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Could Country-by-Country Reporting Increase Profit Shifting?

Abstract

Since 2016, Country-by-Country reporting has provided tax authorities with detailed information about multinationals' worldwide activities. It has been hailed as a game-changer for corporate taxation, enabling tax authorities to target multinational firms with high profits in tax havens. We model Country-by-Country reporting as increasing both tax planning and audit costs for profit-shifting multinationals, where the latter costs depend on the share of profits held in tax havens. Then, Country-by-Country reporting makes shifting profits from a high-tax country to a tax haven relatively more attractive than shifting from a low-tax country to a tax haven—a substitution effect. Thus, while the total amount of profits shifted to the tax haven decreases, 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 staggered difference-in-differences design. The opposing effects for low-tax and high-tax countries also help explaining the mixed findings of previous empirical studies on Country-by-Country reporting.

JEL-Codes: H250, H260, F230.

Keywords: country-by-country-reporting, profit shifting, anti-tax-avoidance rules.

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1 Introduction

The introduction of global Country-by-Country (CbC) reporting is a major breakthrough in the quest to illuminate global activities, profits, and tax payments of multinational corporations (MNCs). For the first time, large MNCs have to provide information on their activities in other countries. Even though this information has largely been provided only to tax authorities, tax audits can now be targeted precisely to those firms that report substantial profits in tax havens. Yet, surprisingly, the empirical evidence on the effectiveness of CbC reporting in increasing MNCs' tax payments is, at best, mixed: After the introduction of CbC reporting, consolidated effective tax rates (ETRs) of affected MNCs increased slightly (Joshi, 2020; Hugger, 2020, 2024); but total tax payments by firms did not (Hugger, 2020). (Public) CbC reporting in the financial sector did not increase consolidated ETRs (Joshi et al., 2020; Overesch and Wolff, 2021). Generally, CbC reporting did, however, have some effect on tax-haven activities (De Simone and Olbert, 2022).

Our paper reconciles these mixed findings by pointing out that CbC reporting affects profit-shifting incentives in several ways. The core idea of our paper is to separate the costs associated with profit shifting into two components: *tax planning costs*, such as costs for consultants and lawyers to justify the deviation from arm's length prices, and *audit costs*. Being audited by the tax authority is costly because it requires resources; and the costs increase with the intensity of the audit. If there is CbC reporting, the probability of being intensely audited increases when the firm shifts profits to the tax haven, as tax haven profits are now an observable indicator of profit shifting. In this setup, CbC reporting has two effects on profit shifting. First, a *direct effect* mitigates all profit shifting (to tax havens): CbC reporting increases the (expected) costs of shifting profits to the tax haven. Second, a *substitution effect* interlinks shifting decisions across all affiliates: Since audit costs increase with the total amount of profits in the tax havens, it becomes cost-efficient to shift profits from high-tax countries, where the tax savings are greater, rather than from low-tax countries. It may even imply that firms shift profits from high-tax to lower-tax countries, instead of to the tax haven.

We derive these results in a simple model of an MNC with one affiliate each in a high-tax country (say, Germany), a low-tax country (say, Poland), and a tax haven (say, the Cayman Islands). The MNC can manipulate payments related to, for example, intellectual property, to shift profits. In the absence of CbC reporting, the decisions to shift profits from the high-tax and the low-tax affiliate are separate from each other. For each affiliate, it is optimal to shift profits to the tax haven as long as the tax savings for the last euro shifted are higher than the marginal tax planning and audit costs of this affiliate. In contrast, with CbC reporting, the profit-shifting decisions of both affiliates become interlinked because audit costs depend on *total* profits in the tax haven. This makes shifting from the high-tax country relatively more profitable than shifting from the low-tax country, as the tax savings are higher. Given

the higher cost of reporting profits in tax havens resulting from CbC reporting, the MNC lowers shifting from the low-tax affiliate to exploit the tax shield in the high-tax affiliate to a larger extent, while keeping overall audit costs in check.

As a result, profit shifting to tax havens decreases with CbC reporting, and effectively, tax-haven affiliates might even cease to exist: If audit costs are substantial, it may be optimal to shift profits from the high-tax affiliate to the low-tax affiliate instead of to the tax haven. Low-tax countries benefit disproportionately from the effects triggered by CbC reporting: Less profit is shifted away from these countries, and they may even receive profits shifted out of the high-tax country. In contrast, high-tax countries benefit less, and under certain, quite plausible conditions, high-tax countries are worse off and lose tax base as a result of CbC reporting.[1]

To confirm our theoretical mechanism, we conduct an empirical analysis using unconsolidated data from Orbis on 50,128 affiliates belonging to 6,228 MNCs headquartered worldwide. In a dynamic difference-in-differences analysis around the introduction of CbC reporting, we compare affiliates of MNCs who become subject to CbC reporting to those who do not. Based on the results of our analytical model, we separately analyze low-tax and high-tax affiliates, based on the median tax rate that the MNC faces among its affiliates. We find that after the introduction of CbC reporting, the profitability of low-tax affiliates increases (indicating that they shift less profit to tax havens). In contrast, the profitability of high-tax affiliates decreases after the introduction of CbC reporting (indicating that they shift more profit to tax havens or to low-tax countries). These opposing results for low-tax and high-tax affiliates align with our model's predictions and help explain the small and inconsistent results from previous empirical studies, which did not separate low-tax and high-tax countries but analyzed all non-tax havens jointly.

Our paper contributes to two strands of literature. First, we add to the literature studying CbC reporting by clarifying how CbC reporting affects profit-shifting incentives. Several previous papers have studied related questions empirically. We discuss this literature in more detail in Section 3. To summarize, there is limited empirical evidence for the effectiveness of CbC reporting in increasing MNCs' ETRs (Hugger, 2020; Joshi, 2020) or in decreasing tax-motivated profit shifting (Nessa et al., 2024; Joshi, 2020). De Simone and Olbert (2022) study the effects of CbC reporting on economic activity of European MNCs. They find that capital and labor expenditures in Europe increase. In particular, capital and labor are shifted towards countries with preferential tax regimes, whereas affiliates in tax havens are closed.

[1]Our findings have broader implications for the implementation of CbC reporting. While 147 countries and jurisdictions participate in the OECD/G20 Inclusive Framework on BEPS, only 102 had introduced mandatory CbC reporting by 2022 (OECD, 2023). Notably, some jurisdictions, including high-tax countries like the U.S., have chosen not to exchange CbC reports automatically. This suggests that missing jurisdictions are not only tax havens but also high-tax countries concerned about the impact on their tax base.

In contrast, Nessa et al. (2024) do not report evidence of such reallocation of activities for U.S. MNCs. Our analysis offers mechanisms that can explain the empirical observations.

