reporting zero taxable income. Bilicka (2019) interprets these patterns as evidence of highly aggressive income shifting.

Despite the outlined advantages, access to administrative data is rare, and much of the literature therefore relies on publicly disclosed financial statement data to measure income shifting at the entity level (e.g., Huizinga et al., 2008; De Simone, 2016; Markle, 2016; De Simone et al., 2022). However, these data come with important limitations. Income items such as dividend income can weaken the link between financial statement profits and taxable income and lead to double counting or misattribution or profits across jurisdictions (Bajgar et al., 2020; Kalemli-Özcan et al., 2024; Blouin and Robinson, 2023). In addition, heterogeneity in financial reporting requirements within and across countries results in the underrepresentation of smaller and less productive firms, skewed profit distributions, and incomplete coverage of ownership structures, particularly for tax haven affiliates. Because tax havens are among the most attractive locations for reporting shifted income, incomplete coverage of these affiliates can bias estimated income-shifting responses toward zero. Consistent with this view, Dowd et al. (2017) find nonlinearities in income-shifting elasticities, with estimates understated in low-tax jurisdictions and overstated in high-tax jurisdictions.

Our study contributes to this literature by constructing a novel dataset that enables us (i) to evaluate the reliability of financial statement data for measuring cross-border income shifting at the entity level, and (ii) to assess how reliance on these data shapes inferences about the relative importance of specific income-shifting strategies.

3.4 Data

Our empirical analyses center on a merged dataset of Austrian corporate tax returns and unconsolidated financial statements, which we construct from three sources.

Corporate Tax Return Data and Financial Statement Data. We access corporate tax-return data (Körperschaftsteuerstatistik) through the Austrian Micro Data Center (AMDC). This dataset, initially provided by the Austrian Ministry of Finance, covers the universe of corporate tax returns filed in Austria between 2005 and 2019. Each entity is assigned a unique firm identifier, which the AMDC can link to the entity's trade register number. We complement these data with unconsolidated financial statement data from Orbis Historical, including annual profit before taxes, total assets, fixed assets, costs of employees, and interest expenses. Detailed information on dividend income and intra-company transactions is obtained from the Austria-specific Sabina database from Bureau van Dijk. Because we focus on unconsolidated financial statements, the entities in our sample can belong to either publicly listed or non-listed groups; we exclude standalone entities from our sample. To maintain confidentiality, the AMDC matches Orbis data with the tax-return data using entity's trade register number and provides us with a pseudonymized dataset.

Group Structure Information. To identify MNE entities and their corresponding group structures, we use data on inward foreign affiliates (IFATS, Austrian entities owned by foreign shareholders) and outward foreign affiliates (OFATS, foreign entities owned by Austrian shareholders). Both datasets are obtained from the AMDC. They cover the period 2008 to 2019; however, due to a change in firm identifiers, we can link the IFATS and OFATS data with the tax-return data only from 2012 onward.

The IFATS and OFATS datasets record direct and indirect cross-border investment relations where an entity holds more than 50% ownership in a foreign entity.[17] The focus on majority-owned entities is consistent with the notion that MNEs are unlikely to shift income to entities they do not control. IFATS provides the country of the foreign ultimate owner of Austrian entities, while OFATS reports the locations of foreign entities controlled by Austrian entities. Combined, these data allow us to distinguish between (i) Austrian entities with foreign subsidiaries, (ii) Austrian entities with foreign shareholders, and (iii) Austrian entities that have both. A limitation of the data is that we cannot identify horizontal ownership links ("sister entities").[18]

[17] In most cases, the foreign entity will correspond to a legal entity such as a corporation, but the data also capture permanent establishments or joint ventures.

[18] In untabulated analyses, we use historical ownership links from Orbis instead of administrative OFATS and IFATS data to identify group structures and determine income-shifting incentives. Using these data does not improve our income-shifting estimates. A likely explanation is that, relative to OFATS and IFATS, Orbis provides limited coverage of low-tax affiliates, leading to a mismeasurement of the true tax rate differential.

Figure 3.1 provides a stylized group structure and illustrates the coverage of MNE entities in the IFATS and OFATS data. IFATS allows us to identify *Foreign 1* as the ultimate owner of the Austrian entity (AT), while OFATS records *Foreign 3-5* as foreign entities owned by an Austrian parent. Other affiliates are not observed in the data because they are either sister companies that lack a vertical ownership link with the Austrian entity (*Foreign 6-7*) or are not the ultimate parent of the Austrian entity (*Foreign 2*).

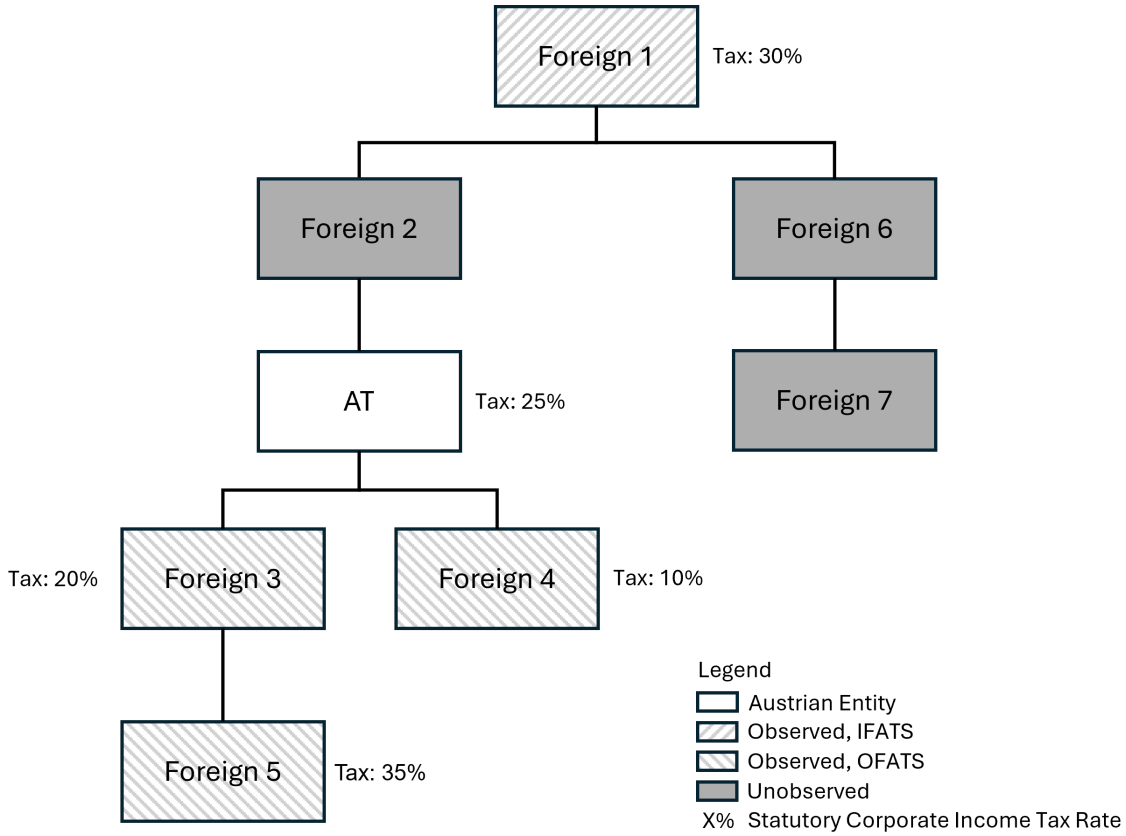
We combine the IFATS and OFATS data with information on statutory corporate income tax rates obtained from the Tax Foundation. We use these data to calculate income-shifting incentives for each Austrian entity in our sample (e.g., entity AT in Figure 3.1). Specifically, we define income-shifting incentives as the difference between Austria's statutory corporate income tax rate (25% throughout our sample period) and the *lowest* foreign statutory corporate income tax rate within the MNE group observable in our data. In Figure 3.1, the Austrian entity belongs to an MNE group with statutory corporate income tax rates ranging from 10% (*Foreign 4*) to 35% (*Foreign 5*). Relative to Austria's 25% tax rate, this structure creates an incentive to shift income *out* of Austria and into entity *Foreign 4*. The resulting tax rate differential is therefore 15 percentage points (= 25% minus 10%), which we use as a measure of income-shifting incentives for entity AT .

Sample Construction. Our initial sample includes all MNE entities for which the AMDC successfully matched tax-return and financial statement data via the entity's trade register number. We exclude entities filing consolidated corporate tax returns under the Austrian group taxation regime due to potentially distinct income-shifting incentives.[19] We also restrict the sample to entities incorporated under Austrian corporate law as these entities are required to prepare and disclose unconsolidated financial statements under Austrian GAAP (e.g., public limited companies–AGs, and private limited companies–GmbHs).

Table 3.1 summarizes our sample selection. We begin with 395,247 entity-year observations in the matched sample for the years 2012-2019 that belong to an MNE group (i.e., we exclude standalone entities and entities without any ownership ties to entities located abroad). We exclude 393 observations that concern non-corporate entities and 47,932 observations from entities filing consolidated tax returns. We then restrict the sample to MNE entities with available OFATS and IFATS data and that

[19]We obtain qualitatively and quantitatively similar income-shifting estimates when including corporations with a consolidated tax return in the sample.

Figure 3.1: Example Group Structure



Note: This figure visualizes a stylized MNE group structure, outlining the MNE entities observable in the IFATS and OFATS data.

report non-missing taxable income on their tax returns. After eliminating singleton observations that drop out in regressions with entity fixed effects, we obtain an initial sample with 39,560 entity-year observations, representing 8,157 unique Austrian MNE entities.

For regressions that include control variables (see Section 3.5 for details), we further drop 5,748 observations without data on fixed assets and 26,871 observations with missing data on costs of employees. Entity fixed effects again result in the exclusion of 224 singleton observations. The final regression sample with control variables consists of 6,717 entity-year observations, representing 1,300 unique Austrian MNE entities.

We conduct our empirical analysis in three steps. First, we quantify income shifting using administrative corporate tax-return data. Second, we compare these estimates with those obtained from financial statement data and examine the sources of any differences between them. Finally, we assess the implications of relying on financial statement data for identifying and evaluating specific income-shifting strategies.

Table 3.1: Sample Selection

Step	Entity-Year Obs.	Unique Entities
Entity-year observations 2012-2019	395,247	56,798
Less: Non-corporate observations	-393	
Less: Entities part of group taxation	-47,932	
Less: Domestic entities	-262,841	
Less: Missing OFATS/IFATS data	-18,970	
Less: Missing taxable income	-22,725	
Less: Singletons due to entity fixed effects	-2,826	
Initial Sample	39,560	8,157
Less: Missing fixed assets	-5,748	
Less: Missing costs of employees	-26,871	
Less: Singletons due to entity fixed effects	-224	
Final Sample	6,717	1,300

Note: This table presents the sample selection for the sample used in our baseline analysis.

3.5 Measuring Income Shifting

3.5.1 Methodology

We quantify the extent to which Austrian MNE entities shift income into or out of Austria based on the following two-way fixed effects regression in the spirit of Hines and Rice (1994):

$$\ln(Y)_{i,t} = \beta_0 + \gamma\, TaxRateDifferential_{i,t} + \beta_1 \ln(FixedAssets)_{i,t} + \beta_2 \ln(CostsofEmployees)_{i,t} + EntityFE_i + TimeFE_t + \epsilon_{i,t}, \tag{3.1}$$

where $\ln(Y)_{i,t}$ denotes one of two profit measures. First, we use the natural logarithm of taxable income Austrian entity i reports on its corporate tax return in year t. Second, we use the natural logarithm of pre-tax profit that entity i reports in its unconsolidated financial statements. We winsorize all outcome variables at the 1%-level. Table A1 in the Appendix provides a detailed variable description.

$TaxRateDifferential_{i,t}$ denotes the tax incentive to shift income into or out of entity i in year t. It is defined as the difference between the Austrian statutory corporate income tax rate (25% throughout the sample period) and the lowest foreign statutory corporate income tax rate of the MNE group observable in our data: $\tau_{Austria} - \tau_{Foreign} = 25 - \tau_{Foreign}$. We compute $TaxRateDifferential_{i,t}$ for entity i using

ownership structures recorded in OFATS and IFATS. Variation in $TaxRateDifferential_{i,t}$ can arise from (i) changes in the MNE group structure and (ii) changes in foreign statutory corporate income tax rates.

We measure $TaxRateDifferential_{i,t}$ using statutory corporate income tax rates to reflect the net tax savings of relocating one euro of income within the MNE group (Beer et al., 2020). We focus on the *lowest* foreign corporate income tax rate rather than all possible bilateral tax rate differentials within the group because several income-shifting strategies (e.g., intra-group interest and royalty payments) allow direct transfers to the lowest taxed entity (Ortmann and Schindler, 2023). A positive $TaxRateDifferential_{i,t}$ indicates an outward-shifting incentive, meaning that the Austrian corporate tax rate exceeds the lowest foreign tax rate. Conversely, a negative $TaxRateDifferential_{i,t}$ implies an inward-shifting incentive. Accordingly, the estimated coefficient γ captures the tax semi-elasticity of reported profits of Austrian entity i in year t. A negative coefficient would indicate that reported profits decrease (increase) as shifting incentives increase (decrease), consistent with greater tax-motivated income shifting at the margin.

Following Huizinga and Laeven (2008), we control for entity-level production factors by including (i) the natural logarithm of total fixed assets—capital, and (ii) the natural logarithm of costs of employees—labor. We include year fixed effects to account for unobserved time-varying confounders, such as macroeconomic conditions, and entity fixed effects to control for time-invariant heterogeneity at the entity level, such as heterogeneous income-shifting preferences. Because MNE group structures in our sample are relatively stable over time, the identifying variation in $TaxRateDifferential_{i,t}$ stems primarily from changes in foreign statutory corporate income tax rates.[20] As foreign corporate tax rate changes are plausibly exogenous from the perspective of Austrian MNE entities, our research design mitigates endogeneity concerns. We cluster standard errors at the entity-level (Petersen, 2009).

3.5.2 Descriptive Statistics

Table 3.2 presents descriptive statistics for the variables used in our income shifting analysis, i.e., as specified in equation (3.1). The mean $TaxRateDifferential_{i,t}$ is -2.27 percentage points, indicating that the average Austrian MNE entity in our sample faces inward-shifting incentives. When distinguishing between inward- and outward-shifting incentives based on the sign of $TaxRateDifferential_{i,t}$, 62% of entities are classified as

[20] When examining the source of variation in the tax rate differential in our sample, we observe that less than 1% of the changes in the tax rate differential come from changes in the group structure.

inward shifters, while 31% are classified as outward shifters.[21] This distribution reflects the fact that Austria's statutory corporate income tax rate during our sample period was close to the OECD average, creating incentives for income shifting both into and out of Austria that depend on the tax rates faced by foreign affiliates.

Table 3.2: Descriptive Statistics

Variable	Obs.	Mean	SD
FATS Differential	6,717	-2.27	7.42
Inward Shifter	6,717	0.62	0.48
Outward Shifter	6,717	0.31	0.46
Taxable Income (in Euro)	6,717	4,028,490	13,081,266
Pre-Tax Profit (in Euro)	6,717	4,657,232	30,731,176
Disparity (in Euro)	6,717	628,742	26,749,853
Total Assets (in Euro)	6,717	62,521,025	456,467,157
Fixed Assets (in Euro)	6,717	29,716,964	405,849,077
Costs of Employees (in Euro)	6,717	9,507,636	17,407,599
ln(Taxable Income)	6,717	13.93	1.28
ln(Pre-Tax Profit)	6,464	14.16	1.56
ln(Disparity)	6,712	11.92	2.26
ln(Total Assets)	6,717	16.65	0.99
ln(Fixed Assets)	6,717	14.56	2.27
ln(Costs of Employees)	6,717	15.30	1.30
Write-Downs (in Euro)	6,717	36,527	997,429
Deduction Limitation (in Euro)	6,717	27,773	530,459
Domestic Dividends (in Euro)	6,717	-171,912	1,999,964
Foreign Dividends (in Euro)	6,717	-619,673	10,411,628
Dividend Income (in Euro)	694	6,272,945	32,140,400
Interest Expenses (in Euro)	5,498	958,299	14,963,109

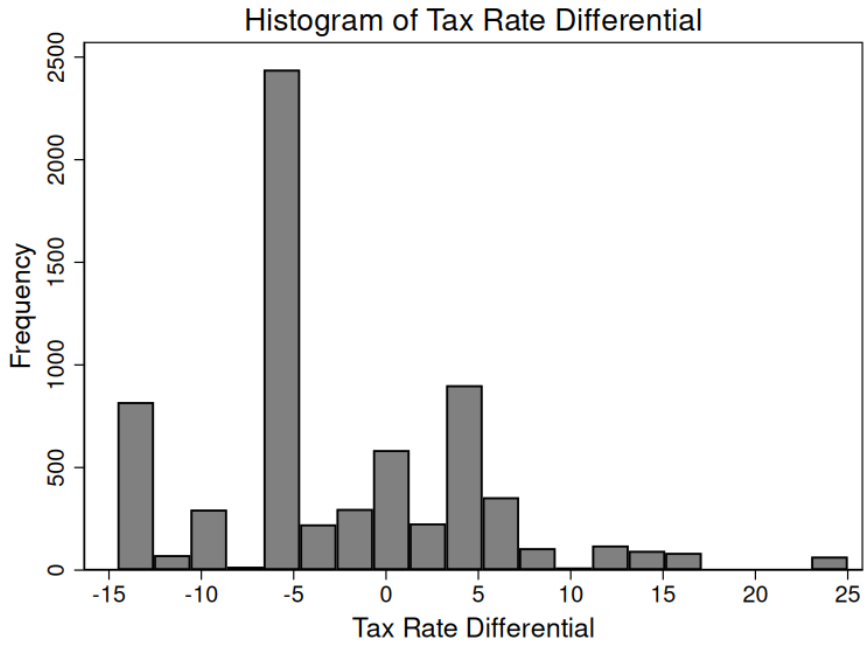
Note: This table presents descriptive statistics for our final sample. We use entity-level data from the AMDC and Orbis for the years 2012-2019. The number of observations, mean, and standard deviation correspond to the sample used in our income shifting analysis. We provide detailed variable definitions in the Appendix.

Figure 3.2 visualizes the distribution of $TaxRateDifferential_{i,t}$ and highlights substantial variation in income-shifting incentives at the entity level. To shed light on where the entities that drive this variation are located, we provide the location of the lowest-taxed entity within each MNE group in Table A3 in the Appendix (see Section 3.A.4). Austrian entities in our sample have affiliated entities in zero-tax jurisdictions,

[21] The remaining 7% of observations have a tax rate differential of zero, because the lowest-tax foreign affiliate is located in a country with a 25% statutory corporate income tax rate.

such as the British Overseas territories as well as in low-tax European countries. We also observe several cases where the lowest-tax foreign entity faces a higher tax rate than the Austrian entity, indicating an inward-shifting incentive. Notable examples include entities located in Italy, Germany, and the United States. Figure A1 in the Appendix depicts the evolution of income-shifting incentives over time. We observe that the average entity in our sample transitions from having an inward- to having an outward-shifting incentive in 2017, which is caused by reductions in foreign corporate income tax rates.

Figure 3.2: Distribution of Tax Rate Differential



Note: This figure presents the distribution of $TaxRateDifferential_{i,t}$ in our sample. We derive data from the AMDC for periods 2012–2019. $TaxRateDifferential_{i,t}$ is defined as the Austrian statutory corporate income tax rate minus the lowest foreign statutory corporate income tax rate within the MNE group.

The remaining descriptive statistics in Table 3.2 suggest that the average MNE entity in our sample reports approximately EUR 4 million in taxable income on its tax return and EUR 4.66 million in pre-tax profits in its financial statement. Thus, taxable income is, on average, lower than pre-tax profits reported in the financial statements. Entities hold mean total assets of EUR 62.5 million, fixed assets of EUR 29.7 million, and incur costs of employees of EUR 9.5 million. All variables exhibit considerable variation, reflecting differences in size and operations across MNE entities.

Figure A2 in the Appendix plots mean taxable income for the entities in our sample

over time (see Section 3.A.4). As expected, entities with incentives to shift income into Austria report consistently higher taxable income than entities with incentives to shift income out of Austria. In contrast to Bilicka (2019), we do not observe systematic reporting of zero taxable income among Austrian MNE entities. This pattern suggests either that the entities in our sample engage in less aggressive income shifting compared to UK MNE entities or that the phenomenon of zero taxable income documented in Bilicka (2019) reflects institutional features specific to the UK setting.

Taken together, the descriptive statistics highlight two key patterns: (i) heterogeneity in income-shifting incentives both across Austrian MNE entities and over time and (ii) the importance of foreign tax rate changes in shaping these incentives. We exploit these features in our subsequent empirical analysis.

3.5.3 Results

Baseline Results. We report the results for estimating equation (3.1) in Table 3.3. Panel A uses taxable income reported on tax returns as the dependent variable. In column (1), which excludes control variables, the coefficient on $TaxRateDifferential_{i,t}$ is negative and statistically significant. The estimate of -0.0076 implies a tax semi-elasticity of taxable income of -0.76. Adding controls for capital and labor in column (2) increases the magnitude of the estimate to -0.0091. In column (3), we replace entity fixed effects with industry fixed effects to preserve cross-entity variation in income-shifting incentives within industries, resulting in a tax semi-elasticity of -1.13.

Economically, the estimate in column (2) implies that a one percentage point increase (decrease) in the incentive to shift taxable income abroad reduces (increases) the taxable income of Austrian MNE entities by approximately 0.9%. This estimate is slightly larger than the consensus estimate of -0.8 reported by Heckemeyer and Overesch (2017). When evaluated at the mean shifting incentive, our estimate suggests that the average entity in our sample shifts about 2% of its taxable income from Austria to a lower-taxed entity.

Figure A3 in the Appendix visualizes the evolution of the tax semi-elasticity over our sample period (see Section 3.A.4). We observe that the extent of income shifting varies over time. For instance, outward shifting decreases sharply after Austria's introduction of an interest and royalty deduction limitation in 2014. Together with our baseline estimates in Panel A of Table 3.3, these results suggest that cross-border income shifting in our setting responds to income-shifting incentives shaped by tax rate changes and contemporaneous policy reforms.

Table 3.3: Results for Income-Shifting Analysis

Panel A: Tax Semi-Elasticity of Taxable Income reported on Tax Returns

	ln(Taxable Income)		
	(1)	(2)	(3)
Tax Rate Differential	-0.0076***	-0.0091**	-0.0113***
	(0.0029)	(0.0045)	(0.0033)
ln(Fixed Assets)		-0.0298	0.1236***
		(0.0214)	(0.0133)
ln(Costs of Employees)		0.3892***	0.3844***
		(0.0566)	(0.0246)
Entity FE	Yes	Yes	No
Year FE	Yes	Yes	Yes
Industry FE	No	No	Yes
Obs.	39,560	6,717	7,126
R^2	0.84	0.77	0.27

Panel B: Tax Semi-Elasticity of Pre-Tax Profit reported in Financial Statements

	ln(Pre-Tax Profit)		
	(1)	(2)	(3)
Tax Rate Differential	-0.0041	-0.0044	0.0046
	(0.0053)	(0.0055)	(0.0045)
ln(Fixed Assets)		-0.0027	0.2266***
		(0.0225)	(0.0180)
ln(Costs of Employees)		0.3896***	0.4173***
		(0.0717)	(0.0308)
Entity FE	Yes	Yes	No
Year FE	Yes	Yes	Yes
Industry FE	No	No	Yes
Obs.	7,549	6,435	6,840
R^2	0.82	0.82	0.33

Note: This table presents the results of the income shifting analysis using entity-level data from the AMDC and Orbis for the years 2012-2019. Panel A measures the tax semi-elasticity of $TaxableIncome_{i,t}$ as reported on corporate tax returns, where the dependent variable is the natural logarithm of $TaxableIncome_{i,t}$. Panel B measures the tax semi-elasticity of $Pre\text{-}TaxProfit_{i,t}$ as reported in financial statements, where the dependent variable is the natural logarithm of $Pre\text{-}TaxProfit_{i,t}$. $TaxRateDifferential_{i,t}$ is a measure for income-shifting incentives, defined as the Austrian statutory corporate income tax rate minus the lowest foreign statutory corporate income tax rate within the MNE group. Control variables include fixed assets and the costs of employees, both transformed by the natural logarithm. All outcome variables are winsorized at the 1% level. We cluster standard errors by entity. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

Panel B of Table 3.3 repeats the analysis in Panel A but uses pre-tax profits reported in financial statements as a proxy for taxable income. Across specifications, the estimated tax semi-elasticities are smaller in magnitude; the estimated coefficients on $TaxRateDifferential_{i,t}$ are also statistically insignificant. In column (2), the point estimate is more than 50% smaller than the corresponding estimate based on taxable income in Panel A.

Taken together, our baseline results suggest that while income-shifting estimates based on administrative tax-return data are broadly consistent with those documented in prior research, financial statement profits do not fully capture an entity's taxable income. In fact, using financial statement data to proxy taxable income attenuates income-shifting estimates toward zero.