Second, we contribute to the theoretical literature studying the incentives (and design) of anti-tax avoidance rules. Peralta et al. (2006) show that countries might use weak transfer pricing regulation to attract mobile capital. Nielsen et al. (2022), however, point out that investment effects of transfer pricing critically depend on the transfer pricing method used and on the exact specification of the model. With respect to thin capitalization rules, Haufler and Runkel (2012) highlight that countries will weaken thin capitalization rules to lower effective capital costs for MNCs and attract mobile capital. Focusing on the design of thin capitalization rules, Gresik et al. (2017) and Mardan (2017) document that earnings stripping rules are preferable over safe harbor rules when transfer pricing matters. The former rules target both debt shifting and transfer pricing. That is beneficial because transfer pricing allows for more aggressive profit shifting and only has a weak to no effect on investment. Finally, Haufler et al. (2018) provide an economic rationale for implementing CFC rules in addition to thin capitalization (or transfer pricing) rules. CFC rules allow for optimal discrimination between home-based and foreign-based MNCs to target investment incentives. All these papers document that anti-avoidance rules effectively reduce profit shifting, but might have some adverse effects on investment. We add that a specific anti-avoidance rule, namely CbC reporting, can even imply an increase in profit shifting in some countries.

We next discuss the history and current status of CbC reporting in Section 2. In Section 3, we review related literature. Subsequently, in Section 4, we set up a stylized model of profit shifting. Section 5 analyzes the effect of CbC reporting on profit shifting and derives conditions under which profit shifting from the high-tax country increases as a result of CbC reporting. We highlight links of our theoretical analysis to previous empirical findings in Section 6. We provide our own empirical analysis reconciling previous findings in Section 7. Section 8 concludes.

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.[2] An MNC is obliged to submit a CbC report in the year after its consolidated global revenues exceed EUR 750

[2]As of spring 2024, 145 countries are part of the Inclusive Framework on BEPS. By 2022, 102 jurisdictions had implemented CbC reporting in their domestic tax legislation, see OECD (2023, Figure 5.1).

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). OECD (2018) 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.

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.[3]

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. 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.[4] The tax authorities then forward the CbC report to all other participating countries where the MNC is active.

The OECD BEPS Action 13 only requires 'private' CbC reporting: Tax authorities share CbC reports only with each other and not with the public. The alternative is 'public' CbC reporting, which the EU recently adopted and began implementing in 2024.[5] In the following, we focus on private CbC reporting, and our model analyzes how the MNC's audit costs change because of the additional transparency towards tax authorities. Public CbC reporting

[3]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.

[4]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.

[5]Since 2014, banks in the EU had to make CbC reports public (see, e.g., Overesch and Wolff, 2021).

additionally triggers public scrutiny and can lead to a 'shaming effect' that may generate reputational costs. We neglect this channel in our analyses.[6]

3 Literature on CbC Reporting

Previous literature studying private CbC reporting has analyzed whether it is an effective measure against profit shifting. This literature is more or less exclusively empirical.[7] Joshi (2020) uses the revenue threshold in the CbC reporting scope in regression discontinuity and difference-in-difference designs. She finds a significant but modest increase in affected MNCs' ETRs. However, she does not find significant evidence that pre-tax earnings increase after MNCs become subject to CbC reporting and concludes that there is no robust evidence for a decrease in profit shifting. Through mechanism analysis, Joshi (2020) suggests that tax enforcement is the primary channel through which CbC reporting could disincentivize tax avoidance. Hugger (2020) estimates a difference-in-difference model in which all firms not obligated to file a CbC report—due to their location or size—form the control group. He finds an increase in consolidated ETRs of MNCs exposed to CbC reporting. ETRs increase more in firms that were not previously subject to reporting obligations, which Hugger (2020) interprets to be the result of a larger increase in detection probability for these MNCs. However, the study also finds that neither overall tax payments at the group level nor the ETRs of individual affiliates increase.

Hugger (2024) uses a bunching analysis to show that there is significant regulatory avoidance, meaning that MNCs avoid becoming subject to CbC reporting by reporting consolidated revenue below the EUR 750 million threshold. Regarding the effect of CbC reporting on tax avoidance, Hugger (2024) uses a difference-in-difference design to show that ETRs of MNCs that do become subject to CbC reporting increase significantly. In a back-of-the-envelope calculation, he further shows that for the average MNC, the costs of complying with CbC reporting roughly equal the costs of regulatory avoidance by foregoing or delaying profit realization.

De Simone and Olbert (2022) focus on the effects of CbC reporting on economic activity, in particular, capital investment, employment, and organizational structure. They use a difference-in-difference and sharp regression discontinuity model around the EUR 750 million

[6]Recent empirical evidence suggests that consumers do not respond in a lasting manner to tax-aggressive behavior of firms (Asay et al., 2024) and that firms do not incorporate reputational concerns into their decisions on tax avoidance (Gallemore et al., 2014; Baudot et al., 2019).

[7]The only other theory paper that we are aware of is Martini et al. (2024). These authors model a two-country setting with CbC reporting and a tax rate differential to analyze the effects of mandatory fiscal arbitration on tax audit quality. They find that CbC reporting increases tax audit quality in the high-tax country because more detailed information raises tax audit effectiveness. In contrast, CbC reporting decreases tax audit quality in the low-tax country because it benefits from profit shifting. These results are consistent with our model.

threshold. They find an increase in capital and labor expenditures in Europe, especially in European countries with preferential tax regimes, which correspond to our low-tax countries. Additionally, De Simone and Olbert (2022) find that MNCs respond to CbC reporting by closing subsidiaries in tax havens.

Nessa et al. (2024) analyze the effect of CbC reporting on tax-motivated income shifting and the location of real activities for U.S. MNCs using administrative data from IRS Form 5471. They show that CbC reporting provides the IRS with incremental information related to activities in both low-tax and non-low-tax countries, but argue that it is unclear whether this information aids the IRS in targeting profit shifting. There is relatively little incremental information from CbC reporting in the U.S., because information regarding transfer pricing risks was already available to the IRS through Form 5471. The authors therefore suggest that it may be that U.S. MNCs perceive no decrease in the net benefits of profit shifting after the introduction of CbC reporting.[8] To assess whether CbC reporting affects tax-motivated income shifting, Nessa et al. (2024) use difference-in-difference and regression discontinuity models around the threshold of USD 850 million to analyze the MNCs' entries in Form 5471 with respect to net income before income tax expense and net transfer pricing payments. Their results do not provide evidence that CbC reporting reduces tax-motivated income shifting. Furthermore, the authors examine whether U.S. MNCs reallocate real activities as a response to CbC reporting. They do not find evidence that U.S. MNCs reallocate tangible assets and compensation expenses to support their tax avoidance by substantiating real economic activities.

The empirical literature on the EU Capital Requirements Directive (CRD) IV, which introduced public CbC reporting for the financial sector, also provides insight into the relationship between tax avoidance and transparency. Overesch and Wolff (2021) estimate a difference-in-difference 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 have to report on tax haven activities. The authors suggest three mechanisms behind this increase in ETRs: reputational damage, the disclosure of sensitive information to tax authorities, and the anticipation of potential future regulatory costs from new transparency regulations. 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

[8] In principle, this is not consistent with our model, which suggests that the added deterrent effect of CbC reporting arises from the additional sharing of information with foreign tax authorities. However, the U.S. has not joined the CbC Multilateral Competent Authority Agreement (MCAA). Instead, the U.S. only exchanges CbC reports with other jurisdictions if there is a bilateral information-sharing agreement (CbC CAA) based on a double tax convention that includes an information-sharing provision. This implies that for U.S. MNCs, the incremental risk from CbC reporting is lower, as the threat of information exchange has not significantly increased.

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.

Our paper can also be related to literature on other forms of geographic disclosure. According to U.S. Financial Accounting Standards, firms had to disclose their geographic earnings until 2008 (afterwards, disclosure was voluntary for most firms). Hope et al. (2013) study the relationship between firms' tax avoidance and these disclosure requirements, as well as mandatory tax reporting to the domestic tax authorities introduced in 2004 (IRS Schedule M-3). Their results indicate that firms that do not disclose geographic earnings have significantly lower ETRs than those that continue to disclose. The extent of profit shifting drives this difference. Furthermore, they find that non-disclosers have significantly more tax-haven affiliates. After the introduction of mandatory profitability reporting regarding foreign entities, the difference in ETRs only partially reverses. As foreign tax authorities do not receive the report, firms may continue to shift profits from high-tax foreign affiliates to low-tax foreign affiliates.[9]

4 A Stylized Model of Profit Shifting

To focus on the relevant effects of CbC reporting, we set up a simple, stylized model of profit shifting with one MNC that owns three affiliates and only makes decisions on profit shifting but not on economic activity. The model, however, contains all relevant aspects to analyze the incentive effects of CbC reporting on the MNC's profit-shifting decisions and the implications for the respective host countries of the affiliates.

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 $i = 1$ that faces a corporate tax rate $t_1 < t_L$ and serves as a profit center. All countries apply the tax exemption principle, which exempts profit distributions from affiliates. This implies that the MNC operates under a territorial tax system and that the location of the headquarters (henceforth HQ) is irrelevant for tax purposes.[10] Therefore, we assume—without loss of generality—that the parent firm is a pure holding company residing in any of the three countries.

[9]Studies of risk-based auditing also allow some inference about the likely effects of CbC reporting. Eberhartinger et al. (2021) use data on risk profiling, predictive modeling, and internal intelligence functions in tax authorities to provide evidence that risk-based tax audits are associated with lower tax avoidance and higher tax revenue. This is consistent with increased profit-shifting costs at the aggregate MNC group level.

[10]Since the United Kingdom and Japan switched to the exemption method in 2009, followed by the United States in 2017, the territorial tax system has clearly become the dominant approach for taxing MNCs in OECD countries. Only Chile, Israel, Mexico, and South Korea still apply worldwide taxation within the OECD. Markle (2016) and Langenmayr and Liu (2023) empirically confirm that profit shifting is a more significant issue under territorial taxation than under worldwide taxation.

The countries can agree on exchanging information on firms via incomplete or complete CbC reporting. With CbC reporting, the MNC needs to report activity and profitability per affiliate to the tax authorities in all countries where it owns affiliates. We model the completeness of CbC reporting by a continuous parameter $\alpha \in [0, 1]$. Depending on the share α, a national tax authority can (partially) infer profits of the MNC in the other countries, particularly in the tax-haven affiliate. In the case of $\alpha = 0$, there is no CbC reporting. For $\alpha = 1$, CbC reporting is complete, and national tax authorities have full information on reported profits worldwide.[11]

Each productive affiliate $i = H, L$ earns taxable profit π_i. The HQ can impose an additional overhead fee P_i for management services (or a trademark), payable to the profit center in the tax haven. Assuming that the economic value of the service (i.e., the arm's-length price) is equal to zero, any such payment P_i serves international profit shifting. Shifting income to the tax haven triggers both convex tax planning costs and convex audit costs. Tax planning costs capture the costs related to the ex-ante business decision, whereas 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 A, we present an alternative, multiplicative specification that results qualitatively in the same effects.[12] Let us now discuss the tax planning and audit costs in turn.

Tax planning costs comprise compliance costs and costs for consultants and lawyers to disguise and justify the deviation from the true arm's-length price because the exact value of the transfer price is unknown to the tax authorities.[13] We follow previous literature in modelling tax planning costs, based on the application of the standard OECD transfer pricing methods (Juranek et al., 2018): Assuming that transfer pricing takes place via an intangible asset, we define convex tax planning (or 'concealment') costs C^C over the level of shifted profits P. Thus, tax planning costs in country i are $C_i^C = C_i^C(P_i)$. 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

[11] An interpretation of imperfect CbC reporting would be that a country does not automatically exchange CbC reports, or through a different channel than the OECD MCAA. Alternatively, one could interpret imperfect CbC reporting as a situation where a country officially participates in CbC reporting but does not rigorously verify the quality of the MNCs' reports, allowing firms to submit incomplete or inaccurate data, which reduces the effectiveness of the information exchange.

[12] In that specification, the 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 simple setting with additive cost components and only sketch some of the effects under the alternative specification in Appendix A.

[13] For related literature on the costs of transfer pricing, see, for example, Haufler and Schjelderup (2000) and Gresik and Osmundsen (2008). Tax planning costs also include the costs related to double taxation, see Martini et al. (2024).

country i are

$$C_i^C = C^C(P_i) = \frac{\theta}{2} P_i^2,\ i = H, L, \tag{1}$$

where θ represents a cost parameter that captures the difficulty of enabling and justifying profit shifting and the tightness of transfer pricing regulation.[14] To simplify the formal analysis and the exposition, we follow the main body of the literature and assume that the cost parameter is homogeneous across countries. In reality, there can be relevant cost differences across countries, and we analyze the case of heterogeneous tax planning costs in Appendix B. There, and in simulations in Appendix C, we show that the results of the simpler homogeneous case carry over to the more general case of cost heterogeneity under mild, realistic assumptions.

Tax audit costs capture the costs that arise when an MNC faces a tax audit. An audit is costly because it requires resources and might disrupt production.[15] The more the tax authority perceives the MNC to be tax aggressive, the more frequent, intensive and thorough tax audits will be. The more intense the tax audit, the more resources the MNC needs to spend on handling the tax auditors, fulfilling documentation requests, and the more likely are costly settlements. All of these aspects result in convex audit costs.[16]

Importantly, CbC reporting provides additional information for the tax authorities to decide whether (or, more generally: which firm) to audit and how much of its scarce resources to spend on a specific MNC. The tax authority will target those cases intensely that it perceives as problematic, that is, for which it expects the highest adjustment in taxable income, and thus tax payments.[17] We assume that a tax authority bases its audit decision on a deviation from an average profit level in the domestic affiliate as long as the authority does not have any information on the activities and profits of the MNC in other countries ($\alpha = 0$). With CbC reporting ($\alpha > 0$), the tax authority can better infer how tax aggressive an MNC is and flag firms with high profits in tax havens. Higher tax haven profits are a strong signal

[14] Grubert (2003) interprets these costs as costs for 'greater than efficient' (Grubert, 2003, p. 224) levels of intercompany transactions, i.e., profit shifting through transfer pricing.