Heterogeneity. Table A4 examines entity-level heterogeneity in cross-border income shifting (see Section 3.A.4). Consistent with our baseline analysis, we use taxable income as the dependent variable in equation (3.1) and split the sample according to entity characteristics likely to moderate the extent of income shifting. We find that income shifting is more pronounced among entities with incentives to shift income out of Austria compared to those with inward-shifting incentives. The former entities exhibit a tax semi-elasticity of -1.9, which is more than twice the baseline estimate reported in column (2), Panel A of Table 3.3. When splitting the sample based on potential tax-haven ties, Austrian MNE entities with foreign affiliates located in a tax haven display an even larger tax semi-elasticity of -4. Collectively, these results indicate that outbound-shifting incentives and tax-haven links are key drivers of cross-border income shifting in our setting.

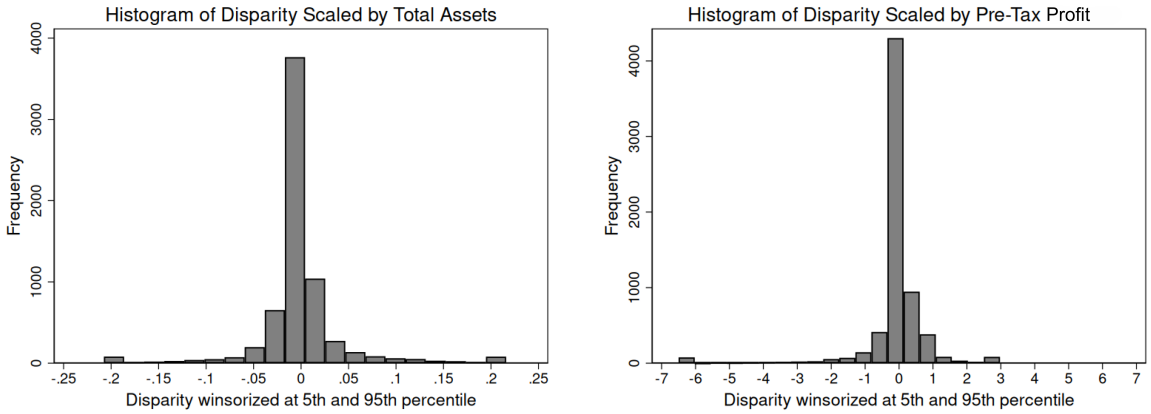
3.6 Explaining Differences in Income-Shifting Estimates

We next investigate *why* financial statement profits yield smaller tax semi-elasticities than taxable income. We begin by comparing entities' pre-tax financial statement profit in year t with their taxable income from the tax return. To this end, we define $Disparity_{i,t}$ as the difference between the two profit measures. We then identify specific tax-return items that account for the difference between financial statement profits and taxable income and assess their impact on the income-shifting estimates reported in the previous section.

3.6.1 Quantifying the Gap between Financial Statement Profits and Taxable Income and its Drivers

As reported in Table 3.2, mean $Disparity_{i,t}$ is positive and amounts to EUR 628 thousand, consistent with financial statement profits exceeding taxable income on average. Figure 3.3 depicts the distribution of $Disparity_{i,t}$, scaled by total assets in Panel (a) and by financial statement profits in Panel (b). Both panels suggest substantial variation in $Disparity_{i,t}$, consistent with the large standard deviation of EUR 26 million reported in Table 3.2.

Figure 3.3: Distribution of *Disparity*



(a) Scaled by Total Assets

(b) Scaled by Financial Statement Profits

Note: This figure presents the distribution of $Disparity_{i,t}$ in our final sample. We use data from the AMDC for the years 2012–2019. $Disparity_{i,t}$ is defined as the difference between financial statement profits and taxable income. Panel (a) scales $Disparity_{i,t}$ by total assets and Panel (b) by financial statement profits. All values are winsorized at the 5th and 95th percentile.

To understand the drivers of the difference between the two profit measures, we evaluate the extent to which specific tax-return items contribute to $Disparity_{i,t}$. We scale each tax-return item by total assets and compute its median across the full sample, identifying the following four items as key drivers: $Write\ Downs_{i,t}$, $Deduction\ Limitation_{i,t}$, $Domestic\ Dividends_{i,t}$, and $Foreign\ Dividends_{i,t}$. $Write\ Downs_{i,t}$ refers to non-tax-deductible write-drowns and $Deduction\ Limitation_{i,t}$ concerns non-tax-deductible interest and royalty payments. Both items reduce financial statement profits without affecting taxable income. $Domestic\ Dividends_{i,t}$ refers to tax-exempt domestic dividend income while $Foreign\ Dividends_{i,t}$ captures tax-exempt foreign dividend income. These items increase financial statement profits but do not affect taxable income.

Table 3.2 provides descriptive statistics for these items. On average, entities report EUR 36 thousand in non-tax-deductible write-drowns ($Write\ Downs_{i,t}$), EUR 28 thousand in non-tax-deductible interest or royalty expenses ($Deduction\ Limitation_{i,t}$), EUR 172 thousand in tax-exempt domestic dividend income ($Domestic\ Dividends_{i,t}$), and EUR 620 thousand in tax-exempt foreign dividend income ($Foreign\ Dividends_{i,t}$). To maximize sample size, we set missing values for these items to zero.

We assess the relative importance of each item in explaining $Disparity_{i,t}$ based on Shapley values. Specifically, we estimate all possible combinations of the four items (i.e., 15 regressions in total) based on the following specification:

$$\begin{aligned}\ln(Disparity)_{i,t} = \beta_0 + \beta_1 Write\ Downs_{i,t} + \beta_2 Deduction\ Limitation_{i,t} + \\ \beta_3 Domestic\ Dividends_{i,t} + \beta_4 Foreign\ Dividends_{i,t} + \\ EntityFE_i + TimeFE_t + \epsilon_{i,t}.\end{aligned} \tag{3.2}$$

For each regression, we compute predicted values for $Disparity_{i,t}$ and compare model fit with and without the respective tax-return item. The resulting relative contributions of each tax-return item are expressed as Shapley values, which we report in Table 3.4. Non-deductible write-downs explain 16.3% of the difference between financial statement profits and taxable income, non-deductible interest or royalty payments explain 50.8%, domestic dividends 17.6%, and foreign dividends 15.2%. These results indicate that the interest and royalty deduction limitation is the dominant driver of the difference between financial statement profits and taxable income, followed by domestic dividends, write downs, and foreign dividends.

Table 3.4: Shapley Values for Tax-Return Items explaining *Disparity*

	Shapley Value
Write Downs	16.3%
Deduction Limitation	50.8%
Domestic Dividends	17.6%
Foreign Dividends	15.2%

Note: This table presents Shapely values for the relative contribution to the estimated coefficient of each tax-return item to the disparity between financial statement profits and taxable income. We use entity-level data from the AMDC and Orbis for the years 2012-2019.

3.6.2 Assessing the Impact on Income-Shifting Estimates

Research Design. To examine how the tax-return items identified in the previous section affect income-shifting estimates, we adjust financial statement profits separately for each item and re-estimate equation (3.1) as follows:

$$\begin{aligned} \ln(Pre\text{-}Tax\ Profit \pm Adjustment)_{i,t} = \beta_0 + \gamma\ TaxRateDifferential_{i,t} + \\ \beta_1 \ln(FixedAssets)_{i,t} + \beta_2 \ln(CostsofEmployees)_{i,t} + \\ EntityFE_i + TimeFE_t + \epsilon_{i,t}. \end{aligned} \tag{3.3}$$

Specifically, we apply four adjustments: (i) add back non-tax-deductible write-downs; (ii) add back non-tax-deductible interest and royalty expenses; (iii) deduct tax-exempt domestic dividend income; (iv) deduct tax-exempt foreign dividend income. Each adjustment brings financial statement profits closer to taxable income, enabling us to isolate how each tax-return item affects income-shifting estimates based on financial statement profits. Consistent with our baseline income shifting analysis, we include entity and year fixed effects, control for fixed assets and labor, and cluster standard errors at the entity level.

To additionally assess whether one can use publicly available financial statement data to approximate taxable income reported on tax returns, we construct analogous adjustments based on line items from financial statements, including dividend income and interest expenses reported in entities' profit and loss statements. For this purpose, we supplement our Orbis data with more granular financial statement information from Bureau van Dijk's Sabina database.

Results. Table 3.5 reports regression results from estimating equation (3.3). Columns (1)–(4) adjust financial statement profits separately for each tax-return item, while column (5) applies all adjustments simultaneously. In Panel A, the coefficients on $TaxRateDifferential_{i,t}$ remain statistically insignificant, indicating that, for the full sample, adjusting financial statement profits for tax-return items does not materially improve income-shifting estimates relative to unadjusted financial statement profits. Notably, adjusting for tax-exempt foreign dividend income in column (4) yields a coefficient on $TaxRateDifferential_{i,t}$ that is comparable in magnitude to the baseline estimate reported in column (2) of Table 3.3, Panel A.

Table 3.5: Adjusting Financial Statement Profits for Tax-Return Items

Panel A: Full Sample

	ln(Pre-Tax Profit ± Adjustment)				
	(1) Write Downs	(2) Ded. Lim.	(3) Dom. Div.	(4) For. Div.	(5) All
Tax Rate Differential	-0.0057	-0.0058	-0.0061	-0.0079	-0.0076
	(0.0054)	(0.0054)	(0.0055)	(0.0052)	(0.0052)
Controls	Yes	Yes	Yes	Yes	Yes
Entity FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Obs.	6,598	6,598	6,598	6,598	6,598
R^2	0.82	0.82	0.81	0.81	0.81

Panel B: Inward vs. Outward Shifters

	ln(Pre-Tax Profit ± Adjustment)				
	(1) Write Downs	(2) Ded. Lim.	(3) Dom. Div.	(4) For. Div.	(5) All
Absolute Tax Rate Differential	-0.0140	-0.0147	-0.0144	-0.0245**	-0.0230**
	(0.0131)	(0.0131)	(0.0134)	(0.0117)	(0.0116)
Inward Shifter x Differential	0.0084	0.0092	0.0096	0.0179	0.0170
	(0.0144)	(0.0143)	(0.0146)	(0.0130)	(0.0129)
Inward Shifter	0.1742	0.1667	0.1643	0.1426	0.1380
	(0.1183)	(0.1199)	(0.1191)	(0.1153)	(0.1127)
Controls	Yes	Yes	Yes	Yes	Yes
Entity FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Obs.	6,598	6,598	6,598	6,598	6,598
R^2	0.82	0.82	0.81	0.81	0.81

Note: This table presents the results of the income shifting analysis after adjusting financial statement profits for tax-return items. We use entity-level data from the AMDC and Orbis for the years 2012-2019. We first adjust financial statement profits ($Pre\text{-}TaxProfit_{i,t}$) for tax-return items and measure the tax semi-elasticity of the resulting profit measure. The dependent variable is the natural logarithm of the adjusted profit measure. $TaxRateDifferential_{i,t}$ is a measure for income-shifting incentives, defined as the Austrian statutory corporate income tax rate minus the lowest foreign statutory corporate income tax rate within the MNE group. In Panel A, we use the full sample. In Panel B, we differentiate between entities with inward- versus outward-shifting incentives. In column (1) of both Panels, we adjust financial statement profits for non-tax-deductible write-downs, in column (2) for non-tax-deductible interest and royalty expenses, in column (3) for tax-exempt domestic dividend income, in column (4) for tax-exempt foreign dividend income, and in column (5) for all adjustments made in columns (1)–(4). Control variables include fixed assets and the costs of employees, both transformed by the natural logarithm. All outcome variables are winsorized at the 1% level. We cluster standard errors by entity. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

Panel B separates entities with inward- and outward-shifting incentives. We calculate the absolute value of $TaxRateDifferential_{i,t}$ and interact it with an indicator variable equal to one for entities with inward-shifting incentives, and zero for those with outward-shifting incentives ($InwardShifter_{i,t}$). While the coefficients on the interaction terms remain statistically insignificant across all specifications, the coefficient on $AbsoluteTaxRateDifferential_{i,t}$, which measures income shifting for entities with outward-shifting incentives, is negative and statistically significant in column (4). The estimate also closely matches the baseline estimate in column (2) of Table A4, Panel A.

These results indicate that adjusting financial statement profits for tax-exempt foreign dividend income yields a profit measure that closely approximates taxable income reported on tax returns, reducing the downward bias in income-shifting estimates based on financial statement data. One potential concern is that this finding is specific to Austria's institutional environment. However, as discussed in Sections 3.2 and 3.A.3 and summarized in Table A2 in the Appendix, Austria's corporate tax and financial accounting systems are broadly comparable to those in many other EU and non-EU countries, suggesting that our findings are likely to generalize to other settings.

A limitation of the analysis in Table 3.5 is that the proposed adjustments to entities' financial statement profits require access to administrative tax-return data, which is not widely available to researchers. In Table 3.6, we therefore replicate the previous analysis using information from entities' public financial statements. Specifically, we use dividend income as reported on entities' profit and loss statements to approximate tax-exempt foreign dividend income reported on tax returns and adjust financial statement profits accordingly.[22]

Table 3.6, column (1) presents the results for the full sample, while column (2) distinguishes between entities with inward- and outward-shifting incentives. In column (1), we find that adjusting financial statement profits for dividend income in the full sample yields a tax semi-elasticity that is close to the baseline estimate in column (2) of Table 3.3, Panel A. Similarly, when separating entities with inward- and outward-shifting incentives in column (2), the results closely match those obtained when adjusting financial statement profits for tax-exempt foreign dividend income reported on tax returns in column (4) of Table 3.5, Panel B .

Taken together, Table 3.6 demonstrates that adjusting financial statement profits for dividend income reported in profit and loss statements mitigates the downward bias

[22]We obtain data from the Sabina database, which provides more detailed financial statement information than standard Orbis. Coverage is limited to larger firms that report detailed revenue sources, such as dividend income.

in income-shifting estimates to nearly the same extent as using detailed information on tax-return items. This finding suggests that researchers without access to administrative tax-return data can use publicly available financial statement data to approximate taxable income and to correct for the bias identified in the previous section.

Table 3.6: Adjusting Financial Statement Profits for Dividend Income Reported in Financial Statements

	ln(Pre-Tax Profit - Dividend Income)	
	(1) Full Sample	(2) Inward vs. Outward Shifters
Tax Rate Differential	-0.0087*	
	(0.0052)	
Absolute Tax Rate Differential		-0.0282**
		(0.0112)
Inward Shifter x Differential		0.0215*
		(0.0125)
Inward Shifter		0.1348
		(0.1182)
Controls	Yes	Yes
Entity FE	Yes	Yes
Year FE	Yes	Yes
Obs.	6,566	6,566
R^2	0.81	0.81

Note: This table presents the results of the income shifting analysis after adjusting financial statement profits for dividend income reported on the profit and loss statement. We use entity-level data from the AMDC and Orbis for the years 2012-2019. We first adjust financial statement profits ($Pre\text{-}TaxProfit_{i,t}$) for dividend income reported in financial statements and then measure the tax semi-elasticity of the resulting profit measure. The dependent variable is the natural logarithm of this adjusted profit measure. $TaxRateDifferential_{i,t}$ is a measure for income-shifting incentives, defined as the Austrian statutory corporate income tax rate minus the lowest foreign statutory corporate income tax rate within the MNE group. In column (1), we use the full sample. In column (2), we differentiate between entities with inward- versus outward-shifting incentives. Control variables include fixed assets and the costs of employees, both transformed by the natural logarithm. All outcome variables are winsorized at the 1% level. We cluster standard errors by entity. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

3.7 Impact on Inferences about Shifting Strategies

Our final analysis examines whether tax-exempt dividend income also affects inferences about the relative importance of specific income-shifting strategies. Prior re-

search shows that earnings before interest and taxes (EBIT) contribute more strongly to income-shifting estimates than pre-tax financial statement profits (Heckemeyer and Overesch, 2017). Because intra-group interest payments reduce entities' pre-tax profits but not their EBIT, this pattern is often interpreted as evidence that debt financing plays a relatively limited role in MNEs' income shifting. However, tax-exempt dividend income has the same mechanical effect on the two profit measures and could therefore provide an alternative explanation for why income-shifting estimates are smaller based on pre-tax profits rather than EBIT. The results in Table 3.6 provide initial support for this argument.

To examine this mechanism more directly, we replicate the analysis in Table 3.6 but adjust financial statement profits for interest expenses rather than dividend income.[23] This adjustment removes the effect of debt financing from pre-tax profit while retaining the impact of dividend income. Table 3.7 reports the results. We again examine the full sample in column (1) and distinguish between entities with inward- and outward-shifting incentives in column (2). In both columns, the resulting tax semi-elasticities are economically small and statistically insignificant. Taken together with the results in Table 3.6, this finding suggests that tax-exempt dividend income, rather than a limited role of debt financing, explain why EBIT-based specifications yield larger income-shifting estimates than those based on pre-tax profits. Failing to adjust financial statement profits for tax-exempt dividend income therefore does not only bias income-shifting estimates but also distorts inferences about the relative importance of different shifting strategies.

An alternative explanation for the results in Table 3.6 is that debt financing indeed plays a limited role in our setting. To examine this possibility, we re-estimate equation (3.1) using the natural logarithm of entity i's interest expenses in year t as the dependent variable. We report the results in Table 3.8. With industry fixed effects, we find a positive and significant coefficient on $TaxRateDifferential_{i,t}$ in column (1), suggesting that interest expenses of Austrian MNE entities respond to income-shifting incentives. This effect is statistically insignificant when we include entity fixed effects in column (2), suggesting that debt structures are stable within entities over time.

In columns (3) and (4), we use the natural logarithm of entity i's long-term debt in year t as the dependent variable, capturing the stock of debt financing. We again estimate a positive and significant coefficient on $TaxRateDifferential_{i,t}$ when including industry fixed effects in column (3); the coefficient turns insignificant when including

[23] Our financial statement data do not allow us to distinguish between external and internal debt. To the extent that interest expenses or long-term debt examined in this analysis reflect external financing, our tests may measure income shifting through internal debt with noise.

entity fixed effects in column (4). Collectively, these results provide some evidence that debt levels are associated with income-shifting incentives in the cross section, while remaining relatively sticky over time within entities. This pattern is consistent with the presence of fixed costs in profit-shifting strategies, as discussed by Bilicka (2019).

Finally, in columns (5) and (6), we examine whether income-shifting incentives are associated with the pricing of debt. Rather than adjusting debt levels, MNEs could respond to shifting incentives by manipulating interest rates charged on intra-group loans. To test this channel, we compute the average interest rate on long-term debt (defined as interest expenses divided by long-term debt) and use it as the dependent variable. The coefficients on $TaxRateDifferential_{i,t}$ are statistically insignificant across both specifications, indicating no evidence of strategic transfer pricing in interest rates.

Taken together, the results in Table 3.6 provide some evidence that MNE entities in our sample use debt financing to shift income; yet, they appear to do so primarily by adjusting debt levels rather than interest rates.

Table 3.7: Adjusting Financial Statement Profits for Interest Expenses Reported in Financial Statements

	ln(Pre-Tax Profit + Interest Expenses)	
	(1) Full Sample	(2) Inward vs. Outward Shifters
Tax Rate Differential	-0.0032	
	(0.0045)	
Absolute Tax Rate Differential		-0.0095
		(0.0109)
Inward Shifter x Differential		0.0031
		(0.0142)
Inward Shifter		0.0484
		(0.1129)
Controls	Yes	Yes
Entity FE	Yes	Yes
Year FE	Yes	Yes
Obs.	6,566	6,566
R^2	0.85	0.85

Note: This table presents the results of the income shifting analysis after adjusting financial statement profits for interest expenses reported on the profit and loss statement. We use entity-level data from the AMDC and Orbis for the years 2012-2019. We first adjust financial statement profits ($Pre\text{-}TaxProfit_{i,t}$) for interest expenses reported in financial statements and then measure the tax semi-elasticity of the resulting profit measure. The dependent variable is the natural logarithm of this adjusted profit measure. $TaxRateDifferential_{i,t}$ is a measure for income-shifting incentives, defined as the Austrian statutory corporate income tax rate minus the lowest foreign statutory corporate income tax rate within the MNE group. In column (1), we use the full sample. In column (2), we differentiate between entities with inward- versus outward-shifting incentives. Control variables include fixed assets and the costs of employees, both transformed by the natural logarithm. All outcome variables are winsorized at the 1% level. We cluster standard errors by entity. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

Table 3.8: Income Shifting through Debt Financing

	ln(Interest)		ln(Debt)		Interest Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Tax Rate Differential	0.0315***	-0.0071	0.0090**	-0.0082	0.7356	-0.1868
	(0.0083)	(0.0089)	(0.0045)	(0.0074)	(0.7885)	(0.1611)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	No	Yes	No
Entity FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	7,531	7,082	7,318	6,890	6,244	5,806
R^2	0.19	0.78	0.30	0.74	0.02	0.38

Note: This table presents the results of an analysis of income shifting via debt financing. We use entity-level data from the AMDC and Orbis for the years 2012-2019. The dependent variable in columns (1) and (2) is the natural logarithm of interest expenses, in columns (3) and (4) the natural logarithm of long-term debt, and in columns (5) and (6) the average interest rate on long-term debt. $TaxRateDifferential_{i,t}$ is a measure for income-shifting incentives, defined as the Austrian statutory corporate income tax rate minus the lowest foreign statutory corporate income tax rate within the MNE group. Control variables include fixed assets and the costs of employees, both transformed by the natural logarithm. All outcome variables are winsorized at the 1% level. We cluster standard errors by entity. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

3.8 Conclusion

Using a novel dataset that combines administrative corporate tax-return data with public financial statement information, we document that income-shifting estimates based on financial statement profits are 50% smaller in magnitude than those based on taxable income. Examining the drivers of this divergence, we find that tax-exempt foreign dividend income—which increases financial statement profits but does not affect taxable income—systematically inflates financial statement profits and attenuates income shifting estimates towards zero. These dividends also distort inferences about the relative importance of specific shifting strategies, in particular intra-firm debt.

We also provide guidance for researchers who lack access to confidential tax-return data on how to mitigate these biases. Specifically, we show that adjusting financial statement profits for dividend income, either as reported on tax returns or as disclosed in profit and loss statements, yields income shifting estimates that closely align with those based on taxable income. Accordingly, researchers can use line-item information from unconsolidated financial statements to reduce the biases we identify.

We acknowledge that our analysis is based on the Austrian institutional context. If income-shifting patterns vary across countries, our findings might not fully generalize. Nevertheless, Austria's tax and financial accounting systems are comparable to those of several other EU and non-EU countries. Accordingly, the effects of tax-exempt dividend income on micro-level income-shifting estimates documented in our study are likely to be relevant in settings with similar institutional features and for research that relies on unconsolidated financial statement data.

This paper contributes to research on the implications of using financial accounting data to measure income shifting (Blouin and Robinson, 2023). We show that tax-exempt dividend income reported in unconsolidated financial statements can attenuate income-shifting estimates on the entity level. These insights inform both policymakers who rely on such estimates and researchers who use financial statement data to study income shifting.

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3.A Appendix

3.A.1 Variable Descriptions

Table A1: Variable Descriptions

Variable	Description	Source
Tax Rate Differential	Maximum tax rate differential in percentage points defined as Austrian statutory corporate income tax rate (25% throughout our sample period) minus the lowest foreign statutory corporate income tax rate within the MNE group.	Tax Foundation /AMDC
Inward Shifter	Indicator variable equal to 1 if the tax rate differential is negative, and 0 otherwise.	Own calculations
Outward Shifter	Indicator variable equal to 1 if the tax rate differential is positive, and 0 otherwise.	Own calculations
Taxable Income	Taxable income as reported on the corporate tax return (data item: kz2605, "Einkünfte aus Gewerbebetrieb").	AMDC
Pre-Tax Profit	Profit or loss before tax as reported in the profit and loss statement (data item: p_l_before_tax).	Orbis
Disparity	Profit or loss before tax as reported in the profit and loss statement (data item: p_l_before_tax) minus taxable income as reported on the corporate tax return (data item: kz2605).	AMDC /Orbis
Total Assets	Total assets as reported on the balance sheet (data item: total_assets)	Orbis
Fixed Assets	Fixed assets as reported on the balance sheet (data item: fixed_assets)	Orbis
Costs of Employees	Costs of employees as reported in the profit and loss statement (data item: costs_of_employees).	Orbis

Variable	Description	Source
Write-Downs	Non-deductible capital write-downs as reported on the tax return (data item: kz9294, "6/7 der gemäß Par. 12 Abs. 3 Z 2 zu verteilenden Abschreibungen und Verluste hinsichtlich von Beteiligungen im Sinne des Par. 10").	AMDC
Deduction Limitation	Non-deductible interest and royalty expenses as reported on the tax return (data item: kz9318, "Hinzuzurechnende Zinsen und Lizenzgebühren gemäß § 12 Abs. 1 Z 10").	AMDC
Domestic Dividends	Tax-exempt domestic dividend income as reported on the tax return (data item: kz9298, "Beteiligungserträge gemäß Par. 10 Abs. 1 Z 1 bis 4").	AMDC
Foreign Dividends	Tax-exempt foreign dividend income as reported on the tax return (data item: kz9314, "Beteiligungserträge gemäß Par. 10 Abs. 1 Z 7 (internationale Schachtelbeteiligung)").	AMDC
Interest	Interest expense as reported in the profit and loss statement (data item: interest_paid).	Orbis
Debt	Long-term debt as reported on the balance sheet (data item: long_term_debt).	Orbis
Average Interest Rate	Interest expense (data item: interest_paid) divided by long-term debt (data item: long_term_debt) as reported in the profit and loss statement and the balance sheet.	Orbis

Note: Variable definitions. All variables identified at the entity-year level over the period 2012-2019.