[15] Furthermore, an intense, large-scale tax audit can result in reputational costs, because the media might publicize the fact that an MNC is being audited.

[16] In many countries, large taxpayers are audited routinely, so that there will always be a fixed amount of audit costs. However, the intensity and cooperativeness of these audits can vary significantly. In this sense, the higher audit costs with CbC reporting stem from an increased audit intensity.

[17] Tørsløv et al. (2023a) argue that tax authorities in high-tax countries do not target transaction 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 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.

for tax revenue that can be recovered by a detailed, large-scale, and in-depth audit.[18] In our model, this implies that the tax authority bases the intensity of tax audits on the level of domestic profit shifting and a weighted level of profits shifted from the other productive affiliate to the tax haven.[19] The weight depends on the extent of CbC reporting. Specifically, with CbC reporting, the national tax authority in country i gathers information on profits $P_i + \alpha P_j$ accumulated in the tax-haven affiliate (depending on the level α of information sharing) and infers the total amount of profits shifted by the MNC. Higher profits in the tax-haven affiliate therefore signal a more tax-aggressive behavior and convexly increase audit costs.

Formally, we apply an audit cost function $C^A = C^A(P_i + \alpha P_j)$, defined over the available information regarding profit shifting in the MNC, and we assume a quadratic form for simplicity.[20] Thus,

$$C_i^A = C^A(P_i + \alpha P_j) = \frac{\theta_A}{2}\left(P_i + \alpha P_j\right)^2, \; i, j = H, L, \tag{2}$$

where θ_A is a parameter that captures how costly tax audits are for an MNC. Note that for full information exchange ($\alpha = 1$), the tax authorities have complete information about the profits in the tax-haven affiliate and can therefore base their tax audits on the sum of total haven profits $P_i + P_j$.

Given all our assumptions, global after-tax profits of the MNC are

$$\begin{aligned} \Pi &= (1 - t_H)\pi_H + (t_H - t_1)P_H - \frac{\theta}{2}P_H^2 - \frac{\theta_A}{2}\left[P_H + \alpha P_L\right]^2 \\ &+ (1 - t_L)\pi_L + (t_L - t_1)P_L - \frac{\theta}{2}P_L^2 - \frac{\theta_A}{2}\left[P_L + \alpha P_H\right]^2, \end{aligned} \tag{3}$$

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

[18] In our model, the tax authority effectively observes shifted profits when it observes tax haven profits. This does not drive our results, however. Even if we allow for some positive arm's-length payment P_0, our argument remains valid: Larger tax haven profits signal more profit shifting, because tax haven profits increase by the amount of shifted profits.

[19] Different from us, Grubert (2003) analyzes deviations in domestic average profit levels for domestic firms that engage in profit shifting versus firms that do not. Previously, i.e., without CbC reporting, it was only possible for national tax authorities to audit based on domestic profit levels.

[20] Our audit cost function implies zero audit costs if the firm does not shift profits. In reality, there can still be an audit (with associated costs), as the tax authority does not know ex-ante that the firm does not shift profits. Adding such a baseline audit probability does not change our results qualitatively, but complicates notation. We therefore set the baseline audit probability to zero.

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

$$\frac{\partial \Pi}{\partial P_H} = (t_H - t_1) - \left[\theta + \theta_A(1+\alpha^2)\right] P_H - 2\alpha\theta_A P_L = 0, \tag{4}$$

$$\frac{\partial \Pi}{\partial P_L} = (t_L - t_1) - \left[\theta + \theta_A(1+\alpha^2)\right] P_L - 2\alpha\theta_A P_H = 0. \tag{5}$$

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

Profit Shifting Without CbC Reporting. In the absence of CbC reporting ($\alpha = 0$), the profit-shifting decisions across affiliates are fully independent of each other, as the optimal level of shifted profits in a country i is given by

$$P_i = \frac{t_i - t_1}{\theta + \theta_A} \quad i = H, L, \quad \text{for} \quad \alpha = 0. \tag{6}$$

In the absence of CbC reporting, profit shifting increases with the domestic tax savings, i.e., the tax differential towards the tax haven, and decreases with marginal tax planning costs $\theta + \theta_A$. A direct implication is that the higher-taxed affiliate shifts more profits as it faces larger tax incentives to do so. Thus, $P_H > P_L$ for $t_H > t_L$.

As soon as domestic tax authorities can use information from CbC reporting ($\alpha > 0$), however, the national profit-shifting levels are interlinked through the audit cost function. We now turn to the effect of introducing CbC reporting.

5 The Effect of CbC Reporting on Profit Shifting

In this section, we first discuss the effects of CbC reporting in general. Then, we derive conditions under which the high-tax country does not only benefit relatively less than the low-tax country from CbC reporting, but loses tax revenues in *absolute* levels.

5.1 Profit Shifting with CbC reporting

CbC reporting introduces two effects on profit shifting. First, profit shifting becomes generally more expensive because CbC reporting increases the difficulty of concealing shifted profits.[21] This direct effect disincentivizes profit shifting, all else equal, in all non-haven affiliates. Second, there is a substitution (or rebalancing) effect because shifting from one non-haven affiliate additionally causes costs in the other non-haven affiliate as well, see the third terms

[21] Technically, the argument of the audit costs C^A increases for any $\alpha > 0$. This effect shows up via the α^2 expression in the second terms of the first-order conditions (4) and (5).

in the first-order conditions (4) and (5). All else equal, the substitution effect incentivizes increased shifting from the high-tax affiliate and reduced shifting from the low-tax affiliate. When CbC reporting becomes more comprehensive (i.e., α increases), the audit costs in *each* affiliate start to increase symmetrically with profits shifted from *any* affiliate. For complete CbC reporting (i.e., $\alpha = 1$), marginal audit costs for each shifted unit of profits are identical across affiliates and arise simultaneously in both affiliates. Intuitively, the MNC maximizes tax savings by shifting more from the high-tax affiliate while mitigating overall audit costs by reducing shifting out of the low-tax affiliate.[22]

The comparative-static analysis allows for identifying the responses to changes in profit-shifting incentives and the impact of the two mechanisms just identified by applying Cramer's Rule (see Appendix B). First, it is straightforward to derive some standard results. A higher tax burden t_1 in the tax haven always reduces profit shifting as

$$\frac{dP_H}{dt_1} = -\frac{\theta + (1-\alpha^2)\theta_A}{|H|} < 0 \quad \text{and} \quad \frac{dP_L}{dt_1} = \frac{\theta + (1-\alpha^2)\theta_A}{|H|} < 0, \tag{7}$$

where $|H| > 0$ from the second-order conditions of the maximization problem. The higher tax rate t_1 reduces marginal tax savings and makes profit shifting less attractive. Note that reduced shifting to the tax haven has a second-round effect, as also audit costs decrease when there is some CbC reporting (i.e., $\alpha > 0$). However, this indirect effect, triggered by the above-mentioned substitution effect, will never overcompensate the direct, negative effect.