3.A.2 Background on the Financial Accounting and Tax Treatment of Dividend Income in Austria

Corporations in Austria must prepare and file annually unconsolidated financial statements in accordance with Austrian GAAP.[24] An Austrian entity that acquires shares in another (domestic or foreign) corporation must record those shares as a financial asset in its financial statements, initially recognized at acquisition cost. The acquiring entity (parent) recognizes income from this investment only when the acquired entity (subsidiary) distributes its after-tax profits as a dividend. This approach, known as the *cost method* of accounting for shareholdings in corporations, applies regardless of the parent's ownership stake, i.e., independent of whether the parent owns 10%, 40%, or 100%. Under the cost method, dividends received do not affect the carrying amount of the financial asset on the parent's balance sheet. This approach contrasts with the *equity method* U.S. firms must apply, under which the parent recognizes its share of the subsidiary's after-tax profits on an accrual basis (Blouin and Robinson, 2023).

For tax purposes, the Austrian corporate income tax code (KStG) provides a participation exemption for dividend income, i.e., Austria operates a territorial tax system. Under this regime, dividend income is excluded from the parent's taxable income, provided that the subsidiary's profits were already subject to corporate taxation (see § 10 KStG). As a result, dividend income increases the parent's pre-tax financial statement profits but does not affect its taxable income (see section 3.A.3 for details).

Case A below illustrates the financial accounting and tax treatment of dividend income in Austria. Austrian parent A owns 80% of Dutch subsidiary S. Assuming a 25% tax rate in the Netherlands, S reports pre-tax financial statement profits of EUR 2,000 (= earnings before interest and taxes (EBIT)), a tax expense of EUR 500, and after-tax financial statements profits of EUR 1,500 (= 2,000 - 500). S distributes its total after-tax financial statement profit, so that parent A receives dividend income of EUR 1,200 (= 80% of 1,500). This income increases A's EBIT by EUR 1,200, resulting in a pre-tax financial statement profit of EUR 5,700.

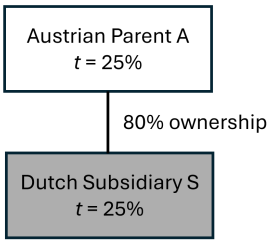
Parent A derives its taxable income from its pre-tax financial statement profits by applying several tax adjustments, a process known in Austria as "Mehr-Weniger

[24] According to § 246 UGB, parent entities with at least one subsidiary must additionally prepare and file consolidated financial statements if they exceed two out of the following three thresholds for two consecutive years: (i) total assets of the parent and its subsidiaries to be included exceed EUR 30 million, (ii) total net revenue exceeds EUR 60 million, (iii) the average annual number of employees exceeds 250. Alternatively, parent entities must file consolidated financial statements if they exceed two out of the three consolidated thresholds: (i) total assets exceed EUR 25 million, (ii) net revenue exceeds EUR 50 million, (iii) the average annual number of employees exceeds 250.

Rechnung". Given that dividend income is tax exempt in Austria, A subtracts EUR 1,200 from its pre-tax financial statement profit of EUR 5,700, yielding taxable income of EUR 4,500. Applying Austria's 25% tax rate on A's taxable implies a tax expense of EUR 1,125. After deducting the tax expense from the pre-tax financial statement profit of EUR 5,700, parent A reports an after-tax financial statement profit of EUR 4,575. Importantly, the dividend income does not affect the carrying amount of A's 80% investment in subsidiary S reported on A's balance sheet.

In Case B, we extend the previous example by additionally incorporating financial income and expenses, specifically interest expenses of EUR 600 and interest income of EUR 1,400, which both affect parent A's financial income and thus its pre-tax financial statement profit. Parent A again adjusts its pre-tax financial statement profits for tax-exempt dividend income when determining its tax base (in the right column; assuming interest expenses are deductible and interest income is taxable). Taxable income is again taxed at 25%, yielding tax expense of EUR 1,325 and an after-tax financial statement profit of EUR 5,175. If interest expenses were non-deductible, A would have to add the interest expenses back to the pre-tax financial statement profit when computing its taxable income.

Financial Accounting and Tax Treatment of Dividend Income



After-tax Profit of Subsidiary S:	
EBIT	2,000
- Tax Expense	-500
After-tax Financial Statement Profit	1,500

Case A: Financial Statement Profit and Taxable Income of Parent A (No Additional Financial Income and Expenses)

Profit and Loss Statement (Financial Statement Profit)		**Tax Return** (Taxable Income)	
EBIT	4,500	Pre-tax Financial Statement Profit	5,700
+ Dividend Income (Financial Income)	1,200	- Dividend Income	-1,200
Pre-tax Financial Statement Profit	**5,700**	**Taxable Income**	**4,500**
- Tax Expense	-1,125	Tax Expense (t = 25%)	1,125
After-tax Financial Statement Profit	**4,575**		

Case B: Financial Statement Profit and Taxable Income of Parent A (Additional Financial Income and Expenses)

Profit and Loss Statement (Financial Statement Profit)		**Tax Return** (Taxable Income)	
EBIT	4,500	Pre-tax Financial Statement Profit	6,500
+ Dividend Income	1,200	- Dividend Income	-1,200
+ Interest Income	1,400	**Taxable Income**	**5,300**
- Interest Expense	-600	Tax Expense (t = 25%)	1,325
Pre-tax Financial Statement Profit	**6,500**		
- Tax Expense	-1,325		
After-tax Financial Statement Profit	**5,175**		

3.A.3 Cross-country Comparison of the Financial Accounting and Tax Treatment of Dividend Income

Financial Accounting Treatment. The financial accounting treatment of shareholdings in subsidiaries in the preparation of unconsolidated financial statements, and, consequently, the recognition of dividend income, is largely uniform across EU member states and aligned with the Austrian framework described in Section 3.A.2. National financial accounting rules, harmonized through the EU Accounting Directive (Directive 2013/34/EU), which EU member states were required to implement by July 20, 2015, govern the structure and presentation of entities' balance sheet and the profit and loss statement. For shareholdings in subsidiaries, most member states require the use of the cost method. Under this method, financial investments are recognized at acquisition cost and subsequent dividend payments do not affect the carrying amount of the asset. Instead, consistent with the Accounting Directive (Art. 13, Annex V, item 9), dividend income is recognized as a separate line item in the profit and loss statement, increasing the pre-tax financial statement profit of the parent entity in the period in which the subsidiary distributes such dividends. Although the EU Accounting Directive allows EU member states to permit the equity method for shareholdings exceeding 20%, this option is restricted to *consolidated* financial statements. Accordingly, in *unconsolidated* financial statements, which are the focus of our study, shareholdings are systematically accounted for using the cost method, such that dividend income affects financial statement profits but not balance sheet valuations.

Tax Treatment. Under the EU Parent-Subsidiary Directive (Council Directive 2011/96/EU), member states are required to provide relief from the economic double taxation of dividend income. To qualify, a parent entity must hold at least 10% of the shares in an EU-resident subsidiary. Most EU member states, as well as several non-EU countries, satisfy this requirement by fully exempting dividend income from corporate taxation at the parent level, consistent with a "territorial" tax system. Accordingly, the tax treatment of dividend income in these countries closely mirrors the Austrian framework described in Section 3.A.2. Several EU member states apply partial exemption regimes. For example, Germany formally exempts 100% of dividend income from the tax base but treats 5% as a deemed non-deductible expense, yielding an effective exemption rate of 95% (§ 8b dKStG). France, Italy, Slovenia, and Spain also apply 95% exemption rules. Ireland is the only EU member state that fully taxes foreign-source dividend income. The country mitigates economic double taxation by crediting foreign taxes paid (Tax Foundation, 2021), an approach closer to a "worldwide" tax system.

Cross-Country Comparison. Table A2 summarizes the financial accounting and tax treatment of dividend income across most EU member states and the UK. The second column reports the extent to which dividend income is exempt from corporate taxation, while the third column identifies the relevant local GAAP provisions requiring the use of the *cost method* for shareholdings reported in *unconsolidated* financial statements. As discussed above, this requirement is consistent with the EU Accounting Directive, which mandates that dividend income be reported as a separate line item in the profit and loss statement.

Overall, the table highlights a high degree of harmonization within the EU with respect to (i) the recognition of dividend income, (ii) the application of the cost method in unconsolidated financial statements, and (iii) the tax exemption of dividend income. Consequently, the Austrian tax and financial accounting frameworks analyzed in this study are broadly representative of those in other EU member states, supporting the external validity and generalizability of our findings.

Table A2: Financial Accounting and Tax Treatment of Dividend Income in the EU and the UK

Country	**Tax Treatment** (% of Dividend Tax Exemption)	**Financial Accounting Treatment** (Local GAAP provision for the Cost Method)
Austria	100	§ 231 (2) Z10 UGB
Belgium	100	A.R. C.Soc. Article 3:163 Annex 6
Bulgaria	100	SC No. 1 - Predstavyane na finansovi otcheti (Presentation of Financial Statements), 18.1. Section B, Article 5
Croatia	100	Zakon o računovodstvu (Accounting Act), Poglavlje VI., Članak 18 (13); NN 107/2025, Pravilnik o strukturi i sadržaju godišnjih financijskih izvještaja, Prilog I
Cyprus	100	The Companies Law (Cap. 113), Article 157H, Fourteenth Annex
Czech Republic	100	Vyhláška č. 500/2002 Sb. (Decree No. 500/2002 Coll.), Annex No. 2, IV.1.
Denmark	100	Årsregnskabsloven § 23(1), cf. Annex 2
Estonia	100	Accounting Act § 18(3), Annex 2
Finland	100	Tilinpäätöslaki 1336/1997, Chapter 3, 1§
France	95	Code de commerce, Articles R123-193; ANC, Recueil des normes comptables françaises, art. 1222-76
Germany	95	§ 275 HGB
Greece	100	Law 4308/2014 (Greek Accounting Standards), Article 16; Appendix B, Models B.2.1. and B.2.2.
Hungary	100	Act C of 2000 on Accounting, Section 70; Schedule No. 2 and 3
Ireland	0	Companies Act 2014, Schedule 3, Part II, Section A, 2.(1); Section B

Italy	95	Art. 2425(c), no. 15 del Codice Civile
Latvia	100	Gada pārskatu un konsolidēto gada pārskatu likums (Law on Annual Statements and Consolidated Annual Statements), Chapter III, Section 9; Annex 2 and 3
Luxembourg	100	Loi comptable de 2002, Titre II, Chapitre II, Section 5, Art. 46
Netherlands	100	Burgerlijk Wetboek, Boek 2, Titel 9, Artikel 2:377 BW
Portugal	100	Decreto-Lei n.º 158/2009, norma contabilística e de relato financeiro 20, parágrafos 29 a 30; Código de Contas 79
Romania	100	OMFP 1802/2014 (Reglementările contabile privind situațiile financiare anuale individuale şi situațiile financiare anuale consolidate) 761
Slovakia	100	Act no. 431/2002 on Accounting, Article 18(4); Measure No. 23054/2002-92 Article 9
Slovenia	95	Slovenian Accounting Standard 15 & 21
Spain	95	Plan General de Contabilidad (Real Decreto 1514/2007, III, 13)
Sweden	100	Årsredovisningslag Chapter 3, Section 3, Appendices 2 and 3
UK	100	The Large and Medium-sized Companies and Groups (Accounts and Reports) Regulations 2008, SI 2008/410, Sch 1, Pt 1, Section B, Profit and loss account formats

Note: This table summarizes the financial accounting and tax treatment of dividend income across EU members states and the UK. Information on the tax treatment of dividend income is collected from Tax Foundation (2025), Deloitte (2025), and PwC (2025). Information on local GAAP provisions and the application of the cost method in unconsolidated financial statements is collected from the website of the International Federation of Accountants and local accounting regulation.

3.A.4 Additional Descriptive Statistics and Regression Results

Location of Affiliates with the Lowest Statutory Tax Rate. Table A3 reports the location of the affiliate with the lowest foreign tax rate within each MNE group. In accordance with AMDC confidentiality requirements, we aggregate observations by geographic region and by foreign tax rate categories. Thus, we report individual countries only when the number of observations is sufficiently large.

Table A3: Affiliate Location with Lowest Tax Rate within MNE groups

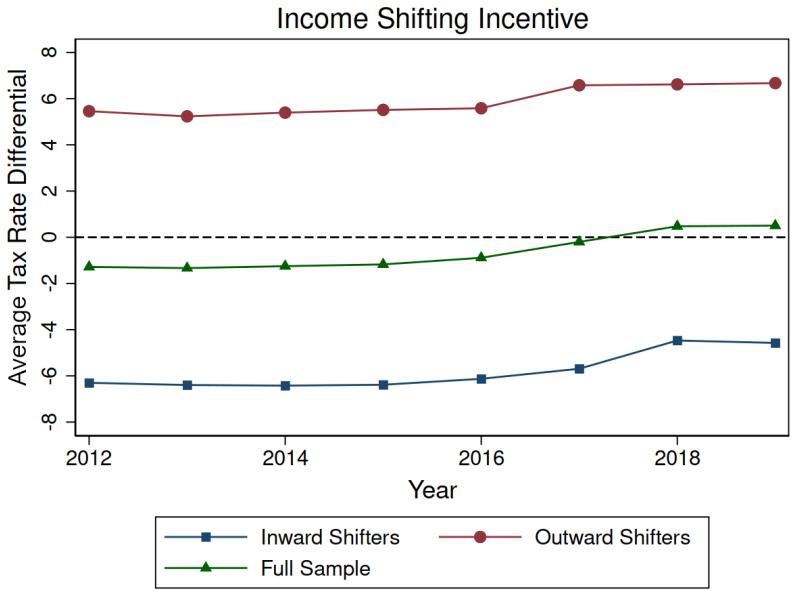
Lowest-Tax Country	Entity-Years	Average Tax Rate
British Overseas	64	0.0
Low-Tax European	85	10.0
Medium-Tax European	124	11.0-15.0
Eastern Europe	421	16.0-20.0
South-West Asia	153	16.5-21.0
United Kingdom	286	20.6
Switzerland	613	21.2
Nordics	307	22.0-23.0
Asia	88	24.0-25.0
Netherlands	376	25.0
Austria		**25.0**
Italy	321	29.2
Germany	2,099	30.1
Japan	172	33.0
United States	903	35.4
France	341	35.9
Rest of Europe	239	25.0-33.0
Rest of World	102	25.0-34.0
Total	6,717	

Note: This table presents the region (and if possible the country) in which the entity with the lowest tax rate in the MNE group is located. Regions are grouped by the average statutory corporate income tax rate of each country during our sample period. For data confidentiality reasons, we are not allowed to disclose individual countries where less than five MNE entities are active.

Tax Rate Differential Over Time. Figure A1 presents the evolution of the tax rate differential and the associated income-shifting incentives over time. The green triangle line depicts the average tax rate differential for the full sample, the red dotted line represents the average tax rate differential for entities with outward-shifting incentives,

and the blue square line for entities with inward-shifting incentives. For earlier sample years (i.e., until 2017), we observe a weak incentive to shift income into Austria (green triangle) which changes to a weak outward shifting income in the final two sample years (2018 and 2019). This shift is caused by reductions in foreign statutory corporate income tax rates rather than changes in Austria's tax rate, which remained stable at 25% throughout our sample period (see section 3.2.1).

Figure A1: Development of Tax Rate Differential Over Time

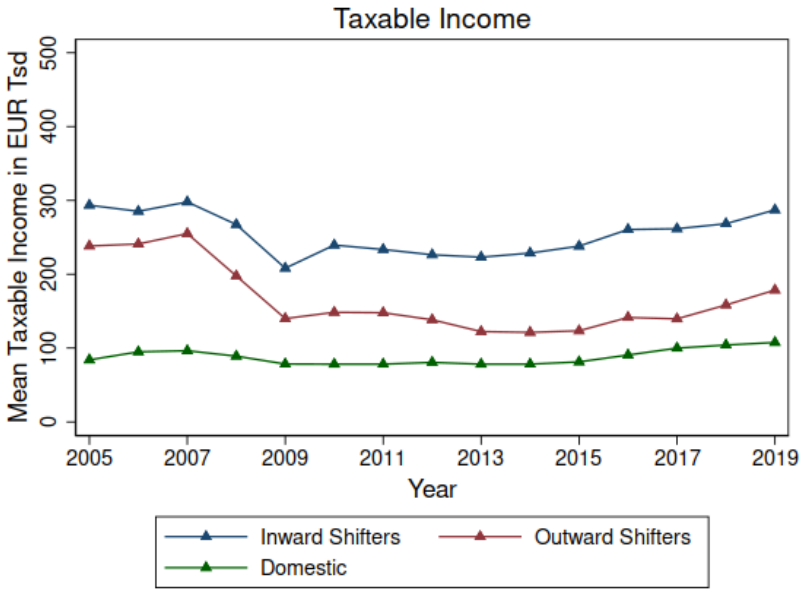


Note: This figure presents the development of the mean $TaxRateDifferential_{i,t}$ over our sample period. We use data from the AMDC for 2012–2019 and show the mean for the full sample and separately for the subsample of entities with inward-shifting incentives and those with outward-shifting incentives. $TaxRateDifferential_{i,t}$ is a measure for income-shifting incentives, defined as the Austrian statutory corporate income tax rate minus the lowest foreign statutory corporate income tax rate within the MNE group.

Taxable Income Over Time. Figure A2 vizualizes the development of mean taxable income over time. The blue line represents MNE entities with inward-shifting incentives, the red line represents those with outward-shifting incentives, and the green line depicts domestic-only entities, which are not included in our primary sample. Inward- (outward-)shifting incentives refer to cases where the Austrian statutory corporate income tax rate is lower (higher) than the lowest foreign statutory corporate income tax rate within the MNE group. As expected, entities with inward-shifting incentives report higher taxable income relative to those with outward-shifting incentives. Domestic-only entities consistently report lower than taxable income than both

groups of MNE entities. The global financial crisis primarily affected MNE entities, which experienced a pronounced decline in taxable income between 2007 and 2009, whereas domestic-only entities remained largely unaffected. Beginning in 2017, MNE entities show stronger growth in taxable income compared to domestic-only entities.

Figure A2: Development of Taxable Income Over Time



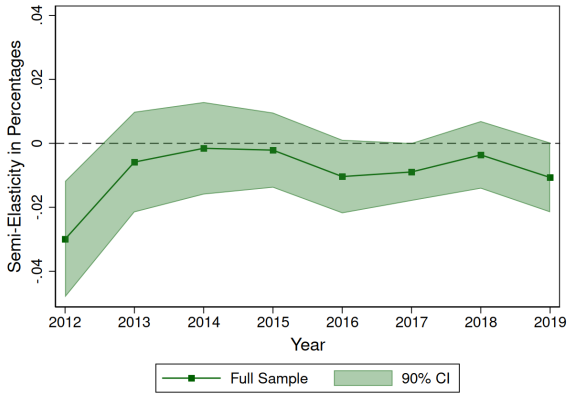
Note: This figure shows the development of the mean $TaxableIncome_{i,t}$ over our sample period. We use data from the AMDC for 2005–2019 and show the mean separately for MNE entities with inward-shifting incentives, MNE entities with outward-shifting incentives, and domestic-only entities.

Tax Semi-Elasticity Over Time. Figure A3 shows the evolution of the estimated tax semi-elasticity and its 90% confidence interval over time. We present these estimates for the full sample (Panel (a)), entities with inward-shifting incentives (Panel (b)), and entities with outward-shifting incentives (Panel (c)). Inward- (outward-)shifting incentives refer to cases where the Austrian statutory corporate income tax rate is lower (higher) than the lowest foreign statutory corporate income tax rate within the MNE group. To obtain these estimates, we re-estimate our primary specification with taxable income as the dependent variable (i.e., the specification reported in Table 3.3, Panel A, column (2)) but interact $TaxRateDifferential_{i,t}$ with separate year indicators.

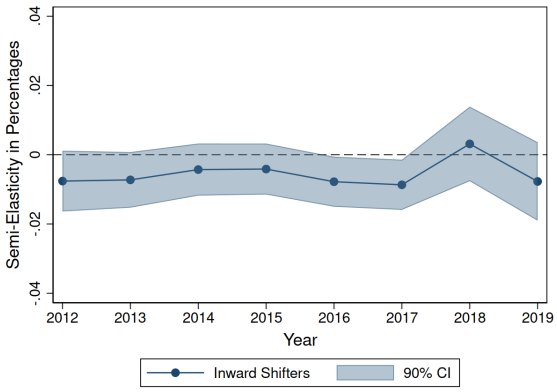
The estimates exhibit meaningful time-series variation, plausibly reflecting the effect of contemporaneous policy reforms. For instance, the semi-elasticity becomes less negative (i.e., entities in our sample shift less income) in 2014, coinciding with Austria's introduction of an interest and royalty deduction limitation. In contrast, the

semi-elasticity becomes more negative after the introduction of non-public Country-by-Country reporting in 2016 and the implementation of a CFC rule in 2019, both of which could facilitate additional outward shifting. These patterns are visible in the full sample and are particularly pronounced among entities with outward-shifting incentives.

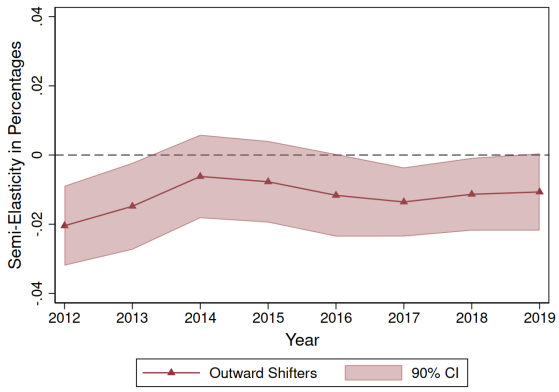
Figure A3: Development of Tax Semi-Elasticities Over Time



(a) Full Sample



(b) Inward Shifters



(c) Outward Shifters

Note: This figure shows the development of the tax semi-elasticities over our sample period. We use data from the AMDC for the years 2012–2019. To obtain these tax semi-elasticities, we re-estimate the specification in Table 3.3, Panel A, column (2) after interacting $TaxRateDifferential_{i,t}$ with separate year indicators. Panel (a) shows estimates for the full sample, Panel (b) shows estimates for entities with inward-shifting incentives (i.e., Austria's statutory corporate income tax rate is lower than the lowest foreign statutory corporate income tax rate within the MNE group), and Panel (c) for estimates with outward-shifting incentives (i.e., Austria's statutory corporate income tax rate is higher than the lowest foreign statutory corporate income tax rate within the MNE group).

Heterogeneity in Income Shifting. Table A4 examines heterogeneity in income-shifting estimates. Consistent with our primary analysis, we use use taxable income

reported on tax returns as the dependent variable in equation (3.1). We then split our sample based on entity characteristics that are likely associated with heterogeneity in income shifting.

Panel A, columns (1) and (2) compare entities with inward- versus outward-shifting incentives based on the sign of the tax rate differential. We again define MNE entities as facing inward-shifting (outward-shifting) incentives when Austria's statutory corporate income tax rate is lower (higher) than the *lowest* foreign statutory corporate income tax rate within the MNE group. Among inward shifters, the estimated semi-elasticity is statistically insignificant and close to zero. In contrast, for outward shifters, the semi-elasticity increases in magnitude to -1.9, more than twice our baseline estimate. A muted response among inward shifters is consistent with Austria being an average-tax jurisdiction during our sample period, making it a less attractive destination for shifted profits than traditional tax havens or low-tax countries. In fact, most inward-shifting incentives arise from relationships with German entities, which face a tax rate of roughly 30% and therefore a tax rate differential of about 5 percentage points. Given that income-shifting structures entail fixed costs (Davies et al., 2018; Goldbach et al., 2021), the differential might be too small to incentivize income shifting from Germany to Austria. Moreover, prior research indicates that MNEs are generally reluctant to shift profits away from the parent jurisdiction (e.g., Germany), especially when the receiving affiliate is located in a medium-tax country (e.g., Austria) (Dischinger et al., 2014). Finally, because the OFATS and IFATS data do not report "sister relationships" (see Section 3.4), we might not capture the precise inward-shifting incentives.

Columns (3) and (4) split entities based on whether the MNE group includes a tax haven affiliate, using the list from Hines (2010).[25] For Austrian MNE entities with a tax haven affiliate, the estimated semi-elasticity is -4, which is more than four times our baseline estimate of -0.9; the estimate for entities without tax-haven ties is statistically insignificant. Columns (5) and (6) further separate EU and non-EU tax havens and show that income shifting is particularly pronounced among MNE entities with EU tax-haven ties, underscoring the importance of tax havens in facilitating income shifting.

Panel B of Table A4 exploits variation in entity characteristics associated with specific income-shifting strategies. Columns (1) and (2) show that the taxable income

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

reported by manufacturing entities does not respond to income-shifting incentives, whereas non-manufacturing entities exhibit a tax semi-elasticity of -1.3. This pattern suggests that relatively immobile tangible assets in manufacturing limit opportunities to shift profits through strategies that require intangible assets, such as intra-group royalty payments. Consistent with this interpretation, low sales entities (column (4)) shift substantially more income than high-sales entities (column (3)), indicating that low-sales entities can employ a broader set of shifting strategies, including intra-group debt financing and royalty payments. High-sales entities, in contrast, have to primarily rely on transfer pricing for intra-group sales of goods and services.

Columns (5) and (6) directly examine the role of debt financing by comparing high- and low-debt entities, where high debt is defined as being in the top quartile of the long-term debt-to-total assets distribution. High-debt entities exhibit a semi-elasticity of -2, whereas the estimate for low-debt entities is -0.0041 and statistically insignificant. These results indicate that interest deductions on intra-group debt are likely an important shifting strategy in our sample.

Table A4: Heterogeneity in Income Shifting

Panel A: Inward vs. Outward Shifters; Tax Haven vs. Non-Tax Haven Ties

	ln(Taxable Income)					
	(1) Inward Shifter	(2) Outward Shifter	(3) Tax Haven	(4) Non-Tax Haven	(5) EU Tax Haven	(6) Non-EU Tax Haven
Tax Rate Differential	-0.0007	-0.0188*	-0.0400*	-0.0029	-0.0598**	-0.0087*
	(0.0052)	(0.0110)	(0.0230)	(0.0040)	(0.0275)	(0.0049)
$\gamma_i = \gamma_j$	$p = 0.14$		$p = 0.11$		$p = 0.07$*	
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Entity FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	4,145	2,011	955	5,724	1,216	5,461
R^2	0.78	0.76	0.78	0.77	0.77	0.77

Panel B: Manufacturing vs. Non-Manufacturing; High vs. Low Sales; High vs. Low Debt

	ln(Taxable Income)					
	(1) Manu-facturing	(2) Non-Manu-facturing	(3) High Sales	(4) Low Sales	(5) High Debt	(6) Low Debt
Tax Rate Differential	0.0042	-0.0127**	0.0013	-0.0102**	-0.0200**	-0.0041
	(0.0059)	(0.0055)	(0.0048)	(0.0049)	(0.0090)	(0.0039)
$\gamma_i = \gamma_j$	p=0.04**		p=0.09*		p=0.10*	
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Entity FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,558	5,147	1,355	4,109	1,520	4,943
R^2	0.75	0.77	0.73	0.76	0.80	0.78

Note: This table presents the results of analyzing heterogeneity in income-shifting estimates. We use entity-level data from the AMDC and Orbis for the years 2012-2019. The dependent variable is the natural logarithm of $TaxableIncome_{i,t}$, defined as taxable income reported on corporate tax returns. $TaxRateDifferential_{i,t}$ is a measure for income-shifting incentives, defined as the Austrian statutory corporate income tax rate minus the lowest foreign statutory corporate income tax rate within the MNE group. *Inward Shifter* (*Outward Shifter*) means the Austrian statutory corporate income tax rate is lower (higher) than the lowest foreign statutory corporate income tax rate, which induces incentives for inward (outward) shifting. *Tax Haven* (*Non-Tax Haven*) indicates Austrian MNE entities that have at least one (no) tax haven affiliate in their corporate group. We identify tax havens based on the Hines (2010) list. *EU Tax Haven* (*Non-EU Tax Haven*) limits the sample to entities with ties to EU (non-EU) tax havens. *Manufacturing* indicates entities in the manufacturing sector. *Non-Manufacturing* indicates all other industries. *High* (*Low*) *Sales* is defined as an entity in the top (bottom) quartile of the distribution of sales. *High* (*Low*) *Debt* is defined as an entity in the top (bottom) quartile of the distribution of total debt. We test for differences in coefficients across columns using a fully interacted model. Control variables include fixed assets and the costs of employees, both transformed by the natural logarithm. All outcome variables are winsorized at the 1% level. We cluster standard errors by entity. ***, **, and * indicate significance at the 1%, 5%, and 10% levels.

Chapter 4

Substance-ial Investment Shifting: The Role of Substance in Anti-Tax Avoidance Rules[1]

Ruby Doeleman

Abstract. Multinational enterprises (MNEs) weigh the tax benefits of profit shifting to low-tax affiliates against the investment required under substance rules. Substance rules stipulate that if an MNE has enough investment in a low-tax country, it can continue shifting its profits there. This paper models how MNEs structure their corporate groups under anti-tax avoidance rules with substance exemptions. The model predicts two effects: an extensive margin effect where substance rules reduce the number of low-tax affiliates, and an intensive margin effect where remaining low-tax affiliates receive greater investment. I confirm this pattern in a staggered difference-in-differences design using affiliate-level data from 2010–2023.

[1]I thank Harald Amberger, Kurt Brekke, Antonia Hohmann, Dominika Langenmayr, Kevin Markle, Johannes Scheurer, Dirk Schindler, participants at the 80th IIPF Conference and the 2024 RSIT Conference, and seminar participants at LMU, NHH, the Stanford Tax Lab, and WU Vienna for their valuable comments and suggestions. I acknowledge support by the Austrian Science Fund (FWF) (Doc 92-G).

4.1 Introduction

Multinational enterprises (MNEs) can reduce their tax burden by shifting profits from affiliates in high-tax countries to affiliates in tax havens (Merlo and Wamser, 2024). Most MNEs have multiple tax-haven affiliates: Among the hundred largest MNEs worldwide, the average corporate group structure includes 549 affiliates, of which 68 are located in offshore financial centers (United Nations Conference on Trade and Development, 2016). These tax-haven affiliates are geographically dispersed and tend to be located near the group's productive affiliates, rather than in a single global hub. Why an MNE operates *multiple* tax-haven affiliates, and why it places them close to where it produces, is not yet well understood.

This paper studies the organizational structure of MNEs in response to anti-tax avoidance rules. I argue that MNEs trade off the benefit of shifting profit to a nearby tax-haven affiliate against the cost of establishing and maintaining each one, and that the cost of shifting profits increases with distance. Shifting profit to a close-by tax-haven affiliate is cheaper than shifting to a far-away one, because proximity lowers the cost of familiarization with local legal institutions and establishing the effective place of management. This gravity-like structure is well documented in the profit-shifting literature (Desai et al., 2004, 2006; Laffitte, 2024; Ferrari et al., 2023; Tørsløv et al., 2023).

To identify how MNEs make locational choices under anti-tax avoidance rules, I analyze anti-tax avoidance rules that affect MNE group structures. To align taxation with real economic activities in low-tax affiliates, many anti-tax avoidance rules provide carve-outs in the form of substance requirements (OECD, 2015). If the MNE is successful in arguing it has sufficient substance in low-tax affiliates, the anti-tax avoidance rule is not applied, and the MNE can continue shifting profits.[2]

In this paper, I assess the tension between the goal of curbing profit shifting from high-tax countries to tax havens, versus the goal of fostering economic activity in high-tax countries. Substance rules could imply a shift from paper profit shifting toward shifting of real activity to satisfy substance requirements. Therefore, I analyze whether substance rules incentivize MNEs to increase employment and fixed assets in tax-haven affiliates, and whether this affects investment in high-tax affiliates.

To analyze the decision of an MNE to set up tax-haven affiliates under substance exemptions, I model an MNE's group structure using a Salop (1979) framework, based

[2]See, e.g., Art. 7(2)a of Council Directive (EU) 2016/1164 of 12 July 2016 laying down rules against tax avoidance practices that directly affect the functioning of the internal market.

on the literature on regional tax havens (Desai et al., 2004, 2006; Laffitte, 2024; Ferrari et al., 2023; Tørsløv et al., 2023) and previous analytical work that uses a Salop framework to model MNE behavior (Brekke et al., 2017; Gresik and Konrad, 2017). Making use of a close-by tax-haven affiliate is cheaper than a far-away tax-haven affiliate for two main reasons. First, tax advisors in the high-tax country might be more familiar with the legal institutions in a close-by low-tax country. Second, to operate a tax-haven affiliate, the effective place of management requires flying in directors to the tax-haven affiliate. This explains the notion of adjustment costs created by the *legal* distance between productive affiliates and tax-haven affiliates. The model optimally trades off the benefits of shifting profit to a close-by tax-haven affiliate against the costs of setting up a tax-haven affiliate.

The model is solved in three stages by backward induction. In the first step, each productive affiliate chooses the optimal amount of profit to shift to its nearest tax-haven affiliate. The affiliate effectively equates the marginal benefit of the tax rate differential with the marginal costs of profit shifting, which increase in the legal distance to the tax-haven affiliate. In the second step, the MNE chooses the optimal level of investment in each tax-haven affiliate, trading off the marginal benefit of reducing adjustment costs against the marginal cost of investment required by the substance rule. In the third step, the MNE determines the optimal number of tax-haven affiliates in the group structure, balancing the benefits of having nearby tax-haven affiliates for profit shifting against the costs of investing in each one.

Substance rules change the group structure of MNEs along two margins. The *extensive margin* is the number of tax-haven affiliates the group holds. The *intensive margin* is the amount of real investment—fixed assets and employment—in each tax-haven affiliate. A substance rule increases the fixed cost of each tax-haven affiliate. On the extensive margin, this incentivizes the MNE to hold *fewer* tax-haven affiliates. On the intensive margin, each remaining tax-haven affiliate now serves a larger share of the group's productive affiliates, so the MNE invests *more* in each one. In short, the group consolidates its shifting into fewer affiliates with larger substance.

To empirically assess the intensive and extensive margin effects of substance rules, I analyze whether MNEs increase real activity in the form of tangible fixed assets, number of employees, and costs of employees after becoming subject to a substance rule. I implement a staggered difference-in-differences design using data from Bureau van Dijk's Historical Orbis over the years 2010–2023 covering affiliates in 68 different countries. In addition to data on substance rules from the OECD (2024), I hand-collect data from national CFC legislation. I exploit variation in whether, when, and how

substance rules are implemented and essentially compare affiliates in the same country that differ in where their shareholders are located. The treatment group contains MNE affiliates that face a tax rate below the CFC tax rate threshold and become subject to a CFC rule that incorporates a substance rule. The control group consists of affiliates that face a CFC rule that does not contain a substance rule and affiliates that face a tax rate above the CFC threshold.

For the extensive margin, I find that the share of substance affiliates in the MNE group decreases significantly after the MNE becomes subject to a substance rule. On the intensive margin, I find that tangible fixed assets, the costs of employees, and the number of employees increase after an affiliate becomes subject to a substance rule. This pattern is in line with the model: the substance rule increases the fixed cost of investment for each tax-haven affiliate, so the MNE reduces the number of tax-haven affiliates and concentrates substance in the remaining tax-haven affiliates. These results are in line with the notion that MNEs exploit substance rules in order to forego application of anti-tax avoidance rules.

The interesting question is whether the increase in substance in tax-haven affiliates is due to an investment-shifting effect, where MNEs move real activity from high-tax affiliates to tax-haven affiliates. To analyze this, I estimate whether substance rules lead to a relocation of fixed assets and employment from high-tax affiliates to tax-haven affiliates. I do not find significant evidence for such investment shifting behavior, which is in contrast with Suárez Serrato (2019), Williams (2018), and Drake et al. (2022). The absence of investment shifting suggests that real activity in low-tax and high-tax affiliates is complementary rather than substituted: meeting substance requirements in tax-haven affiliates does not appear to come at the expense of investment in high-tax affiliates, consistent with the view that profit shifting can lower the cost of capital for the MNE as a whole.

The paper's primary contribution is to analyze how MNEs structure their corporate groups in response to anti-tax avoidance rules. This sets the paper apart from other real-effects literature. Whereas the existing literature estimates how MNEs' real investment responds to anti-avoidance rules, I model the organizational choice itself—how many tax-haven affiliates a group holds and where it locates them—and identify how substance carve-outs in CFC rules reshape that structure along an extensive and an intensive margin. This paper contributes to the literature on the real effects of anti-avoidance rules (De Simone and Olbert, 2022; Suárez Serrato, 2019; Williams, 2018; Drake et al., 2022; Buettner et al., 2018; De Mooij and Liu, 2020) and to the theoretical literature on CFC rules and tax competition (Weichenrieder, 1996; Haufler et al.,

2018; Pieretti and Pulina, 2020; Clifford, 2019). This paper also relates to the literature that poses that profit shifting to low-tax countries reduces the cost of capital in high-tax countries (Hong and Smart, 2010; Becker and Riedel, 2012). Previous literature shows that taxation affects location decisions (Voget, 2011; Beer et al., 2020), both when it comes to setting up affiliates and allocating investment within the MNE group. The real effects of substance rules depend on whether investment in high-tax and tax-haven affiliates is complementary: If substance rules lead to shifting of fixed assets and employment, this may reduce activities in high-tax countries (Suárez Serrato, 2019; Williams, 2018; Drake et al., 2022).

By analyzing whether substance rules distort real investment, I aim to provide policy implications for the use of substance rules to curb profit shifting. The alignment with substance is important in assessing transfer pricing: The OECD Transfer Pricing Guidelines stipulate that dealing at arm's length with affiliates requires a functional analysis of economically significant activities and responsibilities (OECD, 2022, p. 46). Substance therefore allows allocating profits to affiliates. The OECD's global minimum tax also contains a substance-based income exclusion, putting substance at the forefront of current tax policy.

In the following, I discuss the institutional background and stylized facts to motivate the model in Section 4.2. Subsequently, in Section 4.3, I review related literature. Section 4.4 contains the model and hypotheses, and Section 4.5 describes the data. Section 4.6 analyzes the extensive margin, Section 4.7 analyzes the intensive margin, and Section 4.8 analyzes spillover effects. Section 4.9 concludes.

4.2 Institutional Background & Stylized Facts

One of the most common types of legislation to counter profit shifting are Controlled Foreign Company (CFC) rules.[3] In Action 3 of its Base Erosion and Profit Shifting project, the OECD recommends CFC rules to combat tax avoidance (OECD, 2015). Since 2019, the EU requires its Member States to implement CFC rules in the Anti-Tax Avoidance Directive 2016/1164. Because some countries implement CFC rules with substance requirements, this is a useful setting to analyze the effects of substance rules on real activities of MNEs.

[3]CFC rules were not originally developed to combat tax avoidance, however. In 1962, the U.S. Kennedy administration introduced a CFC system in Subpart F to mitigate the post-war balance of payments deficit. The focus on passive income in the CFC rule was a compromise reached after Congress opposed including active income, see Kofler et al. (2020, Chapter 1).

In short, CFC rules are a cross-border corporate tax on foreign affiliates of domestic MNEs. Under a CFC rule, if a parent company controls a foreign affiliate, certain types of passive income of that subsidiary may be attributed to the parent entity and taxed accordingly. Thus, CFC rules essentially create an exception to the tax exemption principle in territorial tax systems. Take the Dutch CFC rule for example: It stipulates that if a Dutch taxpayer has more than 50% ownership in a foreign entity that faces a statutory tax rate below 9%, the Dutch taxpayer must include in its tax base the CFC's passive income, proportional to the ownership that the Dutch taxpayer holds in the CFC.[4]

CFC rules have several scoping characteristics, including the definition of controlling ownership, the tax rate threshold, and types of income to be attributed. First, controlling ownership means having decisive influence, often defined as a threshold of more than 50% of ownership (OECD, 2015, p.21). Second, the tax rate threshold determines the tax rate below which a CFC becomes subject to CFC rules (OECD, 2015, p.33). This threshold can be absolute or relative to the domestic tax rate, and can be based on statutory or effective tax rates. Instead of a tax rate threshold, some countries apply black lists and white lists that list countries that are in or out of scope of the CFC rule. Third, types of income targeted by CFC rules usually include passive income, such as dividend, interest, royalties, rents, capital gains and other income that is deemed passive (OECD, 2015, p.43).

Many countries have also implemented exemptions to the application of CFC rules. These exemptions can be categorized as being in one (or all) of three forms: active income exemptions (transactional), business reason exemptions (motive), and active business exemptions (functional).[5] First, active income exemptions usually apply a safe harbor ratio of passive income to total income.[6] Second, business reason exemptions require that a certain arrangement has not been put in place for the essential purpose of obtaining a tax advantage.[7] Third, there are active business exemptions, so-called substance rules.[8] These substance rules essentially require taxpayers to demonstrate that the CFC carries on substantive economic activity supported by staff, equipment, assets, and premises.

[4]The rule is more detailed. See Art. 13ab of the Dutch Corporate Income Tax Act 1969.

[5]I categorize these exemptions based on data from OECD (2024) and hand-collected data from national tax legislation. Examples can be found in EU Directive 2016/1164 (ATAD1).

[6]For a transactional exemption, see Art. 7(4)b ATAD1.

[7]For a motive exemption, see Art. 7(2)b ATAD1.

[8]For a functional exemption, see Art. 7(2)a ATAD1. See OECD (2015, p. 47) for an overview of the considerations on using substance analysis.

Because profit shifting provides tax benefits, MNEs are incentivized to circumvent the application of CFC rules by manipulating the three scoping thresholds above (Clifford, 2019). First, MNEs can manipulate the control requirement, but countries have implemented anti-abuse provisions that will test whether the MNE actually controls the CFC. Second, MNEs can make use of passive income thresholds.[9] Third, MNEs can manipulate tax rate thresholds, primarily if these are based on the effective tax rate.[10] Fourth, MNEs can exploit substance rules.

Substance rules are central to this paper. These rules provide an incentive to shift real investment, because they exempt an affiliate from CFC rules if the CFC has sufficient employees and assets, i.e., a substantial physical presence. I obtain data on all substance rules worldwide from OECD (2024) and I hand-collect data from national legislation on the details of the substance requirement. Table A1 in the Appendix gives an overview of countries' substance legislation. For illustrative purposes, Table 4.1 shows a sample of countries that have implemented substance rules.

Some countries apply substance rules in the form of *safe harbors*, implying that a CFC must have a minimum measurable amount of substance. For example, until 2020, the Netherlands applied a safe harbor. In short, this required a CFC to have at least EUR 100,000 in employee expenses and a permanent office. As Table 4.1 shows, Canada's substance rule also contains a partial safe harbor, requiring that the CFC transacts principally with arm's length persons and has more than five full-time employees. Another example is South Africa, which lists types of businesses that qualify as real economic activity.

Substance rules also come in the form of *subjective tests*. These tests require a case-by-case evaluation of all relevant facts and circumstances that provide evidence that the CFC mainly carries out an economic activity. This often involves testing whether a CFC has enough fixed assets and employees, see for example Austria and Germany in Table 4.1. The majority of countries apply such subjective tests. For example, Table 4.1 shows that Norway and Sweden require that the CFC is established for business reasons and that it engages in real economic activities. Similarly, Belgium (shown in Table 4.1), the U.K. and Ireland require that the CFC carries out significant people functions.

[9] Desai and Dharmapala (2009) and Gunny (2010) provide general evidence that MNEs manipulate income to shift profits.

[10] In addition to incentives for MNEs, low-tax countries have an incentive to facilitate MNEs in shifting their profits. Low-tax countries can increase their statutory corporate tax rate to increase the MNE's absolute and effective tax rate.

Table 4.1: Selected Examples of Substance Rules in National Legislation

Country	Introduction	Substance Rule	Burden of Proof	Legislation
Austria	2019	Significant economic activity in terms of personnel, equipment, assets and premises	Taxpayer	Art. 10a KStG 1988
Belgium	2019	Owner of assets and assume risks related to this asset – comparison whether Belgian taxpayer carries out key functions	Tax Authorities	Art. 185/2 WIB 1992
Canada	1976	More than five full-time employees in carrying out an active business	Taxpayer	Art. 95(1) ITA 1985
Germany	1972	Material resources and sufficiently qualified personnel to independently carry out real economic activity while assuming full risk, in EU CFC state only	Taxpayer	Art. 8(2) AStG 1972
Hungary	2017	Personnel, facilities, equipment and premises to carry out actual business activities; safe harbor if at least 50% of total revenue comes from production, manufacturing, agriculture, services, investment, or trading carried out with own assets and employees	Taxpayer	Art. 8(1)f Act LXXXI 1996
Italy	2001	Effective economic activity through the use of personnel, equipment, assets, and premises; economic integration in local market; safe harbor if more than 50% of costs and revenue are sourced in CFC country	Taxpayer	Art. 167 TUIR 1086
Norway	1994	In fact established in an EEA state or treaty state and carries out genuine economic activity there	Taxpayer	Art. 10-64 TA 1999
Poland	2015	Established in EU; Local, qualified, commensurate personnel and equipment within scope of activity; Economic reasons for arrangements; Independent performance of economic functions, including local management	Taxpayer	Art. 24a CITA 1992
Sweden	2008	Established in EU for business reasons and engaged in real economic activities, supported by staff and risk-taking	Taxpayer	Section 39a ITA 1999

Note: Data from Kofler et al. (2020) and national legislation.

Some countries apply a mix between a safe harbor and subjective tests. For example, Table 4.1 shows that Italy and Hungary apply a safe harbor combined with a subjective test, namely if at least 50% of total revenue comes from real activities carried out with own assets and employees in the CFC country.

The 2006 Cadbury-Schweppes ruling (C-196/04) by the Court of Justice of the European Union (CJEU) had an important influence on the use of substance rules within the EU (Whitehead, 2007). The ruling assessed whether the UK's CFC rules were in line with EU law. Cadbury-Schweppes had two Irish subsidiaries which were subject to CFC rules. Had the subsidiaries been established in the U.K., they would not have been subject to CFC rules. This could violate the right of establishment within the EU. However, only if the CFC is a 'wholly artificial arrangement aimed at circumventing national law', imposing a CFC rule would be allowed to prevent tax avoidance (par. 108 of C-194/04). The ruling therefore effectively introduced substance rules within the EEA, with the risk of violating the EU fundamental freedoms when failing to do so correctly.

Because of the Cadbury-Schweppes ruling, some EU countries only allow substance exemptions within the European Economic Area (EEA) and do not provide substance rules for non-EEA CFCs.[11] These countries include Germany, Greece, Norway, Poland, Sweden, and Romania. Alternatively, some countries apply a stricter substance rule outside of the EEA. Examples are France and Italy, which apply a stricter burden of proof for non-EEA CFCs. Another example is Finland, which requires that Finland and the CFC country have an Exchange of Information Agreement for applying the substance rule.

The investment effects of substance rules depend on their design. Countries define substance differently and apply different standards to assess whether the substance requirements are fulfilled. From the subjective tests described, it seems that substance is defined as being more than having an employee in an office picking up the phone. This suggests that substance rules could have consequences for the shifting of real investment, not just substance on paper or "phantom investment".

4.2.1 Stylized Facts on MNE Group Structures

To motivate the model, I provide three stylized facts about MNE group structures. These motivate the two building blocks of the model: that MNEs hold *several* tax-haven

[11] For empirical research on the effects of these rules on investment and taxable income, see Ruf and Weichenrieder (2013) and Schenkelberg (2020).

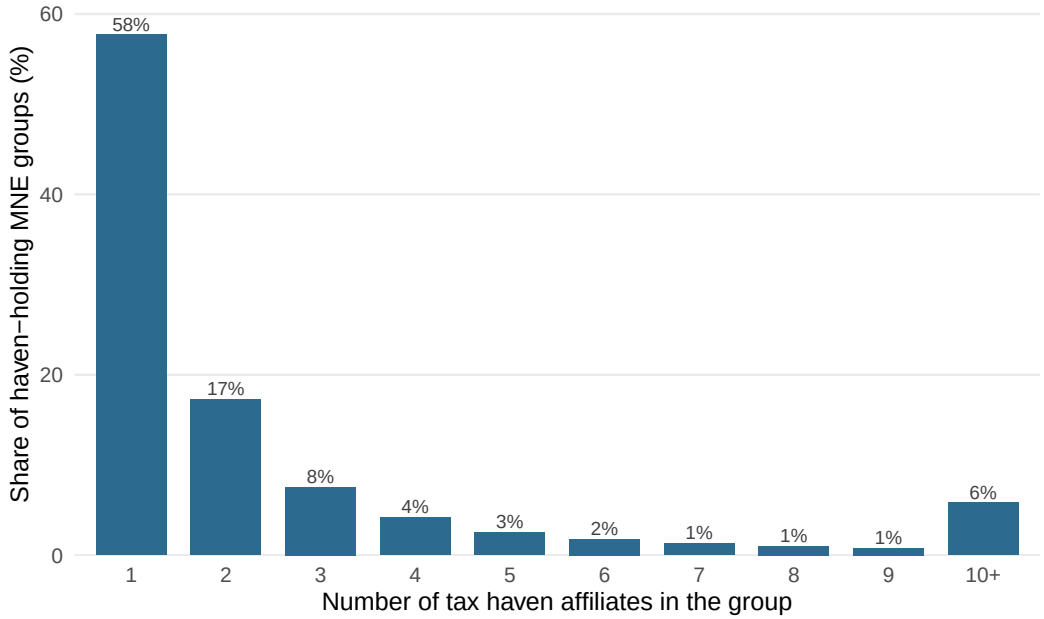
affiliates, and that they locate them *close* to the productive affiliates. Throughout, I look at ownership structures of MNE groups as recorded in Bureau van Dijk's Historical Orbis Data. The MNE group is the set of affiliates sharing a Corporate Global Ultimate Owner, and I restrict to groups with affiliates in at least two countries. Statistics are for 2019; I provide a complete description of the sample construction in Section 4.5. In this section, I classify an affiliate as a tax-haven affiliate if it is located in one of the jurisdictions listed in Dharmapala and Hines (2009); all remaining affiliates are productive affiliates.