Furthermore, profit shifting from an affiliate increases with the tax rate of that affiliate as

$$\frac{dP_H}{dt_H} = \frac{\theta + (1+\alpha^2)\theta_A}{|H|} > 0 \quad \text{and} \quad \frac{dP_L}{dt_L} = \frac{\theta + (1+\alpha^2)\theta_A}{|H|} > 0. \tag{8}$$

The increase in the domestic tax rate increases marginal tax savings. In addition, CbC reporting reinforces the effect of the domestic tax rate because interlinked audit costs make shifting from the affiliate in that country relatively more attractive (see the term related to α^2 again).

Finally, in a standard setting without CbC reporting (i.e., $\alpha = 0$), profit shifting only depends on the tax differential between the shifting affiliate and the tax-haven affiliate.[23] However, the independence of shifting incentives from tax rates other than the domestic and tax haven rates no longer holds if $\alpha > 0$, as CbC reporting links the audit costs between the two affiliates through the substitution effect. Indeed, a higher tax rate in one affiliate will

[22]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).

[23]The weighted tax rate differential, identified as the 'C measure' in Huizinga and Laeven (2008), does not apply in that case (Hopland et al., 2021).

decrease profit shifting in the other affiliate, whenever there is some CbC reporting ($\alpha > 0$):

$$\frac{dP_H}{dt_L} = \frac{dP_L}{dt_H} = -\frac{2\alpha\theta_A}{|H|} \leq 0. \tag{9}$$

Shifting profits from the now higher-taxed affiliate gets relatively more attractive. However, shifting more profits increases audit costs in all productive affiliates. Therefore, the firm shifts less profits from the other affiliate to mitigate overall audit costs.

Next, we turn to the most relevant effect for our purposes: How does introducing some CbC reporting (i.e., partial information exchange $\alpha > 0$) affect the profit-shifting behavior of the MNC? Putting the effects for both affiliates together shows that introducing some CbC reporting $\alpha > 0$ always reduces total profit shifting to the tax haven. Formally, we find (see Appendix B)

$$\frac{d(P_H + P_L)}{d\alpha} = -\frac{2\theta_A\left[\theta(1+\alpha)(P_H+P_L) + 2\theta_A(1-\alpha^2)(1-\alpha)(P_H+P_L)\right]}{|H|} < 0. \tag{10}$$

CbC reporting makes audits more targeted and increases total audit costs. As total costs increase, the global amount of profits shifted reduces.

Importantly, however, the effects on shifting are different for each affiliate, as we show next. Subtracting the first-order conditions, (4) − (5), leads to

$$P_H - P_L = \frac{t_H - t_L}{\theta + \theta_A(1-\alpha)^2} > 0. \tag{11}$$

There will always be a larger amount of income shifted from the high-tax affiliate than from the low-tax affiliate. In addition, the difference in shifting between affiliates increases with CbC reporting. The reason for this effect is straightforward. Under CbC reporting, any profit shifting causes additional audit costs in all affiliates. For $\alpha = 1$, the marginal audit costs of shifting from the high-tax or the low-tax affiliate become identical. For identical audit costs, all else equal, it pays off to shift from the high-tax affiliate because doing so generates higher tax savings than shifting from the low-tax affiliate (for the same amount of overall audit costs). Consequently, CbC reporting requirements make profit shifting from high-tax affiliates more attractive than from low-tax affiliates.

Formally, the differential between both affiliates increases in α, for a given tax differential, as

$$\frac{\partial(P_H - P_L)}{\partial\alpha} = \frac{2(1-\alpha)(t_H - t_L)}{\left[\theta + \theta_A(1-\alpha)^2\right]^2} > 0 \quad \text{for} \quad \alpha < 1. \tag{12}$$

Consequently, the difference between shifting from country H and shifting from country L is maximized for complete information exchange under CbC reporting, i.e., where $\alpha = 1$. Therefore, a second implication from our analysis so far is that the low-tax country gains relatively more tax base than the high-tax country from CbC reporting.

Now, we zoom into the absolute changes per country. How does the amount of profits shifted from the low-tax affiliate change in response to CbC reporting? Consider

$$\frac{dP_L}{d\alpha} = \frac{det_{P_L\alpha}}{|H|} = \frac{\begin{vmatrix} -\left[\theta + (1+\alpha^2)\theta_A\right] & 2\theta_A(\alpha P_H + P_L) \\ -2\alpha\theta_A & 2\theta_A(P_H + \alpha P_L) \end{vmatrix}}{|H|}, \tag{13}$$

where

$$\begin{aligned} det_{P_L\alpha} &= -\left[\theta + (1+\alpha^2)\theta_A\right] 2\theta_A(P_H + \alpha P_L) + 4\alpha\theta_\alpha^2(\alpha P_H + P_L), \\ &= -2\theta\theta_A(P_H + \alpha P_L) - 2\theta_\alpha^2(1-\alpha^2)(P_H - \alpha P_L) < 0, \, \forall\alpha \leq 1, \end{aligned} \tag{14}$$

as $P_H > P_L$ for $t_H > t_L$. Accordingly, CbC reporting unambiguously reduces profit shifting in the low-tax affiliate. The reason is twofold. First, CbC reporting causes higher audit costs, all else equal. Second, the substitution effect discussed above reduces shifting from the low-taxed affiliate even further.

We can also explicitly solve the first-order conditions for the optimal shifting in both affiliates. From equation (11) follows $P_H = P_L + \frac{t_H - t_L}{\theta + (1+\alpha^2)\theta_A}$, which can be substituted in equation (5) to identify

$$P_L^* = \frac{\left[\theta + (1-\alpha)^2\theta_A\right](t_L - t_1) - 2\alpha\theta_A(t_H - t_L)}{\left[\theta + (1+\alpha)^2\theta_A\right]\left[\theta + (1-\alpha)^2\theta_A\right]}. \tag{15}$$

The numerator N in equation (15) is positive for $\alpha = 0$ and monotonically decreasing in α as

$$\frac{\partial N}{\partial \alpha} = -2\theta_A\left[(1-\alpha)(t_L - t_1) + (t_H - t_L)\right] < 0. \tag{16}$$

If marginal audit costs θ_A are sufficiently large, P_L^* turns negative for some $\alpha > 0$ and remains negative when α increases further.

In the absence of CbC reporting, the low-tax affiliate will shift income to the tax haven. As profit-shifting costs are increasing and convex, it is optimal to shift profits from both affiliates. With CbC reporting, shifting from one affiliate increases audit costs for both affiliates. Therefore, the low-tax affiliate shifts less profits to the tax haven. If audit costs are substantial, it may even be optimal to shift profits from the high-tax affiliate to the low-tax affiliate (formally, in our model, the amount of profits shifted from the low-tax affiliate to the tax haven turns negative). In this case, the MNC sacrifices some tax savings $(t_L - t_1)$ to reduce overall audit costs. The smaller the tax differential between the low-tax affiliate and the tax haven, i.e., the smaller $t_L - t_1$, the more beneficial this inverted structure becomes

for the MNC.[24]

We state:

Proposition 1 *The introduction of Country-by-Country reporting may imply that multinationals shift profits to less-scrutinized low-tax affiliates instead of to the tax haven. As a consequence, 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 might eventually end up with no income. Hence, it provides a theoretical channel for the empirical finding in De Simone and Olbert (2022) that MNCs close subsidiaries in tax havens, and shift to affiliates in countries with preferential (low) tax regimes, in response to the introduction of CbC reporting. See Section 6 for more discussion of this link.