Stylized Fact 1: MNEs hold multiple tax-haven affiliates. Many MNEs have several tax-haven affiliates. Of the 276,514 MNE groups in the sample, 48.1% hold at least one tax haven affiliate. The average MNE group with at least one tax-haven affiliate holds 3.7 haven affiliates. Figure 4.1 plots the distribution of the number of haven affiliates per group among haven-holding MNEs. 58% of MNEs has a single tax-haven affiliate, but 25% hold three or more. 6% hold ten or more. Holding multiple tax-haven affiliates is not exclusive to the largest MNEs: among groups with 5-9 affiliates the median group holds 2 haven affiliates, increasing to 5 among groups with 25-99 affiliates.[12] This is in line with Merlo and Wamser (2024), who find that even small MNEs hold tax-haven affiliates.

Stylized Fact 2: Tax-haven affiliates are geographically dispersed and located near productive affiliates. MNEs do not hold tax-haven affiliates in a single location. Instead, haven affiliates are spread across regions, each near a cluster of the group's productive affiliates. Figure 4.2 maps the haven and productive affiliates of a large, globally active multinational (Panel A) and, in aggregate, of all sample groups (Panel B), illustrating that haven affiliates are geographically close to production. The illustrative group in Panel A shows its European tax-haven affiliates (the Netherlands, Belgium, Ireland, and Switzerland) close to European operations and its Asian haven affiliates (Hong Kong and Singapore) close to its Asian operations. In aggregate (Panel B), haven affiliates equally concentrate in Europe and Hong Kong.

[12]The top 20% of MNEs holds 37 affiliates on average.

Figure 4.1: Distribution of the Number of Tax-Haven Affiliates in MNEs



Note: Data from Orbis, 2019. The figure plots how many tax-haven affiliates MNEs hold. Groups are defined by the Corporate Global Ultimate Owner. Tax havens defined as in Dharmapala and Hines (2009).

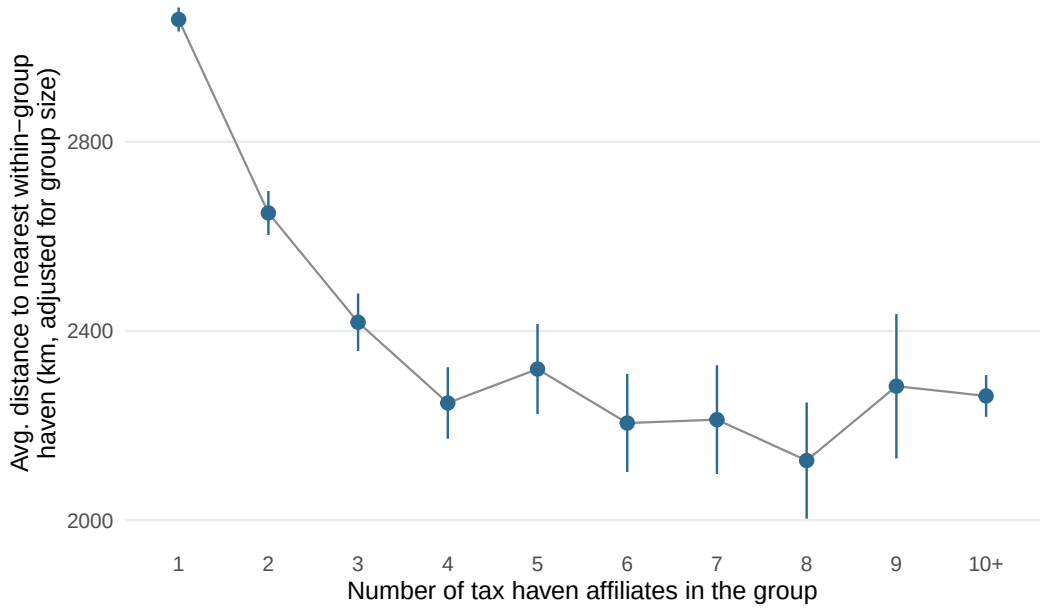
Stylized Fact 3: Productive affiliates are close to a tax-haven affiliate, and closer when the group holds more of them. On average, a productive affiliate's nearest haven affiliate is 2,584 km away, whereas it would be 7,464 km for a tax haven drawn at random from all haven locations. Moreover, this distance falls as the group holds more haven affiliates: Figure 4.3 shows a negative relationship between the number of tax-haven affiliates in a group and the average distance from its productive affiliates to the nearest one.

Together, these three facts—multiplicity, geographic dispersion, and proximity—motivate the model: MNEs hold several haven affiliates and locate them close to the production they serve.

Figure 4.2: Geographic Spread of MNE Affiliates

Note: Data from Orbis, 2019. Panel A shows the productive affiliates (blue circles) and tax-haven affiliates (red diamonds) of a single large multinational, with line segments linking each productive location to its nearest within-group haven. Panel B aggregates all sample MNE groups; marker size is proportional to the number of affiliates. Groups are defined by the Corporate Global Ultimate Owner; tax havens follow Dharmapala and Hines (2009). Affiliate locations are capital cities.

Figure 4.3: Distance to the Nearest Tax-Haven Affiliate



Note: Data from Orbis, 2019. Average distance with 95% confidence intervals from a group's productive affiliates to the nearest within-group haven affiliate after adjusting for total group size. Affiliate locations are capital cities. Groups are defined by the Corporate Global Ultimate Owner; tax havens follow Dharmapala and Hines (2009).

4.3 Literature

This paper investigates whether substance exemptions generate real effects. Therefore, this paper builds on the literature around the real effects of anti-tax abuse rules and the potentially beneficial role of profit shifting in investment (Alstadsæter et al., 2024). Hong and Smart (2010) show that tax avoidance may be beneficial because it reduces the tax burden on mobile capital and thereby increases investment. Suárez Serrato (2019) finds that shutting down tax havens might have negative consequences for real investment and employment in high-tax countries. Becker and Riedel (2012) find that there are within-MNE spillovers of taxation, where an increase in the parent company's corporate tax rate decreases investment in affiliates. CFC rules also place importance on the location of parent entities. Voget (2011) shows that an increase in repatriation taxes and the introduction of CFC rules increase the number of headquarter relocations. Buettner et al. (2018) and De Mooij and Liu (2020) find that the introduction of transfer pricing regulation decreases real investment. These papers do not find that total investment by MNEs decreases, which suggests that investment is instead shifted abroad. I add to this literature by specifically looking into the real effects of exemptions in anti-profit shifting rules that are meant to foster investment.

The literature around CFC rules has mostly focused on the use of CFC rules to curb profit shifting. Overesch et al. (2024) provide an extensive overview of the existing research on CFC rules. Weichenrieder (1996) formally analyzes the impact of anti-tax avoidance legislation on the size and growth of MNEs' low-tax affiliates. The model in his paper provides intuition for why MNEs want to increase substance, since substance allows to continue shifting profits. Pieretti and Pulina (2020) provide theoretical analysis of the incentives of anti-profit shifting rules on the relocation of economic activity to low-tax countries. They conclude that eradicating paper profit shifting only increases corporate tax revenue in high-tax countries if tax havens cannot efficiently provide infrastructure to attract real investment.

There is also empirical literature that considers CFC rules. Gschossmann and Pfrang (2024) analyze the effects of CFC rules on European MNEs' location, financial, and economic activity decisions. They focus on extensive and intensive margin effects. On the extensive margin, the share of CFCs decreases, but the financial income of the remaining affiliates remains unchanged. Their results show that the costs of employees are increased in CFCs, which suggests that substance rules are a driver of CFC activity. Egger and Wamser (2015) use MiDi data in a Regression Discontinuity Design over the period 1996-2008 to study the impact of CFC rules on real FDI. They find that CFC rules decrease real investment in fixed assets in low-tax affiliates. On the extensive investment margin, Egger and Wamser (2015) find that unconditionally, exit of treated affiliates is about seven percentage points more likely and entry is five percentage points less likely. However, this effect is not robust to controlling for the forcing variables, suggesting that the overall effect on investment in fixed assets is not distorted by extensive margin investment decisions. Clifford (2019) uses data from Bureau van Dijk's Orbis to analyze CFC rules from 2003-2013. Using a Regression Discontinuity Design, she shows that affiliates just below the tax rate threshold experience a 13% decrease in financial profits. She also shows that increases in group-level CFC exposure increases financial profit within higher-tax affiliates. This indicates a spillover effect of CFC rules for high-tax countries, implying that CFC rules can protect both the global and the domestic tax base. This spillover effect is confirmed by Hansen et al. (2023). On the extensive investment margin, Clifford (2019) finds that CFC rules increase (decrease) the propensity to open a new affiliate just above (below) the tax rate threshold.

4.4 Model and Hypotheses

4.4.1 Model Set-Up

To formulate the hypotheses, I model the decision of an MNE to set up tax-haven affiliates for profit shifting.[13] I focus on an MNE that has both productive affiliates which are used to generate real profits, and tax-haven affiliates that are used for profit shifting. Figure 4.4 depicts this type of ownership structure.[14]

In line with what we observe empirically, MNEs can have several tax-haven affiliates. Merlo and Wamser (2024) show that even small MNEs are likely to have several tax-haven affiliates, providing several shifting opportunities for different productive affiliates. For large MNEs, the UNCTAD concludes in its World Investment Report 2016 that based on Orbis data, the largest hundred MNEs worldwide have on average 549 affiliates, of which on average 68 are located in Offshore Financial Center, see United Nations Conference on Trade and Development (2016).

In the model, MNEs choose their tax-haven affiliates to be close to productive affiliates. An important reason to locate tax-haven affiliates nearby is that this allows the MNE to benefit from the familiarity of legal institutions in the tax haven. Dharmapala and Hines (2009) show that governance quality has a statistically significant and quantitatively large association with the probability of being a tax haven. Dharmapala (2020) discusses that nontax factors are relevant for location decisions. Examples of these nontax factors are the availability of local legal and business expertise relevant to managing the holding structure. This could reflect the specialization of legal and accounting firms with respect to nearby tax havens (Dharmapala, 2020).

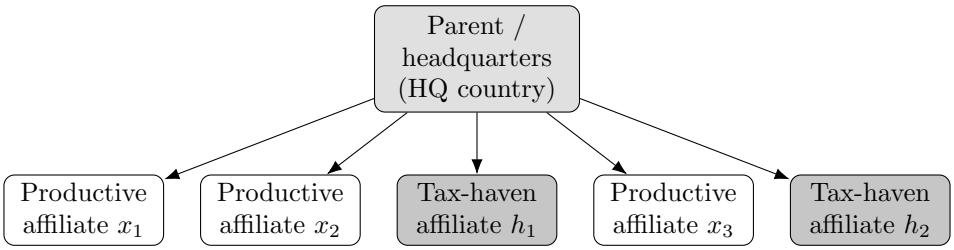
Another reason for a distance effect is the need to locate the effective place of management in the low-tax country.[15] The place of effective management requirement forces management decisions to actually be made in the tax-haven affiliate's jurisdiction in order to be treated as tax resident. The requirement of physical presence entails travel costs that increase in distance.

[13] I talk about tax-haven affiliates, but the model applies to all affiliates used for profit shifting. Some countries apply relatively high tax rate thresholds, targeting not only tax-haven affiliates but also medium- to high-tax affiliates.

[14] For the empirics, which anti-avoidance rule constrains the affiliate is determined at the shareholder level: any (intermediate) parent country can apply a CFC rule that targets the affiliate. It is therefore the (intermediate) parent's country, not the country of a productive affiliate, that governs whether the group falls under a CFC rule. Under the EU Anti-Tax Avoidance Directive, for example, the CFC rule applies in the Member State of the controlling parent (Art. 7–8 of Directive 2016/1164).

[15] This concept is primarily a legal concept and has not been studied directly in the empirical literature.

Figure 4.4: Ownership Structure of the Multinational Group



Note: The MNE consists of a parent (headquarters) in the HQ country that owns productive affiliates (x) and tax-haven affiliates (h) located in different countries. Ownership links run from the parent to each subsidiary. The headquarters' country determines which anti-avoidance and substance rule applies to the group. Figure 4.5 rearranges the same affiliates on a Salop circle to represent the geographic and legal distance between them.

Empirically, this distance relationship also exists: Desai et al. (2004) and Desai et al. (2006) show that tax-haven affiliates may enhance investment in especially nearby non-haven affiliates. Laffitte (2024), Ferrari et al. (2023), and Tørsløv et al. (2023) also provide evidence of a gravity-like profit shifting relationship for the distance between between productive affiliates and tax-haven affiliates. In particular, Dharmapala (2020) discusses that Caribbean havens seem particularly important for US MNEs, while European havens are important for European MNEs. Therefore, MNEs seem to face affiliate-level profit-shifting costs that increase in the distance to the tax-haven affiliate.

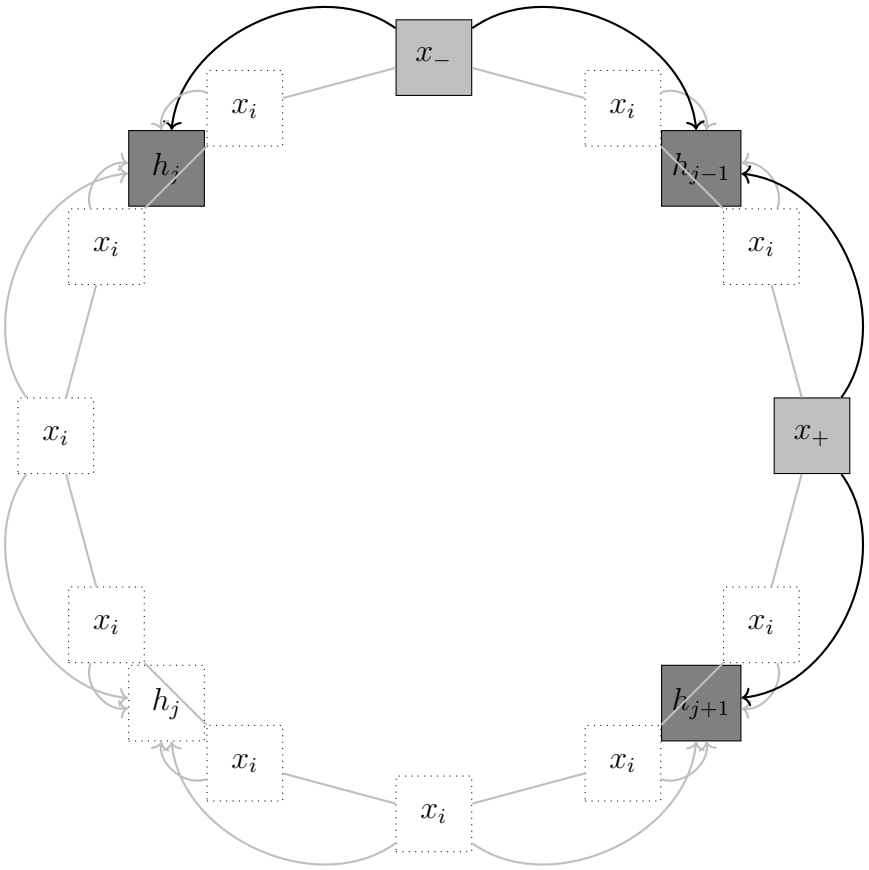
To analyze the notion that regional tax-haven affiliates serve close-by high-tax affiliates and that MNEs optimize the number of tax-haven affiliates in their group structure, I focus on a simple Salop (1979) framework, inspired by the model in Brekke et al. (2017).[16] The Salop circle in Figure 4.5 represents the MNE's structure. The productive affiliates are assumed to be uniformly distributed on a Salop circle of circumference 1, represented by the x in Figure 4.5. There are $h \in 1, ..., j$ identical tax-haven affiliates with tax rates t_j. I assume they are identical, because tax-haven affiliates serve as profit-shifting destinations and generally have disproportionately low real economic activity in comparison with profit levels (Fuest et al., 2022).[17]

The tax-haven affiliates are located equidistant from each other at $z_j \in [0, 1]$ on

[16]For another application of a Salop framework in studying MNE behavior, see Gresik and Konrad (2017).

[17]I treat tax-haven affiliates as pure shifting vehicles. Allowing them to also have real production would enrich the distinction between productive and non-productive havens, but it would not overturn the extensive- and intensive-margin mechanisms, which operate through the fixed cost and distance of each tax-haven affiliate rather than through its own productive output.

Figure 4.5: Multinational Group Structure



Note: The Salop circle represents the geographic and legal distance between the affiliates of the MNE shown in Figure 4.4; the parent is not pictured. Productive affiliates (x) are uniformly distributed on the circle and tax-haven affiliates (h) sit between them. Arrows show the direction of profit shifting: each productive affiliate shifts to its nearest tax-haven affiliate. x_- and x_+ represent affiliates that are just indifferent between shifting to two close-by tax-haven affiliates.

the Salop circle in Figure 4.5. Each productive affiliate shifts profit to the closest tax-haven affiliate. The two shaded productive affiliates labeled x_- and x_+ in Figure 4.5 are the marginal productive affiliates that are indifferent between two closest-by tax-haven affiliates.

The productive affiliate generates real profit m_i in its host country i. If the MNE does not establish a tax-haven affiliate, the productive affiliate pays $t_i m_i$ in corporate taxes in its host country. However, to decrease its tax burden, the productive affiliate can shift part of its profit $P_{i,j}$ to the nearest-by tax-haven affiliate j located at z_j. Shifting profits is costly, however. In particular, there are two types of variable costs, borne by a productive affiliate when it shifts; the third type of cost is a fixed cost, borne by the MNE as a whole for each tax-haven affiliate it operates.

Each productive affiliate faces two types of *variable costs of shifting*. First, in line with the literature on regional tax havens, the cost of profit shifting increases in the distance to the tax-haven affiliate. Thus, the MNE faces costs that are similar to transport costs in a traditional Salop framework. I refer to these costs as adjustment costs, defined as $\alpha(k_j)d_{i,j} = \alpha(k_j)\,|z_j - x_i|$. The adjustment costs increase in the productive affiliate's distance to the tax-haven affiliate $|z_j - x_i|$ with $x_i \in [0, 1]$. This distance cost is the central variable cost of the model: it makes a *nearby* tax-haven affiliate more valuable than a distant one, which is what gives the MNE an incentive to operate several, regionally placed tax-haven affiliates.[18] The adjustment cost parameter $\alpha(k_j) = \frac{\bar{\alpha}}{k_j}$ captures the proximity of legal institutions and ease of obtaining tax advice, but also anti-avoidance rules. Note that adjustment costs decrease in investment k_j in the tax-haven affiliate, because greater substance in tax-haven affiliates facilitates transfer pricing documentation and reduces the risk of disputes by the tax authorities.

Second, profit shifting involves convex tax-planning costs $\frac{P_{i,j}^2}{2}$, which increase in the amount of profit shifted $P_{i,j}$.[19] These are standard convex tax planning costs for hiring tax advisors to set up transfer pricing documentation and dealing with the productive affiliate's tax authorities in case of disputes.

The tax-haven affiliate faces a proportional corporate income tax t_j. This tax rate determines whether affiliates established in the low-tax country will be subject to CFC rules—and substance requirements. Having the tax-haven affiliate allows the productive

[18] Because adjustment costs increase in distance, the average adjustment cost a group faces decreases as it operates more tax-haven affiliates, since additional affiliates shorten the distance to the nearest one. Modeling the shifting cost as directly decreasing in the number of tax-haven affiliates would be an alternative that delivers the same extensive-margin comparative statics.

[19] The quadratic form is a convenient convex specification that guarantees an interior shifting optimum; the qualitative results hold for any strictly convex tax-planning cost.

affiliate to shift profits and avoid paying taxes in its host country. Therefore, if the productive affiliate decides to shift part of its profits $P_{i,j}$ to a tax-haven affiliate, it gains net benefits $(t_i - t_j)P_{i,j}$.

The *fixed cost of a tax-haven affiliate* is the investment the MNE must make for it to have enough substance. The MNE invests in fixed assets and local employees at cost $f(k_j, \phi) = \frac{\phi k_j^2}{2}$, with investment $k_j \geq 0$ and diminishing marginal returns. This is a fixed cost in the sense that the MNE incurs it once per tax-haven affiliate, independently of how much any individual productive affiliate shifts to it. The increases ϕ indicates the substance rule: a stricter rule raises the investment the affiliate needs to satisfy the substance requirements, so $\frac{\partial f(k_j,\phi)}{\partial \phi} > 0$.[20] Investment k_j therefore enters both cost categories with opposite signs: On the one hand, increasing investment decreases the variable adjustment cost of shifting because it facilitates proving to tax authorities that there are real economic activities in the tax haven. On the other hand, higher investment increases the fixed cost of the affiliate, which is intensified by the substance requirement. This trade-off between a lower variable adjustment cost and a higher fixed substance cost is the core tension of the model.

Given these three types of costs, the MNE decides whether to make use of tax-haven affiliates for profit shifting and how many tax-haven affiliates it wants to establish. This problem can be solved in three stages. First, the MNE decides on the number of tax-haven affiliates h. Second, the MNE chooses the level of investment k_j in each tax-haven affiliate, taking into account substance rules ϕ.[21] Third, the MNE maximizes after-tax profits by choosing the optimal amount of profits shifted $P_{i,j}$ from each productive affiliate.

The model is solved by backward induction: Section 4.4.2 solves the third-stage shifting decision, Section 4.4.3 the second-stage investment decision, and Section 4.4.4 the first-stage choice of the number of tax-haven affiliates.

[20] Here k_j stands for substance broadly—local staff, tangible assets, and the functions they perform—in line with the subjective substance tests described in Section 4.2.

[21] Investment therefore takes place in the second stage—after the group structure is chosen but before profits are shifted. This ordering also answers why the fixed cost does not appear in the third-stage shifting problem: by the time a productive affiliate shifts $P_{i,j}$, both h and k_j are already determined, so $f(k_j, \phi)$ is sunk and does not affect the marginal shifting decision.

4.4.2 How Much Profit Does the MNE Shift?

Starting with the profit-shifting decision, the MNE maximizes the sum of profit over all of its affiliates:

$$\Pi = \sum_{i=1} \pi_{i,j} - hf(k_j, \phi),$$

which consists of the after-tax and after-shifting profits in each productive affiliate i minus the investment in the h tax-haven affiliates, conditional on the MNE group structure and investment in tax-haven affiliates.[22]

The after-tax profit-maximization problem for each symmetric affiliate is given by

$$\max_{P_{i,j}}: \quad \pi_{i,j} = (1 - t_i)\, m_i + (t_i - t_j)\, P_{i,j} - \tfrac{\bar{\alpha}}{k_j} d_{i,j} P_{i,j} - \tfrac{P_{i,j}^2}{2}.$$

The MNE decides how many profits $P_{i,j}$ to shift from each productive affiliate i to tax-haven affiliate j. Taking the first-order condition yields

$$\frac{\partial \Pi_{i,j}}{\partial P_{i,j}} = (t_i - t_j) - \frac{\bar{\alpha}}{k_j} d_{i,j} - P_{i,j} = 0.$$

Rewriting gives the optimal amount of profits shifted

$$P_{i,j}^* = (t_i - t_j) - \frac{\bar{\alpha}}{k_j} d_{i,j}. \tag{4.1}$$

The optimal amount of profit shifted increases in the affiliate's tax rate t_i, since this makes profit shifting more attractive. It decreases in the tax-haven affiliate's tax rate t_j and the adjustment costs $\frac{\bar{\alpha}}{k_j} d_{i,j}$, because these costs reduce the net benefit of profit shifting. Thus, each affiliate optimally equalizes the marginal benefits of shifting against the marginal costs of shifting to maximize after-tax profit.

Substituting the optimal amount of profits shifted in equation (4.1) into the affiliate's after-tax profit, maximized after-tax profits in each productive affiliate are given by

$$\pi_{i,j}^* = (1 - t_i)\, m_i + \frac{1}{2} \left(t_i - t_j - \frac{\bar{\alpha}}{k_j} d_{i,j} \right)^2, \tag{4.2}$$

which consists of the after-tax profit from real activities $(1 - t_i)\, m_i$ as well as the net benefits from profit shifting $\frac{1}{2} \left(t_i - t_j - \frac{\bar{\alpha}}{k_j} d_{i,j} \right)^2$. These net benefits increase in the

[22] The MNE maximization problem is additively separable across productive affiliates, so the results do not rely on investments in different affiliates being complements or substitutes. The extensive and intensive margins arise from the fixed cost and distance of each tax-haven affiliate, not from cross-affiliate spillovers.

productive affiliate's tax rate t_i and decrease in the tax-haven affiliate's tax rate t_j and the adjustment costs $\frac{\bar{\alpha}}{k_j} d_{i,j}$. The further away the productive affiliate is from the tax-haven affiliate, the higher the adjustment costs. This introduces the incentive to set up nearby tax-haven affiliates, based on which the MNE decides on its optimal group structure.

4.4.3 How Much Does the MNE Invest in each Tax-Haven Affiliate?

The MNE chooses how much to invest in each tax-haven affiliate. Substituting the optimal shifting decision from equation (4.2), each tax-haven affiliate serves the productive affiliates located closest to it on the Salop circle. I assume the tax-haven affiliates are symmetric, so that $t_j = t_{j+1} = t_{j-1}$. The net profits shifted *aggregated* across the productive affiliates that each tax-haven affiliate serves are

$$D_{i,j} = \frac{(t_i - t_j)^2}{2h} - \frac{\bar{\alpha}(t_i - t_j)}{4h^2 k_j} + \frac{\bar{\alpha}^2}{24h^3 k_j^2}. \tag{4.3}$$

The aggregated net profits shifted per tax-haven affiliate are obtained by finding the productive affiliates that are just indifferent between two close-by tax-haven affiliates and integrating their net shifting benefits over the interval that each tax-haven affiliate covers on the Salop circle; Appendix 4.A provides the full derivation.

The three terms of equation (4.3) can be interpreted as follows. The first term, $\frac{(t_i - t_j)^2}{2h}$, is the net shifting benefit the tax-haven affiliate would deliver *absent* adjustment costs: the tax saving from the rate differential $(t_i - t_j)$.[23] The second and third terms capture how adjustment costs decrease this shifting benefit. The second term, $-\frac{\bar{\alpha}(t_i - t_j)}{4h^2 k_j}$, is the first-order reduction in profits shifted, because more distant productive affiliates shift less. The third term, $+\frac{\bar{\alpha}^2}{24h^3 k_j^2}$, is a smaller second-order term of the opposite sign. Because both involve the adjustment-cost parameter $\bar{\alpha}$ divided by the investment k_j, investment in the tax-haven affiliate decreases the importance of the adjustment costs, which provides the intensive-margin incentive to invest. The aggregate shifting benefit decreases in the number of tax-haven affiliates h, since each then serves a lower number of productive affiliates, which incentivizes the extensive margin later on.

[23] The tax-rate differential is squared because the amount optimally shifted is itself proportional to the differential. This squares when integrating over the productive affiliates the tax-haven affiliate serves.

Because the affiliate mass is normalized to one[24] and there are h tax-haven affiliates, the MNE's after-tax profit can be written as

$$\Pi = (1 - t_i)m_i + h\left[D_{i,j} - f(k_j, \phi)\right], \tag{4.4}$$

where the first term shows after-tax profits from production in the productive affiliates. The second term shows, for each of the h tax-haven affiliates, the net benefits from shifting profits to nearby tax-haven affiliates, taking into account the fixed costs of setting up h tax-haven affiliates.

In the second stage, the MNE chooses investment k_j to maximize (4.4), taking the number of tax-haven affiliates h as given:

$$\max_{k_j}: \quad \Pi = (1 - t_i)m_i + h\left[D_{i,j} - f(k_j, \phi)\right].$$

The first-order condition is

$$\frac{\partial \Pi}{\partial k_j} = \frac{\bar{\alpha}(t_i - t_j)}{4h^2k_j^2} - \frac{\bar{\alpha}^2}{12h^3k_j^3} - \phi k_j = 0, \tag{4.5}$$

where the first two terms capture the marginal benefit of investment: higher investment lowers adjustment costs, which increases the net benefit of profit shifting and thereby after-tax profit. The third term captures the marginal cost of investment under the substance rule, because the substance rule requires higher investment in each tax-haven affiliate, reducing after-tax profit. In the optimum, the MNE equates the marginal benefit of reducing adjustment costs against the marginal cost of investment in each tax-haven affiliate.

4.4.4 How Many Tax-Haven Affiliates Does the MNE Establish?

Given optimal profits shifted and optimal investment, the MNE chooses the number of tax-haven affiliates h to maximize equation (4.4):

$$\max_{h}: \quad \Pi = (1 - t_i)m_i + h\left[D_{i,j} - f(k_j, \phi)\right].$$

[24] Normalizing the mass of productive affiliates to one abstracts from group-size or scale effects. The model speaks to how a group of a given size restructures under substance rules, not to how the absolute number of affiliates scales with firm size.

The corresponding first-order condition is

$$\frac{\partial \Pi}{\partial h} = \frac{\bar{\alpha}(t_i - t_j)}{4h^2 k_j} - \frac{\bar{\alpha}^2}{12h^3 k_j^2} - \frac{\phi k_j^2}{2} = 0, \tag{4.6}$$

which contains three arguments that capture the trade-off that the MNE faces: it wants to shift to nearby tax-haven affiliates but faces fixed costs of investing in each tax-haven affiliate. The first term shows that the optimal number of tax havens affiliates depends on the benefit of profit shifting, as indicated by the tax rate differential. The first and second term together show that the optimal number of tax-haven affiliates also depends on the adjustment costs. The third term indicates that the optimal number of tax-haven affiliates depends on the fixed costs of investment in each tax-haven affiliate, which is influenced by substance rules. This forms the starting point for my hypotheses.

4.4.5 Hypotheses

Based on the first-order conditions for optimal investment and the optimal number of tax-haven affiliates in equations (4.5) and (4.6), I derive the effects of changes in the adjustment costs, the tax rates in both the productive affiliates and tax havens, and the costs of investment.[25]

Extensive Margin. The comparative statics of the first-order condition (4.6) deliver two distinct extensive-margin predictions: one for the introduction of a CFC rule, which compresses the tax-rate differential, and one for the introduction of a substance requirement, which raises the fixed cost of each tax-haven affiliate. I state them as two separate hypotheses.

The tax-rate effect. The optimal number of tax-haven affiliates increases in the tax-rate differential $(t_i - t_j)$: It increases in the productive affiliate's tax rate t_i[26] and decreases in the tax-haven affiliate's tax rate t_j.[27] This mechanism is visible in the first term

[25] To derive the comparative statics, first define the FOC for the optimal number of tax-haven affiliates as $g(\bar{\alpha}, t_i, t_j, k_j, \phi, h) = \frac{\bar{\alpha}(t_i - t_j)}{4h^2 k_j} - \frac{\bar{\alpha}^2}{12h^3 k_j^2} - \frac{\phi k_j^2}{2}$. Furthermore, I assume the second-order conditions are negative: $SOC : \frac{\partial^2 \Pi}{\partial h^2} = -\frac{\bar{\alpha}(t_i - t_j)}{2h^3 k_j} + \frac{\bar{\alpha}^2}{4h^4 k_j^2} < 0$, which is required to maximize profits. Conversely, the FOC for the optimal amount of investment in each tax-haven affiliate is defined as $p(\alpha, t_i, t_j, k_j, \phi, h) = \frac{\bar{\alpha}(t_i - t_j)}{4h^2 k_j^2} - \frac{\bar{\alpha}^2}{12h^3 k_j^3} - \phi k_j$. The second-order condition is negative again: $SOC : \frac{\partial^2 \Pi}{\partial k_j^2} = -\frac{\bar{\alpha}(t_i - t_j)}{2h^2 k_j^3} - \frac{\bar{\alpha}^2}{4h^3 k_j^4} - \phi < 0$

[26] $\frac{dh}{dt_i} = -\frac{\bar{\alpha}/(4h^2 k_j)}{SOC} > 0.$

[27] $\frac{dh}{dt_j} = \frac{\bar{\alpha}/(4h^2 k_j)}{SOC} < 0.$

of equation (4.6), $\frac{\bar{\alpha}(t_i - t_j)}{4h^2 k_j}$: a larger tax-rate differential increases the marginal benefit of shifting, so the MNE optimally has more tax-haven affiliates. CFC rules essentially equalize the tax haven's tax rate to the productive affiliate's tax rate ($t_i = t_{CFC} = t_j$), which eliminates the profit shifting benefit in the first term of equation 4.6 for an MNE whose parent country operates a CFC rule. Indeed, Clifford (2019) finds that MNEs open affiliates just above the CFC threshold. This suggests that the optimal number of tax-haven affiliates decreases because the tax rate differential becomes smaller.

Hypothesis 1a *After the MNE group becomes subject to a CFC rule, the number of tax-haven affiliates in the group decreases.*

The substance effect. A substance requirement adds a second, distinct extensive-margin force. It raises the investment each tax-haven affiliate must have to qualify for the exemption, and hence the fixed cost $f(k_j, \phi)$ in the third term of (4.6). Formally, a stricter rule lowers the optimal number of tax-haven affiliates.[28]

Under a substance rule, providing sufficient evidence that there is substance in a low-tax country facilitates profit shifting because the substance rule provides an exemption from the application of CFC rules. Before the substance rule, the MNE holds the number of tax-haven affiliates at which the marginal affiliate—the one serving the smallest, most distant arc of productive affiliates—is just indifferent between two tax-haven affiliates. At that point, the aggregate net shifting benefit $D_{i,j}$ equals the fixed cost of investment in each tax-haven affiliate $f(k_j, \phi)$. With fewer tax-haven affiliates, each remaining tax-haven affiliate serves more productive affiliates—a share $1/h$ of the Salop circle—which increases the aggregate profits shifted to each tax-haven affiliate. Substance rules thus consolidate profit shifting into fewer, larger tax-haven affiliates.

In their working paper, Ruf and Weichenrieder (2013) suggest that the number of tax haven affiliates does not decrease after becoming subject to German CFC rules, but Gschossmann and Pfrang (2024) show the opposite. Concentration could imply that within-affiliate investment in tax havens is increased, whereas other tax-haven affiliates are closed to curb the fixed costs of investment within the MNE group. The model in this paper provides an explanation for the geographical dispersion of haven affiliates and explains why multinationals might have several haven affiliates.[29]

[28] $\frac{dh}{d\phi} = \frac{\partial f(k_j, \phi)/\partial \phi}{SOC} < 0$.

[29] Anecdotal evidence even suggests that MNE group structures often have several affiliates in tax havens, for example to selectively apply the U.S. Check-the-Box Regime or benefit from specific Tax Treaty provisions through particular routes of ownership. This suggests that the concentration effect occurs.

Hypothesis 1b *After the MNE group becomes subject to a substance rule, the number of tax-haven affiliates in the group decreases.*

Intensive Margin Effect. Under a substance rule, providing sufficient evidence that there is substance in a low-tax country facilitates profit shifting because the substance rule provides an exemption from the application of CFC rules. This incentivizes the MNE to invest more in its tax-haven affiliates.

Taking the total derivative of k_j with respect to the substance requirement ϕ in equation (4.5) yields:

$$\frac{dk_j}{d\phi} = \frac{\partial k_j}{\partial \phi} + \frac{\partial k_j}{\partial h} \cdot \frac{dh}{d\phi} > 0.$$

The first term is a *direct effect*, which captures how a stricter substance rule raises the marginal cost of investment, which decreases investment.[30] The second term is a *concentration effect*, which captures the indirect effect of substance rules on investment through the extensive margin. From Hypothesis 1b, a stricter substance rule decreases the optimal number of tax-haven affiliates. As the optimal number of tax-haven affiliates decreases, each remaining tax-haven affiliate serves a larger share of the MNE's productive affiliates, increasing the marginal return to investment in that tax haven. Formally, from equation (4.5), a decrease in h increases the first two terms, which increases optimal investment in each tax-haven affiliate.[31] This prediction is consistent with Gschossmann and Pfrang (2024), who find that employee costs rise in CFCs after the ATAD reform. Therefore, the intensive-margin hypothesis is:

Hypothesis 2 *After an MNE affiliate becomes subject to a substance rule, fixed assets and employment in that affiliate are increased.*

Investment Shifting Effect. An interesting policy question is whether substance rules in tax-haven affiliates prevent loss of real investment in high-tax affiliates. This could be the result of an investment shifting effect, which implies a re-routing of investment from high-tax to low-tax countries (Buettner et al., 2018; Suárez Serrato, 2019; Drake et al., 2022; Williams, 2018). Investment shifting behavior might provide a double hit for high-tax countries: They lose both tax base through profit shifting, and economic activities as MNEs increase real investment in the tax-haven affiliate to avoid applying CFC rules. However, it may also be the case that investment in tax-haven

[30] $\frac{\partial k_j}{\partial \phi} < 0$.

[31] Since $\frac{dh}{d\phi} < 0$ and $\frac{\partial k_j}{\partial h} < 0$, the concentration effect is positive.

affiliates is complementary to investment in high-tax affiliates (Hong and Smart, 2010). Therefore, the fourth hypothesis is stated in the null form.

Hypothesis 3 *Real investment in fixed assets and employment in unaffected affiliates of the MNE remains unchanged as another affiliate in the MNE group becomes subject to a substance rule.*

Summarizing, as a result of substance rules within a CFC rule, the optimal number of tax-haven affiliates decreases—*extensive margin effect*. The remaining number of tax-haven affiliates receive a higher level of investment—*intensive margin effect*. It is a priori unclear how the substance rule affects investment in non-substance affiliates and whether an *investment shifting effect* occurs.

4.5 Data

I obtain data on substance rules from OECD (2024). In addition, I hand-collect data from national CFC legislation on the details of the substance rule. Table A1 in the Appendix shows the shareholder countries included in the sample which have implemented CFC rules. An asterisk (*) indicates that the sample observes affiliates in this country.

To test the hypotheses, I use unbalanced panel data for affiliates that have at least one foreign majority-shareholder from Bureau van Dijk's Historical Orbis over the period 2010–2023. To define treatment based on the tax rate threshold, I collect data from the Tax Foundation on yearly statutory corporate tax rates in percentages, which include both state and local taxes. I exclude affiliates with negative values in any year for total assets, tangible fixed assets, long-term debt, turnover, profit, and the number and costs of employees.

The sample contains 53 parent countries that have a CFC rule in place at some point during the sample period, see Table A1. 30 of these countries operate a substance requirement, which the affiliate must satisfy for the CFC rule not to apply. 3 of them provide a safe harbor rule; the other 27 apply a subjective test, which requires evaluation of all relevant facts and circumstances to assess whether there is substantial economic substance. The sample includes affiliates in 68 different countries. Table A2 lists the countries of those affiliates in countries that do not have a CFC rule in place, so that combined with Table A1, it lists all countries with observed affiliates.

Table 4.2 shows descriptive statistics in four panels. Panel A explains the sample construction. Restricting to affiliates with a foreign majority shareholder, and censoring those whose ultimate owner changes, leaves 8.4 million affiliate-years covering 1.2 million affiliates in 472,565 groups. The three effects from the model draw on this sample differently, which is why they report different totals: the intensive margin uses the 2,655,900 affiliate-years belonging to treated affiliates and their two control groups, the spillover margin uses the 6,076,048 affiliate-years of affiliates that are never themselves within scope, and the extensive margin aggregates to 2,586,731 group $\times$ year $\times$ affiliate-type cells across 242,591 groups.

Panel B reports affiliate characteristics *before* treatment, separately for affiliates that eventually fall within the scope of a substance rule, affiliates whose parent operates a CFC rule without one, and affiliates whose parent operates neither. Substance affiliates face a mean statutory rate of 18.9 percent against 22.7 percent for CFC-only affiliates. Substance affiliates are also larger than untreated affiliates—a median of 12 employees against 5—and are part of substantially larger MNE groups, with a median of 11 affiliates against 8 in CFC-only groups and 2 in untreated groups.

Panel C reports when treatment occurs. 29,892 affiliates fall within the scope of a substance rule at some point, spread over 13 cohorts. 12 parent countries first operate a substance rule in 2019, when the EU Anti-Tax Avoidance Directive required member states to implement CFC rules, and that cohort accounts for 21.5 percent of all treated affiliates. Only 15 of the 30 substance countries adopt within the sample period; the remainder already operated a requirement before 2010, and contribute affiliates that obtain treatment when their own statutory rate crosses the threshold rather than when the rule is introduced.

Panel D describes the two group-level samples. The extensive margin contains 242,591 groups with a median of 2 affiliates in the first year the group is observed ('base year'), of which 79.1 percent are exposed to a substance rule at some point. The spillover sample contains 122,441 groups with a median of 3 affiliates, of which 5.7 percent ever contain a treated affiliate.

Table 4.2: Descriptives

Panel A: Sample Construction

	Affiliate-years	Affiliates	Groups
Orbis affiliate-years, 2010–2023	147,759,136	36,270,315	31,485,867
with an ownership group	144,780,434	35,692,831	31,485,867
with a foreign majority shareholder	8,604,115	1,239,483	473,736
after removing ownership changes	8,426,906	1,233,272	472,565
Extensive-margin sample (H1)	2,586,731	—	242,591
Intensive-margin sample (H2)	2,655,900	421,878	214,329
matched control group	145,283	17,526	10,899
Spillover sample (H3)	6,076,048	862,115	122,441
matched control group	588,333	77,367	6,140

Panel B: Pre-Treatment Affiliate Characteristics

	Substance	CFC-only	Never-rule
Total Assets (EUR Tsd)	70,035.6	79,669.5	58,240.5
	(859,326.7)	(5,008,564.3)	(7,447,815.4)
Median	1,349.8	1,662.1	703.8
Tangible Fixed Assets (EUR Tsd)	1,824.2	1,998.8	1,242.4
	(4,371.9)	(4,645.9)	(3,652.9)
Median	56.8	32.9	9.9
Number of Employees	52.1	46.7	31.4
	(87.2)	(83.3)	(66.6)
Median	12.0	9.0	5.0
Costs of Employees (EUR Tsd)	2,084.2	1,837.5	1,049.4
	(3,721.0)	(3,353.4)	(2,581.3)
Median	412.0	462.7	128.0
ln(Tangible Fixed Assets)	11.98	12.37	11.59
	(2.88)	(2.96)	(3.05)
ln(Number of Employees)	2.67	2.64	2.09
	(1.76)	(1.78)	(1.71)
ln(Costs of Employees)	12.70	12.75	11.61
	(2.44)	(2.31)	(2.49)
Statutory Tax Rate (%)	18.93	22.67	21.10
	(6.35)	(4.59)	(6.18)
Affiliates in Group	84.0	72.1	41.0
	(205.2)	(185.6)	(147.7)
Affiliate-years	133,367	1,151,758	970,893
Affiliates	29,892	173,869	191,368

Note: Affiliate-level data from Bureau van Dijk's Historical Orbis for the years 2010–2023. Panel A describes the sample construction. I keep multinational affiliates with a foreign majority shareholder, and drop affiliates from the group if their ownership changes. Panel B reports variable means with standard deviations in parentheses, and medians. For substance affiliates, I show years before the affiliate first becomes subject to a substance requirement; for CFC-only affiliates, I show years before it first becomes subject to a CFC rule; for never-rule affiliates, I show all years. Logarithmic variables are winsorised at the 1st and 99th percentiles. Affiliate-level statutory tax rates are obtained from the Tax Foundation.

Table 4.2: Descriptives (continued)

Panel C: Timing of Substance-Rule Treatment

	Affiliates newly treated	Parent countries newly adopting	Cumulative share (%)
2011	1,675	0	5.6
2012	1,349	0	10.1
2013	3,519	1	21.9
2014	2,231	1	29.4
2015	1,788	0	35.3
2016	1,701	0	41.0
2017	3,413	1	52.4
2018	1,853	0	58.6
2019	6,424	12	80.1
2020	2,175	0	87.4
2021	2,146	0	94.6
2022	1,385	0	99.2
2023	233	0	100.0
Total	29,892	15	

Panel D: Number of Affiliates in each MNE Group

	Groups	Mean size	Median size	Ever exposed (%)
Extensive margin (H1)	242,591	6.5	2	79.1
Spillover margin (H3)	122,441	7.2	3	5.7

Note: Affiliate-level data from Bureau van Dijk's Historical Orbis for the years 2010–2023. Panel C reports the year in which affiliates first fall within the scope of a substance requirement, based on the tax-rate threshold or the introduction of a substance requirement. Panel D reports the number of affiliates in the in the two group-level samples, measured.

4.6 The Extensive Margin

4.6.1 Measuring the Number of Tax-Haven Affiliates

Hypotheses 1a and 1b predict that after the MNE becomes subject to a CFC rule, and separately to a substance rule, the number of tax-haven affiliates in the group should decrease. Using Orbis Historical Data, I link every affiliate to an MNE group in every year using the direct ownership links, tracing each entity to its global ultimate owner using the fifty-percent control threshold. The group structure is measured using ownership snapshots from each current year or earlier, so no assignment uses future information. This matters because group membership is not stable: 4.6 percent of affiliates change ultimate owner during the sample period, which is why I update the ownership structure once a change is recorded in Orbis.

I define tax-haven affiliates based on Dharmapala and Hines (2009), excluding the countries that can be considered conduit countries: Belgium, Cyprus, Hong Kong, Ireland, Luxembourg, Malta, the Netherlands, Singapore and Switzerland. These are relatively large economies usually used in conduit structures because they have good treaty networks. To focus on pure tax havens, I use the remaining thirty-five jurisdictions as the baseline definition and report the full list as a robustness check.[32] It should be noted that Orbis records entities that file publicly, and the most secretive jurisdictions do not require public filing. For example, the British Virgin Islands contribute 268 affiliates to the ownership universe and Jersey and Guernsey fewer than thirty. The estimates below therefore should be read as applying to the part of the MNE that shows up in Orbis, and they are likely to understate the response of the unreported part.

Treatment is defined as follows: An MNE group is considered subject to a CFC rule when its affiliates fall within the rule's scope. Variation in treatment comes from three sources: a shareholder country adopts a CFC rule, an affiliate country's statutory rate crosses below the threshold, or a parent country's own rate changes and moves the threshold with it. Treatment requires that a controlling shareholder is resident in a country operating a CFC rule and that the affiliate's statutory tax rate lies below the

[32] Andorra, Anguilla, Antigua and Barbuda, Aruba, the Bahamas, Bahrain, Barbados, Belize, Bermuda, the British Virgin Islands, the Caribbean Netherlands, the Cayman Islands, Curacao, Gibraltar, Grenada, Guernsey, the Isle of Man, Jersey, Lebanon, Liechtenstein, Macao, the Marshall Islands, Mauritius, Monaco, the Netherlands Antilles, Panama, Puerto Rico, Samoa, the Seychelles, Sint Maarten, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, the Turks and Caicos Islands and Vanuatu. The Netherlands Antilles is carried alongside its post-2010 successor codes so that pre- and post-dissolution Orbis vintages both resolve.

shareholding country's threshold. Having a shareholder in a CFC-rule country applies to 91 percent of MNEs by 2019, and of 70 percent of affiliate-years, mostly because the United States, Germany, Japan, France and the United Kingdom have long operated CFC regimes and the EU Anti-Tax Avoidance Directive extended them to every EU member state in 2019. Being *within scope* is less prevalent: 6 percent of affiliate-years for CFC rules and 1 percent for substance requirements.

4.6.2 Identification

I take the first year in which I observe an MNE group in the sample and hold the composition of the group fixed ('base-year'). Orbis coverage of ownership links improves over time, and it is unclear whether these are *new* affiliates, or improvements in data quality. I therefore follow the affiliates in the group from the first time I observe the MNE group in the data. The outcome is their *survival*: the share of the base-year affiliates of a given type (CFC/substance versus non-CFC/substance) that still belong to the group in year t. Entities that join the MNE group later enter neither the numerator nor the denominator so expansion of the group—either through group expansion or data improvement—does not enter the measure. This set-up allows including group × year fixed effects and identify the effect from the difference between (CFC/substance versus non-CFC/substance *within the same group and year*. I estimate

$$Survival_{g,t,c} = \beta \left(Exposure_{g,t,c} \times TaxHaven_c \right) + \mu_{g,t} + \lambda_c + \varepsilon_{g,t,c}, \tag{4.7}$$

with g for the MNE group, t for the year and c for the affiliate type. $Survival_{g,t,c}$ is the share of group g's base-year affiliates of type c still belonging to the group in t; $Exposure_{g,t,c}$ is the continuous share of those affiliates within the scope of a CFC rule (Hypothesis 1a) or a substance requirement (Hypothesis 1b). $TaxHaven_c$ indicates tax-haven affiliates in the MNE group. The group × year fixed effects $\mu_{g,t}$ absorb year-varying group trends, including its growth, its underlying propensity to restructure, and other anti-avoidance legislation such as the Anti-Tax Avoidance Directive. λ_c absorbs baseline differencse in survival between tax-haven and other affiliates. Standard errors are clustered at the group level.