Finally, what happens in the high-tax affiliate? The change in shifting from the high-tax affiliate is given by

$$\frac{dP_H}{d\alpha} = \frac{det_{P_H\alpha}}{|H|} = \frac{\begin{vmatrix} 2\theta_A(\alpha P_H + P_L) & -2\alpha\theta_A \\ 2\theta_A(P_H + \alpha P_L) & -\left[\theta + (1+\alpha^2)\theta_A\right] \end{vmatrix}}{|H|}, \tag{17}$$

where

$$\begin{aligned} det_{P_H\alpha} &= -2\theta_A\left[\alpha P_H + P_L\right]\left[\theta + (1+\alpha^2)\theta_A\right] + 4\alpha\theta_A^2\left[P_H + \alpha P_L\right] \\ &= -2\theta\theta_A(\alpha P_H + P_L) + 2\theta_A^2(1-\alpha^2)(\alpha P_H - P_L). \end{aligned} \tag{18}$$

Two extreme cases are given by

$$det_{P_H\alpha}|_{\alpha=0} = -2\theta\theta_A P_L - 2\theta_A^2 P_L < 0 \quad \Rightarrow \quad \left.\frac{dP_H}{d\alpha}\right|_{\alpha=0} < 0, \tag{19}$$

$$det_{P_H\alpha}|_{\alpha=1} = -2\theta\theta_A(P_H + P_L) < 0 \quad \Rightarrow \quad \left.\frac{dP_H}{d\alpha}\right|_{\alpha=1} < 0. \tag{20}$$

Consequently, introducing some CbC reporting will always reduce profit shifting in the high-tax country because, for a low level of α, the effect from an increase in total costs dominates the substitution effect. Locally, complete information exchange ($\alpha = 1$) will also reduce profit shifting as the marginal substitution effect from increasing α at very high levels drops to zero for $\alpha = 1$ (see the second term in equation (18)). Importantly, however, the derivative in equation (18) is non-monotonic. For increasing α, both P_H and P_L will adjust, and the

[24]In this sense, there is some parallel of our CbC reporting framework to the 'C measure' and the weighted tax differential in Huizinga and Laeven (2008). Huizinga and Laeven (2008) effectively model transfer pricing in the case of intermediate goods (see also Hopland et al., 2021). To avoid excessive costs of profit shifting, the MNC will only shift profits out of high-tax affiliates, and the low-tax affiliates will turn into net receivers. Note that in our setting, CbC reporting causes this effect.

substitution effect pushes for a higher P_H and a lower P_L, all else equal. Consequently, for a medium value of CbC reporting (i.e., an intermediate value of α) and an audit cost parameter θ_A that is sufficiently large relative to the tax planning costs θ, there is a range for which a higher α locally triggers more extensive profit shifting in the high-tax affiliate.

To shed more light on this, we derive the explicit solution for shifting from the high-tax affiliate. Utilizing equation (11) in a similar way as before and substituting for P_L in the first-order condition (4), we can solve for the optimal shifting in the high-tax affiliate

$$P_H^* = \frac{[\theta + (1-\alpha)^2\theta_A](t_H - t_1) + 2\alpha\theta_A(t_H - t_L)}{[\theta + (1+\alpha)^2\theta_A]\,[\theta + (1-\alpha)^2\theta_A]}. \tag{21}$$

In absence of CbC reporting ($\alpha = 0$), the optimal profit-shifting decision in the high-tax affiliate is given by

$$P_H^*(\alpha = 0) = \frac{(t_H - t_1)}{\theta + \theta_A}, \tag{22}$$

whereas in case of perfect CbC reporting with complete information exchange ($\alpha = 1$), the optimal level of profits shifted turns into

$$P_H^*(\alpha = 1) = \frac{(t_H - t_1)}{\theta + 4\theta_A} + \frac{2\theta_A(t_H - t_L)}{\theta\,[\theta + 4\theta_A]}. \tag{23}$$

Thus, when we compare the level effect of a complete introduction of CbC reporting on profit shifting in the high-tax affiliate, we obtain

$$P_H^*(\alpha = 1) - P_H^*(\alpha = 0) = \frac{(t_H - t_1)}{\theta + 4\theta_A} + \frac{2\theta_A(t_H - t_L)}{\theta\,[\theta + 4\theta_A]} - \frac{(t_H - t_1)}{\theta + \theta_A} \gtrless 0. \tag{24}$$

This equation confirms that profit shifting under complete CbC reporting will be *higher* than in the case of no CbC reporting, if the audit cost parameter θ_A is sufficiently large, all else equal.

We address in Section 5.2 whether the range across the completeness parameter α is sufficiently large to imply higher *total* profit shifting in the high-tax country as compared to the case without any CbC reporting (i.e., $\alpha = 0$).

Before that, we want to summarize the findings from our model: Introducing CbC reporting always reduces total profit shifting by the MNC (to the tax haven). However, the resulting benefits for governments in terms of taxable income are distributed unequally. A low-tax country always gains from CbC reporting because it will experience an increase in its tax base. In contrast, a high-tax country might lose when tax audits are based on information from CbC reporting because the substitution effect in shifting can dominate. In that case, the tax base in the high-tax country will decrease because the MNC internationally rebalances its profit shifting by shifting more from the high-tax country and less from the low-tax country. Even if both countries experience an increase in their tax bases, the low-tax country gains

more than the high-tax country because introducing CbC reporting widens the difference between the shifted incomes, i.e., $P_H - P_L$ increases with α, cf. equation (11).

Therefore, we conclude:

Proposition 2 *Introducing Country-by-Country reporting has asymmetric effects on profit-shifting behavior and tax revenue in countries. More specifically:*

(i) Tax havens always lose tax base in response to Country-by-Country reporting.

(ii) Low- to medium-tax countries always gain from Country-by-Country reporting, as their tax bases increase unambiguously. They benefit from a substitution effect that requires rebalancing profit shifting to mitigate overall audit costs.

(iii) High-tax countries always gain less than low-tax countries and might even experience a decrease in their tax base because the substitution effect makes shifting from high-tax affiliates more attractive for a given amount of audit costs.

5.2 When does the high-tax country lose under CbC reporting?

As discussed in the previous section, high-tax countries always have less to gain from CbC reporting than low-tax countries. Under some conditions, CbC reporting induces MNCs to shift more profits from high-tax countries than in the absence of CbC reporting. We now derive these conditions.