The estimated coefficient of interest β compares a group's own tax-haven affiliates with its other affiliates as its exposure to CFC rules and substance rules increases. Hypotheses 1a and 1b predict $\beta < 0$: the share of tax-haven affiliates should decrease when a CFC rule or substance rule kicks in. Because the comparison is within-MNE, the design does not rely on finding a comparable untreated MNE.

Because the outcome is a mean of binary indicators, observations are weighted by the number of base-year affiliates of the relevant type.[33] I require a group to be observed for at least 5 years and to hold at least 2 affiliates in its base year. [34]

4.6.3 Extensive Margin: Results

Figure 4.6 plots event-study coefficients for equation (4.7). The pre-treatment estimates are close to zero and individually insignificant. The CFC-rule estimates show that first-increased exposure to a CFC rule decreases the likelihood of survival of a specific affiliate significantly. The same holds for the substance rule: With increased exposure, the share of tax-haven affiliates decreases significantly.[35]

Table 4.3 reports estimates for equation (4.7). Exposure to a CFC rule varies within more groups than exposure to a substance requirement—782 versus 568. Once an affiliate becomes subject to a CFC rule, its likelihood of survival decreases by -0.017 with a standard error of 0.016: the point estimate has the predicted sign but cannot be distinguished from zero. The results thus do not provide robust evidence for Hypothesis 1a.

Exposure to a substance requirement decreases the survival of a group's substance-treated affiliates by 4.6 percentage points relative to its other affiliates, against a mean survival rate of 0.85, and the estimate is significant at the five percent level. Overall, the results support the extensive margin effect for substance affiliates in Hypothesis 1b: Multinational groups seem to reduce their number of tax-haven affiliates when those affiliates come within the scope of a substance requirement. This is in line with the idea that the fixed cost of maintaining tax-haven affiliates increases due to substance requirements.

To test the distance-effect in the model in Section 4.4, I measure, for each group and year, the average distance from its base-year productive affiliates to the nearest tax-haven affiliate still belonging to the MNE group. I then regress the distance on exposure, with group and year fixed effects and standard errors clustered at MNE level.

[33] Each observation is the share of a group's base-year affiliates of one type (treatment versus control) still in the group in a given year, so it is a sample proportion whose variance is inversely proportional to the number of affiliates; weighting by the affiliate count is therefore inverse-variance weighting

[34] Increasing the second threshold to three, six and eleven affiliates moves the substance-rule estimate only within -0.046 to -0.032.

[35] The event-study design is not optimal for a continuous-exposure treatment variable, and I code the event-study indicator as 1 upon first increase in exposure to the rule. The event study allows me to show visual evidence for hypotheses 1a and 1b.

Figure 4.6: Extensive Margin: The Share of Tax-Haven Affiliates

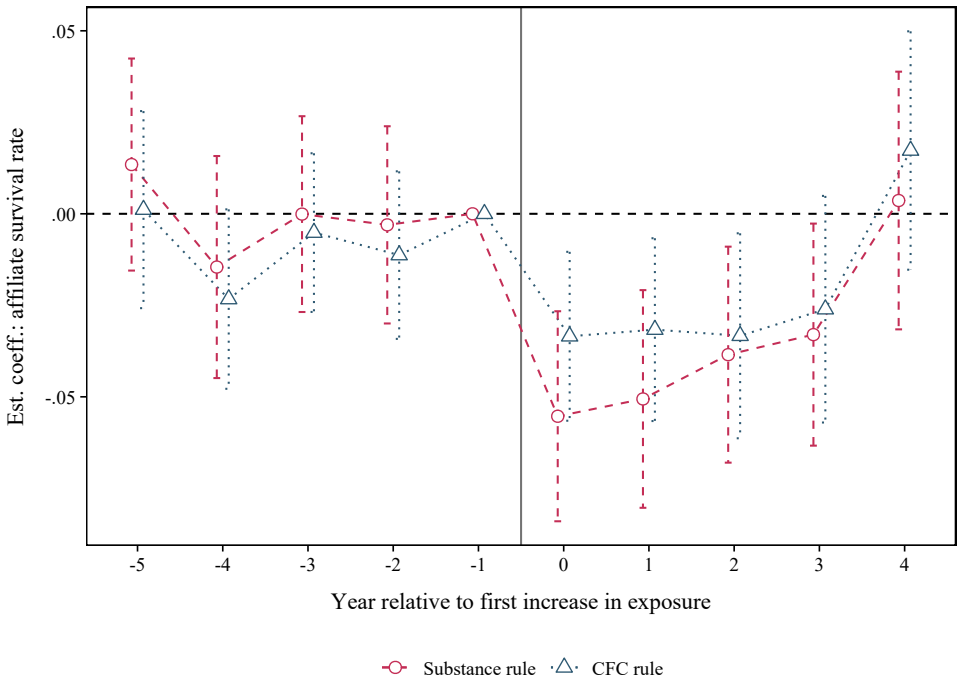
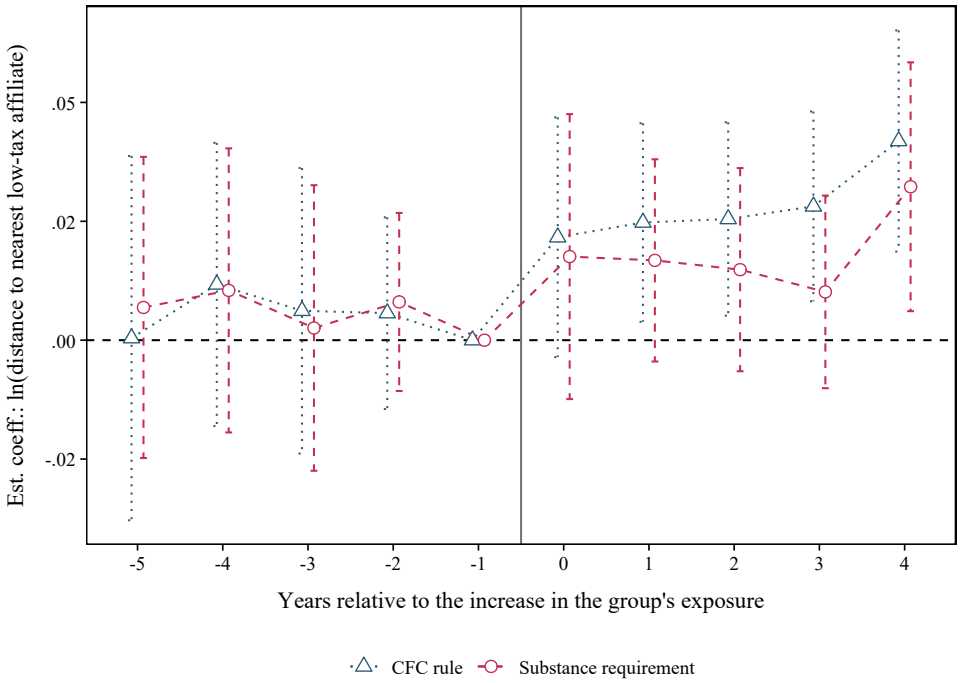


Figure 4.7: Extensive Margin: Distance to the Nearest Tax-Haven Affiliate



Note: Data from Orbis for 2010–2023. The figure plots event-study estimates for equation (4.7), in which exposure is interacted with indicators for years relative to the first increase in a group's exposure to a CFC rule. The dependent variable in Figure 4.6 is the share of a group's base-year tax-haven affiliates that still belong to the group. The dependent variable in Figure 4.7 is the average distance to the nearest-by tax-haven affiliate. Tax-havens defined as in Dharmapala and Hines (2009) excluding nine conduit countries. Year four pools that year and all later ones. 90% confidence intervals from standard errors clustered at the MNE level. All specifications include MNE × year and affiliate-type fixed effects and are weighted by the number of base-year affiliates of that type.

Table 4.3: The Number of Low-Tax Affiliates: CFC and Substance Rules

	Share of Low-Tax Affiliates		Distance to Nearest	
	(1) CFC Rule	(2) Substance Rule	(3) CFC Rule	(4) Substance Rule
Exposure × Tax Haven	-0.017	-0.046**		
	(0.016)	(0.019)		
Exposure			0.028**	0.018
			(0.012)	(0.013)
Group × Year FE	Yes	Yes	No	No
Group FE	No	No	Yes	Yes
Year FE	No	No	Yes	Yes
Affiliate-Type FE	Yes	Yes	No	No
Observations	74,160	74,160	32,351	32,351
MNE Groups	3,507	3,507	3,507	3,507
Mean Survival Rate	0.849	0.849		
Mean Distance (km)			5,999	5,999

Note: Group-level data from Orbis for the years 2010–2023. Each group's composition is fixed at its first observed year; the outcome is the share of those base-year affiliates of a given type still belonging to the group. Low-tax affiliates are those located in the tax havens listed by Dharmapala and Hines (2009), excluding Belgium, Cyprus, Hong Kong, Ireland, Luxembourg, Malta, the Netherlands, Singapore and Switzerland. *Exposure* is the share of the group's base-year affiliates of that type that fall within the scope of a CFC rule (column 1) or a substance rule (column 2), that is, whose parent country operates the rule and whose statutory tax rate lies below the parent's threshold. Group × year fixed effects absorb all group-level variation, so the coefficient is identified from the difference between low-tax and other affiliates of the same group in the same year. Observations are weighted by the number of base-year affiliates of that type. In columns 3 and 4 the outcome is instead the logarithm of the average distance from the group's base-year productive affiliates to the nearest low-tax affiliate still belonging to the group, where affiliate locations are country centroids. Production is held at the base-year roster and only the low-tax set is allowed to change, so the measure responds to the closure of low-tax affiliates rather than to the exit of productive ones; it is then a minimum over a shrinking set, and a positive coefficient means the surviving low-tax affiliates are worse placed to serve the group's production. The reported coefficient is the average of the five post-treatment event-study estimates plotted in Figure 4.7, with a standard error computed from their joint covariance. Distance is undefined once a group's last low-tax affiliate closes, so those group-years leave the sample, which retains 1.3 percent of them; the estimates are therefore conditional on the group still holding a low-tax affiliate and understate the unconditional change. Observations in columns 3 and 4 are weighted by the number of base-year productive affiliates. Standard errors are clustered at the MNE (GUO) level. ***, ** and * indicate significance at the 1%, 5% and 10% levels.

Columns (3) and (4) of Table 4.3 report the average effect over the five post-treatment years. Exposure to a CFC rule increases the distance to the nearest tax-haven affiliate by 2.8 percent, with a standard error of 0.012 and significance at the five percent level. Exposure to a substance requirement gives 1.8 percent (0.013), of the same sign and magnitude but insignificant.

Figure 4.7 shows the event-study estimates. The pre-treatment estimates are small and individually insignificant for both rules, and the effect then grows: by the fourth year the distance is 4.2 percent higher (1.4) after exposure to a CFC rule and 3.2 percent (1.6) after exposure to a substance requirement, both significant. Taken together with the decrease in the number of tax-haven affiliates in columns (1) and (2), the estimates are in line with the model's predictions.

4.7 The Intensive Margin

4.7.1 Measuring Investment in Tax-Haven Affiliates

Hypothesis 2 predicts that substance requirements increase real activity in tax-haven affiliates. As measures for real activity, I use the natural logarithm of tangible fixed assets, the number of employees and the cost of employees, each winsorized at the first and ninety-ninth percentiles. The sample is based on 21,629 treated affiliates that report tangible fixed assets, 20,536 report employment and 15,951 report employee costs in Orbis.

Treatment is defined as follows: An affiliate is treated in year t when its parent country operates a substance requirement *and* the affiliate's statutory tax rate lies below that country's threshold. Treatment is not absorbing: 11,084 affiliates, 37.1 percent of those ever treated, become untreated at some point. An affiliate can become untreated because the statutory rate crosses above the threshold—plausibly exogenous to the affiliate—or because its ownership changes. I keep the first type and drop the second type to address endogeneity concerns. Treatment changes due to ownership changes drop 1.53 percent of treated affiliate-years.

4.7.2 Identification

Because substance-treated affiliates and non-treated affiliates likely differ in unobserved ways, I consider three control groups.

The first control group includes affiliates whose parent country operates a CFC rule but no substance requirement, so the coefficient measures the *incremental* effect of the substance requirement over the CFC rule itself. This maps to the model most closely, because the CFC rule alone operates through the tax-rate channel and the substance requirement adds the fixed-cost channel.

The second control group includes never-treated affiliates whose parent country operates neither rule, giving the total effect of being subject to a substance rule.

The third control group restricts the CFC-only controls from the first control group to affiliates matched to the substance affiliates on pre-treatment size. I match each treated affiliate with a CFC-only affiliate in the same affiliate country and the same treatment-cohort year on log total assets in the year before treatment, using one-to-one exact matching without replacement, and a caliper of 0.25 of a pooled standard deviation. The matching yields 8,763 pairs and improves balance.[36]

Using each control group, I estimate

$$Y_{i,t} = \beta \, Substance_{i,t} + \alpha_i + \delta_t + \varepsilon_{i,t}, \tag{4.8}$$

with i for the affiliate and t for the year. $Y_{i,t}$ is the natural logarithm of tangible fixed assets, number of employees, or costs of employees. $Substance_{i,t}$ indicates that the affiliate is within the scope of a substance requirement. The affiliate fixed effects α_i absorb time-invariant differences between affiliates, including jurisdiction, sector and any average size difference. The year effects δ_t absorb common trends. Standard errors are clustered at the MNE group level.

Treatment is staggered over thirteen cohorts in 2010-2023, so already-treated affiliates act as controls for later ones, and treatment is non-absorbing. Both are known to bias the two-way estimator when effects are heterogeneous. I therefore also report estimates using De Chaisemartin and D'Haultfœuille (2024).

4.7.3 Investment in Tax-Haven Affiliates

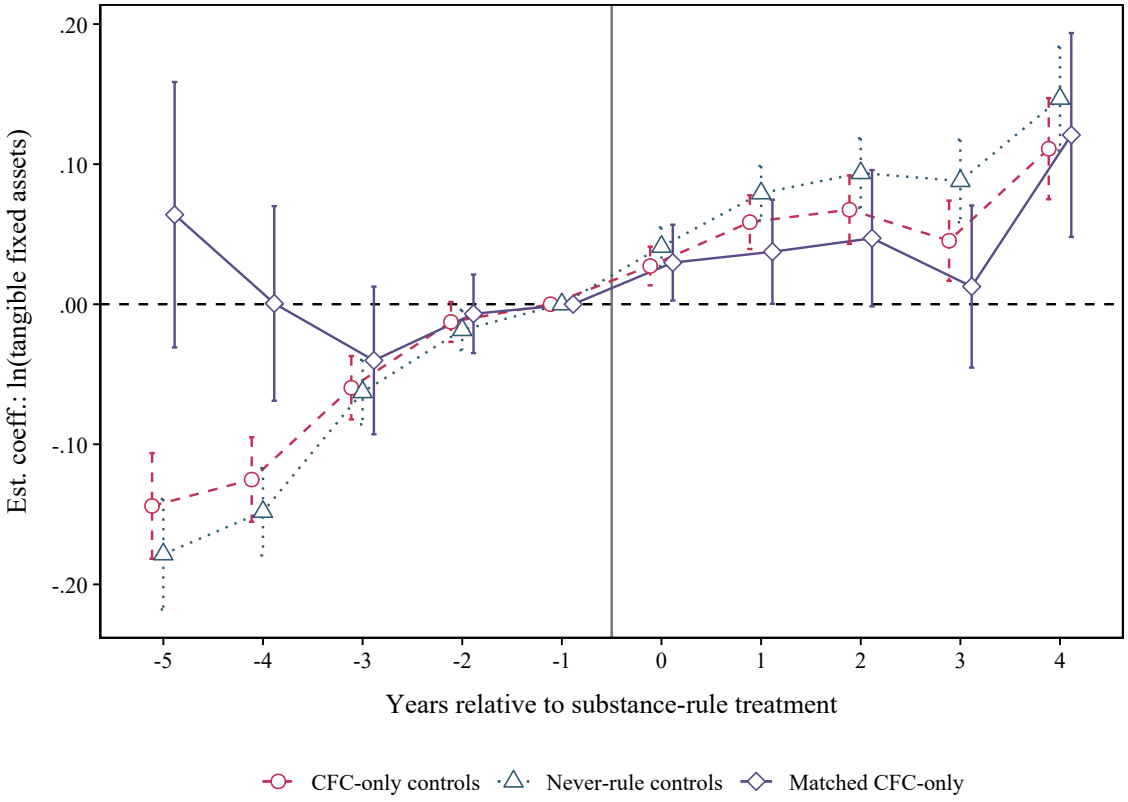
Tables 4.4 through 4.6 report estimates for equation (4.8), with one table per outcome. The first four columns show estimates for the two unmatched control groups; the last two show the matched control group.

[36] The standardized difference in log total assets decreases from −0.095 to +0.005, and the median pair differs by 0.05 log points. 69 percent of treated affiliates have no match, but the loss of observations is not selective on size: the mean within-cell size percentile of the unmatched treated affiliates is 0.511 against 0.507 for the matched.

Tangible Fixed Assets. The event study in Figure 4.8 shows that the non-matched samples have significant pre-trends. The matched specification has no significant pre-trends, and shows a modest significant increase in tangible fixed assets upon becoming subject to substance rules.

Table 4.4 shows that upon becoming subject to a substance requirement, tangible fixed assets increase significantly under all specifications. Against affiliates whose parents operate a CFC rule but no substance requirement in column (2), tangible fixed assets increase by 6.8 percent. Against the never-treated in column (4), this difference is 9.9 percent. In the matched sample in column (6), tangible fixed assets increase by 5.3 percent.

Figure 4.8: Intensive Margin: Tangible Fixed Assets



Note: Affiliate-year level data from Orbis over 2010–2023. Dynamic estimates using De Chaisemartin and D'Haultfœuille (2024) for the natural logarithm of tangible fixed assets for each of the three control groups. Includes affiliate and year fixed effects. 90% confidence intervals from standard errors clustered at the MNE level.

Table 4.4: Investment in Tangible Fixed Assets: Substance Rules

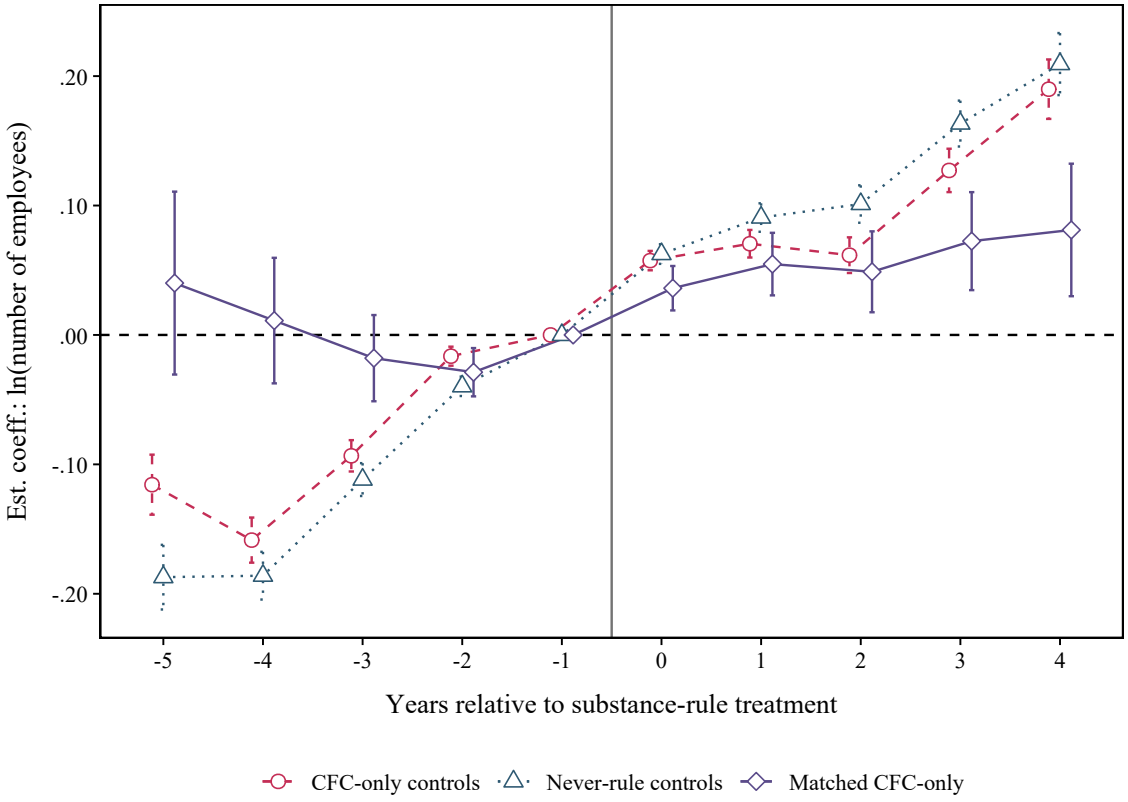
	CFC-Only		Never-Rule		Matched	
	(1) TWFE	(2) DCDH	(3) TWFE	(4) DCDH	(5) TWFE	(6) DCDH
Substance Rule	0.090***	0.068***	0.112***	0.099***	0.027	0.053**
	(0.012)	(0.013)	(0.012)	(0.014)	(0.019)	(0.026)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,023,317	858,308	691,448	556,062	90,179	70,056
Affiliates	145,436	145,436	122,095	122,095	12,207	12,207
p(joint placebo)	–	0.000	–	0.000	–	0.342

Note: Affiliate-level data from Orbis for the years 2010–2023. *Substance Rule* indicates that the affiliate's parent country operates a substance requirement and the affiliate's statutory tax rate lies below that parent's threshold. Columns (1) and (2) use as controls affiliates whose parent country operates a CFC rule but no substance requirement; columns (3) and (4) use affiliates whose parent country operates neither rule; columns (5) and (6) use CFC-only controls matched to the treated affiliates within cohort year and host country on log total assets in the year before treatment, with a caliper of 0.25 of a pooled standard deviation. TWFE columns report two-way fixed-effects estimates. DCDH columns report the average total effect of the heterogeneity-robust estimator of De Chaisemartin and D'Haultfœuille (2024), estimated with five post-treatment effects and four placebos. All outcome variables are transformed by the natural logarithm and winsorised at the 1st and 99th percentiles. All columns include affiliate and year fixed effects; standard errors are clustered at the MNE (GUO) level. p(joint placebo) is the p-value of the joint test that all four placebo estimates equal zero; it is not defined for the two-way fixed-effects columns. ***, ** and * indicate significance at the 1%, 5% and 10% levels.

Number of Employees. The event study in Figure 4.9 again shows that the non-matched samples have significant pre-trends. All three specifications however, show a significant increase in the number of employees upon becoming subject to a substance rule.

Table 4.5 estimates that upon becoming subject to a substance requirement, the number of employees increases significantly under all specifications. Against affiliates that are subject to a CFC rule but not to a substance rule in column (2), the number of employees increases by 10.8 percent. Against the never-treated in column (4), this difference is 13.5 percent. In the matched sample in column (6), the number of employees increases by 6.7 percent.

Figure 4.9: Intensive Margin: Number of Employees



Note: Affiliate-year level data from Orbis over 2010–2023. Dynamic estimates using De Chaisemartin and D'Haultfœuille (2024) for the natural logarithm of the number of employees for each of the three control groups. Includes affiliate and year fixed effects. 90% confidence intervals from standard errors clustered at the MNE level.