From the discussions of equations (18) and (24), we already inferred that the ratio of audit costs relative to tax planning costs needs to be sufficiently high. We can reorganize condition (24) to identify the cut-off ratio as

$$\frac{\theta_A}{\theta} > \frac{t_H - t_1}{2(t_H - t_L)} + \frac{t_L - t_1}{(t_H - t_L)}. \tag{25}$$

Based on the recent distribution of statutory corporate tax rates, see Figure 2.1 in OECD (2023), reasonable assumptions on high and low tax rates seem to be $t_H = 30\%$ and $t_L = 15\%$. When we additionally set the tax rate in an average tax haven to $t_1 = 5\%$, the cut-off value is $\frac{\theta_A}{\theta} > 1.5$. Consequently, if the cost parameter for audit costs is at least 1.5 times larger than that for tax planning costs, our simple model unambiguously predicts that a high-tax country will lose tax base by introducing (complete) CbC reporting.

Equation (25) highlights two relevant margins. The first term on the right hand side of this equation represents the relative loss from not shifting from the high-tax country to the tax haven but to the low-tax country. The larger the tax rate differential $(t_H - t_1)$, the more the MNC loses from not shifting to the tax haven (see the numerator), increasing the

critical value for the audit costs. In contrast, the larger the tax differential $(t_H - t_L)$, the more profitable it is to shift from the high-tax to the low-tax country (see the denominator), implying a lower critical value for the audit costs.

The second term on the right hand side of the equation captures the relative loss from not shifting profits from the low-tax affiliate to the tax haven. The larger the differential $(t_L - t_1)$ in the numerator, the higher the audit costs need to be to make the substitution effect profitable. The denominator follows the same intuition as for the first term: A larger tax rate differential $(t_H - t_L)$ makes it more profitable to shift from the high-tax to the low-tax country and mitigates the critical level of audit costs.

In the general case with heterogeneous tax planning costs in countries H and L, $\theta_H \neq \theta_L$, it is difficult to obtain an analytical solution, see Appendix B again. Still, we manage to identify some general effects that support a dominating substitution effect for increasing completeness of CbC reporting, α, and for a sufficiently large parameter θ_A for the audit costs. Moreover, simulations based on realistic tax rate proportions support the finding, see Appendix C. Therefore, we are optimistic that our theoretical results derived for homogeneous cost parameters also hold more generally.

Our findings have some implications for the implementation of CbC reporting. By 2018, only 76 jurisdictions had introduced mandatory CbC reporting files. The number slightly increased to 102 jurisdictions by 2022, see OECD (2023, Figure 5.1). However, 147 countries and jurisdictions participate in the OECD/G20 Inclusive Framework on BEPS. Our results suggest that the 'missing' jurisdictions are not only tax havens worrying about their business model but also high-tax countries concerned about the effect on their tax base. For example, the U.S. has not joined the Multilateral Competent Authority Agreement (MCAA) on the exchange of CbC reports, which is a standardized mechanism for the automatic exchange of CbC reports.

Furthermore, our results suggest that high-tax countries might implement CbC reporting but then credibly commit and signal not to use the information for tax audits. There are indeed differences in the purpose for which tax authorities use CbC reports as the OECD (2022, p. 33) concludes that '[t]he specific approaches adopted vary depending upon each tax administration's general approach to risk assessment.' In addition, the European Court of Auditors (2021) finds that the information from CbC reports is under-used within the EU, for example as many EU Member States have not established rigorous systems of risk analysis. In sum, the substitution effect we identified might explain why CbC reporting did not turn out as the big game changer, although it was (and still is) seen as an essential tool to fight profit shifting.

Our findings are based on the assumption that CbC reporting serves a red-flagging purpose. The current CbC reporting framework provides tax authorities with only aggregated country-level information through the CbC report, which prevents a more targeted use. The

MNC HQs additionally have to submit local files to their host countries, which are not exchanged with other countries. These local files contain transaction-level transfer pricing documentation and would allow tax authorities to compare specific transfer pricing transactions directly. A potential reform could therefore be to also exchange local files.[25] However, it is not clear whether tax authorities have the capability to use such vast information to effectively target audits more precisely.

6 Bringing the Model to the Data

Our theoretical analysis relates to the existing empirical literature in various aspects. The mechanism of audit costs as a driver for the 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, 2020, 2024), which is in line with our finding that overall profit shifting (to tax havens) decreases. The fact that Hugger (2020) does not find significant increases in total tax payments suggests that our substitution effect indeed matters. As profits continue to shift from high-tax to low-tax countries, and profit shifting may increase in absolute terms in high-tax countries, the overall rise in tax payments could be modest.[26]

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 ETRs. Their finding that affiliates in EU countries feature higher reported income is also in line with our predictions if one interprets the (receiving) EU countries as—relatively—low-tax countries.[27]

There are also striking parallels with De Simone and Olbert (2022). They find that activity moves from high(er)-taxed EU affiliates to affiliates in EU countries with preferential tax regimes. The latter can be interpreted as low-tax countries (or even as disguised tax havens). Our model predicts that paper profits move from high-tax to low-tax countries. Moreover, De Simone and Olbert (2022) find that MNCs close tax-haven affiliates, and they argue that this happens to reduce the appearance of tax aggressiveness. In our model, a similar mechanism drives MNCs' responses to CbC reporting and turns the use of tax havens into an expensive operation: As shifting to low-tax countries (instead of tax havens) reduces

[25]Note that some countries have implemented a legal possibility for tax authorities to request local files, including, e.g., Indonesia, a high-tax country.

[26]However, an increase in profits in high-tax countries without a corresponding change in low-tax countries, as found in Hugger (2020), contradicts our predictions. Hugger (2020)'s robustness tests put some doubt on the generalizability of his finding, indicating that these results are driven by domestic affiliates of HQ located in the same country.

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

the likelihood of tax audits and audit costs, tax-haven affiliates play much less of a role or turn into (pure) conduit entities for rerouting profits from high-tax countries to low-tax countries. In a more elaborate theory model with fixed costs for transfer pricing, MNCs would relocate their intangibles and potentially split them among several low-tax affiliates.[28] Such a procedure would keep audit costs in check and lead to the elimination of presence in tax havens, as De Simone and Olbert (2022) empirically find. This finding also aligns with the reduction of tax-haven affiliates in MNCs in response to geographic earnings disclosure (see Hope et al., 2013).

Our model shows that CbC reporting changes the profit-shifting patterns among low-tax and high-tax countries. Previous empirical evidence analyzed firms in all non-haven countries jointly and can thus provide only indirect evidence for the mechanism in our model. We therefore turn to the data to test our model directly. Before we do so, let us recap its predictions for low-tax and high-tax countries.[29]

Low-tax countries. In the model, firms shift less profit out of low-tax countries after the introduction of CbC reporting because both the direct effect and the substitution effect work in the same direction for low-tax affiliates. Therefore, we expect that after the introduction of CbC reporting, affiliates in low-tax countries will report higher taxable profits if they are part of an MNC subject to CbC reporting, compared to other MNCs' affiliates in the same countries that are not subject to CbC reporting.