Table 4.5: Investment in Number of Employees: Substance Rules

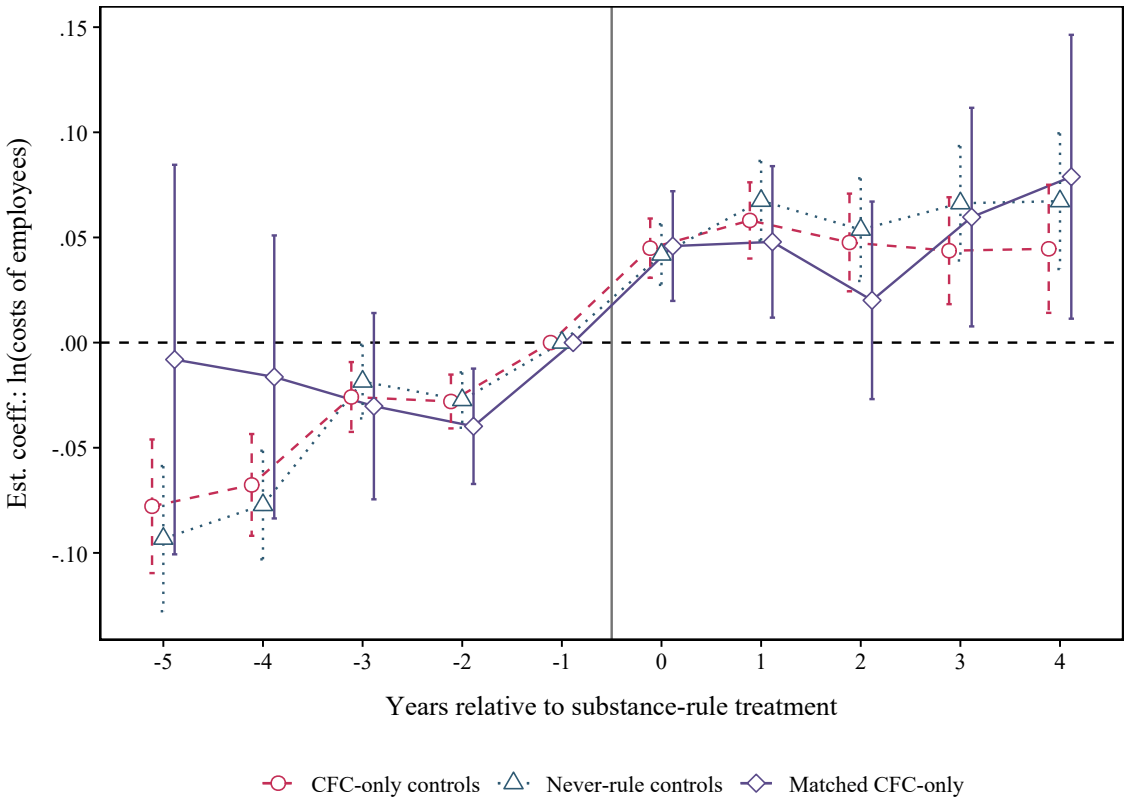
	CFC-Only		Never-Rule		Matched	
	(1) TWFE	(2) DCDH	(3) TWFE	(4) DCDH	(5) TWFE	(6) DCDH
Substance Rule	0.144***	0.108***	0.148***	0.135***	0.056***	0.067***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.013)	(0.018)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	827,771	690,365	511,584	405,483	69,638	53,767
Affiliates	126,363	126,363	101,899	101,899	10,353	10,353
p(joint placebo)	–	0.000	–	0.000	–	0.069

Note: Affiliate-level data from Orbis for the years 2010–2023. *Substance Rule* indicates that the affiliate's parent country operates a substance requirement and the affiliate's statutory tax rate lies below that parent's threshold. Columns (1) and (2) use as controls affiliates whose parent country operates a CFC rule but no substance requirement; columns (3) and (4) use affiliates whose parent country operates neither rule; columns (5) and (6) use CFC-only controls matched to the treated affiliates within cohort year and host country on log total assets in the year before treatment, with a caliper of 0.25 of a pooled standard deviation. TWFE columns report two-way fixed-effects estimates. DCDH columns report the average total effect of the heterogeneity-robust estimator of De Chaisemartin and D'Haultfœuille (2024), estimated with five post-treatment effects and four placebos. All outcome variables are transformed by the natural logarithm and winsorised at the 1st and 99th percentiles. All columns include affiliate and year fixed effects; standard errors are clustered at the MNE (GUO) level. p(joint placebo) is the p-value of the joint test that all four placebo estimates equal zero; it is not defined for the two-way fixed-effects columns. ***, ** and * indicate significance at the 1%, 5% and 10% levels.

Costs of Employees. The event study in Figure 4.10 shows that the non-matched samples have significant pre-trends also in this cae, and the matched sample now has a significant estimate for the last year before treatment. Upon becoming subject to a substance rule, the event-study coefficients show a significant increase in the costs of employees.

Table 4.6 estimates that upon becoming subject to a substance rule, the costs of employees increase significantly under all specifications. Against the CFC-only control group in column (2), the costs of employees increase by 5.9 percent. Against the never-treated in column (4), this difference is 7.0 percent. In the matched sample in column (6), the costs of employees increase by 5.9 percent.

Figure 4.10: Intensive Margin: Costs of Employees



Note: Affiliate-year level data from Orbis over 2010–2023. Dynamic estimates using De Chaisemartin and D'Haultfœuille (2024) for the natural logarithm of the costs of employees for each of the three control groups. Includes affiliate and year fixed effects. 90% confidence intervals from standard errors clustered at the MNE level.

Table 4.6: Investment in Costs of Employees: Substance Rules

	CFC-Only		Never-Rule		Matched	
	(1) TWFE	(2) DCDH	(3) TWFE	(4) DCDH	(5) TWFE	(6) DCDH
Substance Rule	0.085***	0.059***	0.105***	0.070***	0.080***	0.059**
	(0.010)	(0.012)	(0.010)	(0.013)	(0.018)	(0.025)
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	594,899	497,348	341,222	271,447	57,037	44,476
Affiliates	87,396	87,396	64,366	64,366	8,059	8,059
p(joint placebo)	–	0.000	–	0.000	–	0.181

Note: Affiliate-level data from Orbis for the years 2010–2023. *Substance Rule* indicates that the affiliate's parent country operates a substance requirement and the affiliate's statutory tax rate lies below that parent's threshold. Columns (1) and (2) use as controls affiliates whose parent country operates a CFC rule but no substance requirement; columns (3) and (4) use affiliates whose parent country operates neither rule; columns (5) and (6) use CFC-only controls matched to the treated affiliates within cohort year and host country on log total assets in the year before treatment, with a caliper of 0.25 of a pooled standard deviation. TWFE columns report two-way fixed-effects estimates. DCDH columns report the average total effect of the heterogeneity-robust estimator of De Chaisemartin and D'Haultfœuille (2024), estimated with five post-treatment effects and four placebos. All outcome variables are transformed by the natural logarithm and winsorised at the 1st and 99th percentiles. All columns include affiliate and year fixed effects; standard errors are clustered at the MNE (GUO) level. p(joint placebo) is the p-value of the joint test that all four placebo estimates equal zero; it is not defined for the two-way fixed-effects columns. ***, ** and * indicate significance at the 1%, 5% and 10% levels.

The results in this section are in line with the model's predictions. A substance requirement makes the exemption from the CFC rule conditional on real activity in the tax-haven affiliate. Affiliates that enter the scope of the substance rule increase both capital and labor relative to otherwise similar affiliates facing a CFC rule without such a test. Taken together with the extensive-margin results in Section 4.6.3, the estimates suggest that MNEs close some of their tax-haven affiliates, and invest more in the ones they keep. That is the mechanism that the model in Section 4.4 describes, and it shows that substance rules affect MNE group structures.

4.8 The Spillover Effect

4.8.1 Measuring Investment in Unaffected Affiliates

Hypothesis 3 asks whether real investment in affiliates not subject to a substance rule changes when a different affiliate of the same multinational group is brought within the scope of a rule. To test this, treatment is defined as follows: an affiliate is exposed in year t when *another* affiliate in the MNE group becomes subject to a substance requirement in that year.

The outcome variables are the same three as in Section 4.7.1—the natural logarithm of tangible fixed assets, of the number of employees and of the cost of employees, each winsorized at the first and ninety-ninth percentiles. 21,952 tax-haven affiliates and 150,391 other affiliates are exposed to within-MNE substance treatment at some point. Because Orbis does not report every outcome for every affiliate, the samples for analysis rely on smaller numbers.

4.8.2 Identification

I estimate whether outcomes in unaffected affiliates change once another affiliate within the group becomes subject to substance rules,

$$Y_{i,t} = \gamma \, GroupSubstance_{i,t} + \alpha_i + \delta_t + \varepsilon_{i,t}, \tag{4.9}$$

with i for the affiliate and t for the year. $GroupSubstance_{i,t}$ indicates that another affiliate in affiliate i's group is within the scope of a substance requirement. The affiliate fixed effects α_i absorb time-invariant differences between affiliates and the year effects δ_t common trends, as in equation (4.8). Standard errors are clustered at the MNE level.

If the MNE shifts real activity out of its high-tax affiliates, the estimate would be $\gamma < 0$ (Buettner et al., 2018; Suárez Serrato, 2019; Drake et al., 2022; Williams, 2018). Under complementarity of investment between tax-haven affiliates and productive affiliates, investment in treated and untreated affiliates moves together and $\gamma > 0$ in both (Hong and Smart, 2010).

I use two control groups. MNE groups with affiliates that are subject to substance rules are substantially larger than groups that do not have substance-treated affiliates. Therefore, I first report estimates using all never-exposed groups. Second, I report estimates using a matched control group, in which each exposed group is paired with an MNE group subject to a CFC rule but never to a substance requirement. I exact-match on cohort-year and country, as well as log total assets.

As on the intensive margin, exposure is staggered and non-absorbing, so I report the two-way fixed-effects estimator alongside the heterogeneity-robust estimator of De Chaisemartin and D'Haultfœuille (2024), with 5 post-treatment effects and 4 placebos.

4.8.3 Investment in Unaffected Affiliates

Figure 4.11 reports estimated coefficients for an event-study based on equation (4.9). The results for tangible fixed assets are insignificant across specifications. Some of the estimated coefficients for the number of employees are significant in later years.

Table 4.7 reports the difference-in-differences estimates of equation (4.9). Panel A compares exposed MNEs with never-exposed MNEs. For tangible fixed assets, the results are insignificant across specifications. The two-way fixed-effects estimates are positive and significant for the number of employees (0.021) and employee costs (0.014), while the heterogeneity-robust estimates are negative and significant (-0.016 and -0.019).

MNEs with substance-treated affiliates are larger, which is why I also obtain results for a matched sample. This reduces the sample to 3,070 matched MNEs, but the pre-trends in Figure 4.12 are insignificant. Now, all estimated coefficients are insignificant as well.

The difference-in-differences estimates are reported in Panel B of Table 4.7. The TWFE estimates for the number of employees and the costs of employees are positive and significant, but since treatment is staggered, I prefer to rely on the estimates using De Chaisemartin and D'Haultfœuille (2024). Those estimates are all insignificant.

Taken together, the estimates in this section suggest that there is no significant evidence for an investment-shifting effect.

Table 4.7: Investment Shifting in High-Tax Affiliates: Substance Rules

	Tangible Fixed Assets		Number of Employees		Costs of Employees	
	(1) TWFE	(2) DCDH	(3) TWFE	(4) DCDH	(5) TWFE	(6) DCDH
Panel A: Unmatched control group						
Group-Substance	0.009	-0.014	0.021***	-0.016***	0.014**	-0.019***
	(0.010)	(0.011)	(0.006)	(0.006)	(0.007)	(0.007)
Observations	1,482,056	1,197,531	1,465,496	1,152,332	1,480,333	1,185,448
Affiliates	212,760	212,760	256,091	256,091	206,381	206,381
p(joint placebo)	–	0.704	–	0.005	–	0.045
Panel B: Matched control group						
Group-Substance	-0.001	-0.019	0.027***	0.011	0.024**	-0.008
	(0.014)	(0.018)	(0.010)	(0.010)	(0.010)	(0.014)
Observations	300,056	238,468	237,056	184,085	200,374	158,854
Affiliates	39,977	39,977	38,216	38,216	26,330	26,330
p(joint placebo)	–	0.497	–	0.447	–	0.451
Affiliate FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: Affiliate-level data from Orbis for the years 2010–2023. *Group-Substance* indicates that another affiliate in the same group is within the scope of a substance requirement in that year. MNE group composition is fixed in the first observed year. Panel A compares exposed MNEs with all MNEs never exposed to a substance requirement. Panel B restricts the comparison to 3,070 matched MNEs. I match CFC-treated MNEs on cohort, affiliate country, and total assets within a caliper of 0.25 pooled standard deviations. TWFE columns report two-way fixed-effects estimates and DCDH columns the average total effect of the heterogeneity-robust estimator of De Chaisemartin and D'Haultfœuille (2024), estimated with 5 post-treatment effects and 4 placebos. All outcome variables are transformed by the natural logarithm and winsorised at the 1st and 99th percentiles. All columns include affiliate and year fixed effects; standard errors are clustered at the MNE (GUO) level. ***, ** and * indicate significance at the 1%, 5% and 10% levels.

Figure 4.11: Investment Shifting, Unmatched Control Group

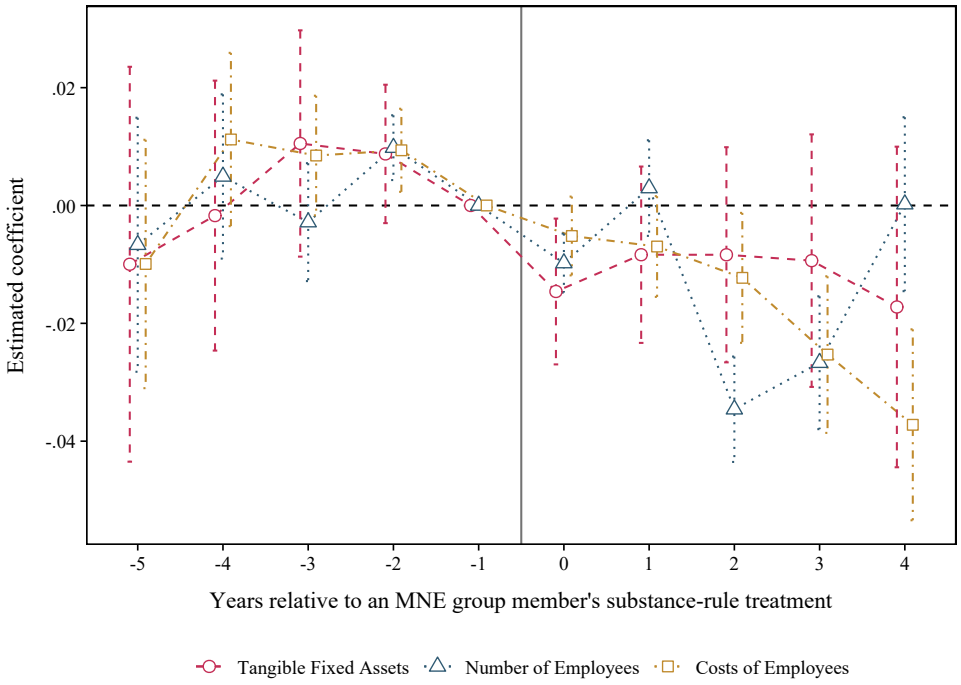
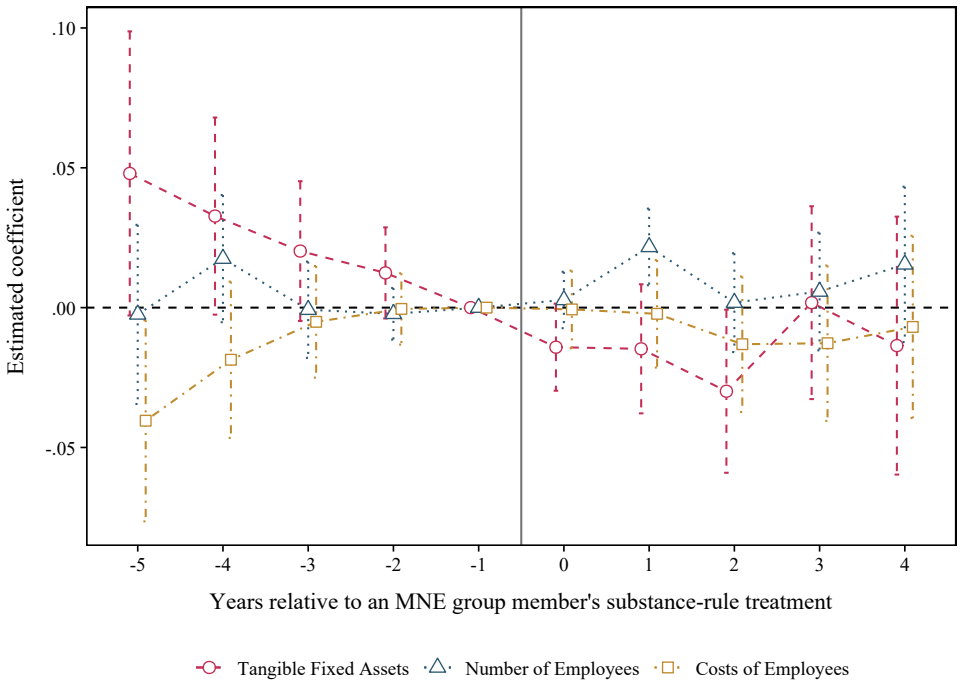


Figure 4.12: Investment Shifting, Matched Control Group



Note: Affiliate-year level data from Orbis over 2010–2023. Dynamic estimates using De Chaisemartin and D'Haultfœuille (2024). Outcomes are the natural logarithm of tangible fixed assets (red, circles), the number of employees (blue, triangles) and the costs of employees (gold, squares). Exposure is another affiliate of the same MNE group becoming subject to a substance requirement, MNE group composition is fixed in the first-observed year. Includes affiliate and year fixed effects. 90% confidence intervals from standard errors clustered at the MNE level.

4.9 Conclusion

Countries have implemented CFC rules to target MNEs' shifting of passive income to low-tax countries. Many countries provide exemptions to CFC rules in case an MNE proves that an affiliate has sufficient substance to plausibly carry out real economic activity. This substance exemption incentivizes MNEs to increase real investment in low-tax countries to facilitate profit shifting.

In this paper, I modeled the effect of substance rules on real investment in fixed assets and employment in tax-haven affiliates. The model predicts that a CFC rule should decrease real investment in tax-haven affiliates, because profit shifting becomes less attractive. However, if there is a substance exemption, investment in tax-haven affiliates should increase. The reason for this effect is that convincing tax authorities that real economic activities are being carried out in a tax-haven affiliate allows the MNE to avoid application of the CFC rule.

Using data from Orbis, I text the model's predictions. On the extensive margin, substance rules decrease the share of affected affiliates in the MNE group. The intensive-margin results then suggest that the MNE then concentrates investment in remaining tax-haven affiliates to satisfy the substance requirement.

The reason to implement substance rules is to ensure that anti-profit shifting rules have a carve-out for genuine economic activities (OECD, 2015, p. 16). The results in this paper indicate that substance rules may increase real investment in tax-haven affiliates. Importantly, it seems that there is no investment shifting from non-affected (high-tax) affiliates to tax-haven affiliates.

4.A Deriving the Net Profits Shifted per Affiliate

This appendix derives the shifting benefit per tax-haven affiliate, equation (4.3), from the optimal profits shifted in equation (4.2). Using the after-tax profit of each productive affiliate in equation (4.2), the MNE's after-tax profit, before it chooses k_j and h, is

$$\Pi = (1 - t_i)m_i + \sum_{j=1}^{h} \left[\int_{\hat{x}_-}^{\hat{x}_+} \frac{1}{2} \left(t_i - t_j - \frac{\bar{\alpha}}{k_j} \right)^2 dx - \frac{\phi k_j^2}{2} \right], \tag{4.10}$$

where the first term is after-tax profit from production and the second collects, for each tax-haven affiliate j, the shifting benefits of the productive affiliates it serves net of its fixed cost. The limits $\hat{x}_-$ and $\hat{x}_+$ are the productive affiliates that are just indifferent between two closest-by tax-haven affiliates.

A productive affiliate is indifferent between two tax-haven affiliates where its after-tax profits are equalized, $\pi^*_{i,j} = \pi^*_{i,j+1} = \pi^*_{i,j-1}$. Solving the upper- and lower-bound indifference conditions yields

$$\hat{x}_+ = \frac{k_j^2}{2\bar{\alpha}} \left[t_j - t_{j+1} + \frac{\bar{\alpha}}{k_j} z_j + \frac{\bar{\alpha}}{k_j} z_{j+1} \right], \qquad \hat{x}_- = \frac{k_j^2}{2\bar{\alpha}} \left[-t_j + t_{j-1} + \frac{\bar{\alpha}}{k_j} z_j + \frac{\bar{\alpha}}{k_j} z_{j-1} \right].$$

Assuming the tax-haven affiliates are symmetric, $t_j = t_{j+1} = t_{j-1}$ and using that the Salop circle has measure one, the limits simplify to $\hat{x}_+ = \frac{1}{2h}$ and $\hat{x}_- = -\frac{1}{2h}$. Evaluating the integral in equation (4.10) over $[\hat{x}_-, \hat{x}_+]$ then yields the shifting benefit per tax-haven affiliate in equation (4.3).

4.B Tables

Table A1: CFC Rules

Country	CFC Rule	Year	Substance Rule	Tax Rate Threshold
Argentina	Yes	1999	Subjective	75% of Argentinian ETR
Australia*	Yes	1990	No	no threshold
Austria*	Yes	2019	Subjective	12.5% ETR
Belgium*	Yes	2017	No	50% of Belgian ETR
Brazil*	Yes	1995	No	no threshold
Bulgaria*	Yes	2019	Subjective	lower than Bulgarian ETR
Canada	Yes	1976	Safe Harbour	no threshold
Chile	Yes	2014	Subjective	30% ETR
China*	Yes	2008	Subjective	12.5% ETR
Colombia*	Yes	2017	Subjective	no threshold
Croatia*	Yes	2019	Subjective	lower than Croatian ETR
Cyprus*	Yes	2019	Subjective	50% of Cypriotic ETR
Czech Republic*	Yes	2019	Subjective	50% of Czech ETR
Denmark*	Yes	1995	No	no threshold
Estonia*	Yes	2000	Subjective	no threshold
Finland*	Yes	1995	Subjective	60% of Finnish ETR
France*	Yes	1980	Subjective	50% of French tax rate
Germany*	Yes	1972	Subjective, EEA only	25% of German tax rate
Greece*	Yes	2014	Subjective, EEA only	50% of Greek ETR
Hungary*	Yes	2017	Safe Harbour	50% of Hungarian ETR
Iceland*	Yes	2010	No	66.67% of Icelandic tax rate
Indonesia	Yes	1995	No	no threshold
Ireland*	Yes	2019	Subjective	lower than Irish ETR
Israel	Yes	2003	No	15% ETR
Italy*	Yes	2001	Subjective	50% of Italian ETR
Japan*	Yes	1978	Subjective	20% absolute ETR
Kazakhstan*	Yes	1995	No	10% absolute ETR
Latvia*	Yes	2019	Subjective	lower than Latvian ETR
Lithuania*	Yes	2004	Subjective	50% of Lithuanian ETR
Luxembourg*	Yes	2019	No	lower than Luxembourg ETR
Malta*	Yes	2019	Subjective	lower than Maltese ETR
Mauritius*	Yes	2019	No	50% of Mauritian tax rate
Mexico*	Yes	1997	Subjective	75% of Mexican ETR
Netherlands*	Yes	2019	Subjective	9% absolute tax rate

Table A1 continued from previous page

Country	CFC Rule	Year	Substance Rule	Tax Rate Threshold
New Zealand*	Yes	1988	No	no threshold
Norway*	Yes	1992	Subjective, EEA only	66.67% of Norwegian ETR
Pakistan	Yes	2019	No	60% of Pakistani ETR
Peru	Yes	2013	No	75% of Peruvian ETR
Poland*	Yes	2015	Subjective, EEA only	75% of Polish ETR
Portugal*	Yes	1995	Subjective	50% of Portugese ETR
Romania*	Yes	2018	Subjective, EEA only	lower than Romanian ETR
Russia*	Yes	2015	No	75% of Russian tax rate
Slovak Republic*	Yes	2019	Subjective	lower than Slovakian ETR
Slovenia*	Yes	2019	Subjective	50% of Slovenian ETR
South Africa	Yes	1997	Safe Harbour	75% of South African ETR
South Korea*	Yes	1995	Subjective	15% absolute ETR
Spain*	Yes	1995	Subjective	75% of Spanish ETR
Sweden*	Yes	1989	Subjective, EEA only	55% of Swedish tax rate
Türkiye*	Yes	2006	No	10% ETR
United Kingdom*	Yes	1984	Subjective	75% of UK CIT rate
United States	Yes	1962	No	90% of US ETR

Note: The table shows data on CFC rules and substance rules from OECD (2024), in addition to hand-collected data from national CFC legislation. The data relates to the analysed sample from Orbis for the years 2010–2023 on the observed parent countries for both Global Ultimate Owners and Immediate Shareholders. An asterisk (*) indicates that the sample observes affiliates located in this country; 9 of the 51 countries are observed as parent countries only. *CFC Rule* indicates that a country has implemented CFC rules. *Year* shows the year of introduction of the CFC rule. *Substance Rule* indicates whether a country has implemented a substance rule and what it looks like. Subjective rules require testing the specific facts and circumstances. Safe Harbour rules are fixed thresholds. *Tax Rate Threshold* indicates the threshold below which a Controlled Foreign Company becomes subject to CFC rules. These thresholds can be absolute or relative, and can be based on statutory or effective tax rates.

Table A2: Other Countries with Affiliates in Sample

Country			
Albania	Egypt	Moldova	Switzerland
Bahamas	Gibraltar	Montenegro	Taiwan
Barbados	Guernsey	Morocco	Ukraine
Bermuda	Hong Kong	North Macedonia	United Arab Emirates
Bosnia and Herzegovina	India	Philippines	Uruguay
British Virgin Islands	Jersey	Serbia	
Cayman Islands	Malaysia	Singapore	

Note: Table shows the additional countries in which the sample observes affiliates and which do not have a CFC rule in place. Data from Orbis for the years 2010–2023.

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