High-tax countries. For affiliates in high-tax countries, the profit-shifting response is a priori ambiguous because the substitution effect moves in the opposite direction of the direct effect. Equation (25) shows that if the audit cost parameter θ_A is significantly larger than the tax planning cost parameter θ, profit shifting from high-tax countries increases. In this case, firms in high-tax countries should report lower taxable profits if they are part of an MNC subject to CbC reporting, compared to other MNCs' affiliates in high-tax countries that are not subject to CbC reporting. However, if the audit costs do not sufficiently exceed the tax planning costs, treated affiliates in high-tax countries will not report lower taxable profits because the substitution effect is smaller than the direct effect. Still, their profit will increase by less than that of treated affiliates in low-tax countries.

[28] Davies et al. (2018) find substantial evidence that there are some fixed costs related to transfer pricing between pairs of affiliates and that transfer pricing only takes place when the tax savings are sufficiently large.

[29] As a third prediction from our model, profits shifted towards tax havens decrease because of the additional marginal cost of profit shifting that results from CbC reporting. Unfortunately, our sample includes an insufficient amount of tax-haven affiliates to test this prediction (see also Tørsløv et al., 2023b, who show that tax-haven affiliates are systematically missing in Orbis).

7 Empirical Analysis

7.1 Identification

To test these hypotheses, 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 reporting ('control group'). As CbC reporting became effective in different years, we carry out a staggered difference-in-differences analysis. As a robustness test, we also implement a regression discontinuity design around the EUR 750 million threshold.

Treatment definition. As treatment group, we use affiliates that are part of an MNC that is subject to CbC reporting. An MNC becomes subject to CbC reporting if it reports total consolidated revenues above EUR 750 million and the global ultimate owner is located in a country that has implemented CbC reporting legislation. 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 HQs 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. We include such corporate groups with a surrogate parent entity in the treatment group.[30]

Treatment timing. Most countries introduced CbC reporting in 2016, including all EU countries.[31] In 2017, Iceland, Malaysia, Singapore, and Venezuela introduced CbC reporting; followed in 2018 by Switzerland, Curaçao, Hong Kong, the Marshall Islands, and the British Virgin Islands; in 2019 by Turkey; and in 2021 by Thailand. Israel, Panama, and the Philippines have not yet implemented CbC reporting.[32] Our sample period 2012–2021 covers four to nine years before and one to six years after the introduction of CbC reporting.[33]

High-tax vs. low-tax split. We split the sample into a high-tax and a low-tax group. To do so, we calculate the median tax rate among all affiliates within an MNC on a year-

[30]In our sample, 87.8% of affiliates are in the EU, but 94.6% of MNCs have an 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 situated.

[31]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.

[32]However, all global ultimate owners in these three countries in our sample have affiliates in the EU and are thus subject to CbC reporting from 2016.

[33]While we use a balanced sample for the analyses without control variables, we do not observe controls for all affiliates in all years.

by-year basis.[34] 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: 26.3%; 2021: 23.8%). The lowest statutory tax rate we observe in the sample is 9%, which implies that the sample does not cover tax-haven affiliates.

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

$$\left(\frac{EBT}{Assets}\right)_{i,m,c,t} = \gamma_1 \cdot CbCR_{m,t} + \text{Firm FE}_i + \text{Country-Year FE}_{c,t} + \epsilon_{i,m,c,t}, \tag{26}$$

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. Using *EBT/Assets* as the main dependent variable has the advantage that affiliates with negative or zero EBT remain in the sample. Zero profit may reflect profit shifting in its most aggressive form (Bilicka, 2019).[35]

$CbCR_{m,t}$ 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 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.

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 audit cost function. Country-year fixed effects control for macroeconomic trends and time-varying country characteristics such as tax rates. In additional analyses, we include affiliate-level control variables, the number of employees and fixed assets, to control for the real factors of production.

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

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

[35] Using the inverse hyperbolic sine of EBT, i.e., $asinh(EBT)$, instead of *EBT/Assets* yields qualitatively similar, albeit less significant, results (available upon request). However, as Chen and Roth (2024) note, transformations like $asinh(EBT)$ or $ln(EBT + 1)$ can be sensitive to the scale of the outcome, particularly when firms move from zero to positive profits. The results cannot be interpreted as percentage changes either when zeros (or negative values) are present. *EBT/Assets* avoids these scaling issues, providing a more stable and reliable measure for our analysis.

$$\left(\frac{EBT}{Assets}\right)_{i,m,c,t} = \gamma_2 \cdot CbCR_{m,t} + \delta \cdot CbCR_{m,t} \cdot TaxRate_{c,t} + \psi \cdot TaxRate_{c,t} + \text{Firm FE}_i + \text{Year FE}_t + \epsilon_{i,m,c,t}. \quad (27)$$

The effect of CbC reporting is now given by $\gamma_2 + \delta \cdot TaxRate_{c,t}$, where $TaxRate_{c,t}$ denotes the statutory corporate tax rate in the country where affiliate i is located. We include affiliate and year fixed effects and carry out additional analyses with time-varying affiliate-level and country-level control variables. 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 model (27) 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.[36]

We estimate our regressions using two-way fixed effects with staggered treatment. In the main analysis, we use the standard fixed effects estimator, as 88.5% of our treated observations are treated in 2016 (Table A.1 confirms that there are no negative weights). Nevertheless, we also use new estimators by Sun and Abraham (2021), Callaway and Sant'Anna (2021) and De Chaisemartin and D'Haultfœuille (2024) in robustness tests. 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.

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 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

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

of CbC reporting, and because the U.S. has not signed up to the CbC MCAA.[37] 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.[38]

We drop affiliates and global ultimate owners with negative total assets and negative turnover. Thus, a negative value of *EBT/Assets* indicates loss-making firms. 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. Furthermore, we drop affiliates for which we do not observe profit before tax or total assets in one of the sample years, to ensure we obtain a value for our outcome variable *EBT/Assets* in each year. Our final sample for analysis includes 501,280 affiliate-years, consisting of 50,128 unique affiliates that are part of 6,228 MNCs.

Table 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 -0.80, and the 99th percentile reports an *EBT/Assets* of 0.63. With a mean of 0.05 and a standard deviation of 0.18, there is large variability in our main variable *EBT/Assets*, including a substantial number of loss-making firms.

Table 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 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.

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.

[37] In robustness analyses, we include U.S. MNCs (see Table 3), finding similar results.

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

Table 1: Descriptives

Panel A: Full Sample

	Obs.	Mean	SD	1st	50th	99th
CbCR	501,280	0.38	0.48	0.00	0.00	1.00
EBT/Assets	501,280	0.05	0.18	-0.80	0.04	0.63
EBT (ths. EUR)	501,280	7,302	156,662	-22,434	342	127,358
Total Assets (ths. EUR)	501,280	152,088	1,823,567	26	10,992	2,317,314
Fixed Assets (ths. EUR)	362,917	69,178	654,373	0	2,337	1,105,622
Employees	362,917	279	2,244	0	50	3,611
GDP (bln. EUR)	362,917	1,720,692	1,448,637	48,589	1,371,821	5,212,328
Tax Rate	501,280	26	6	10	25	38

Panel B: Low-Tax vs. High-Tax

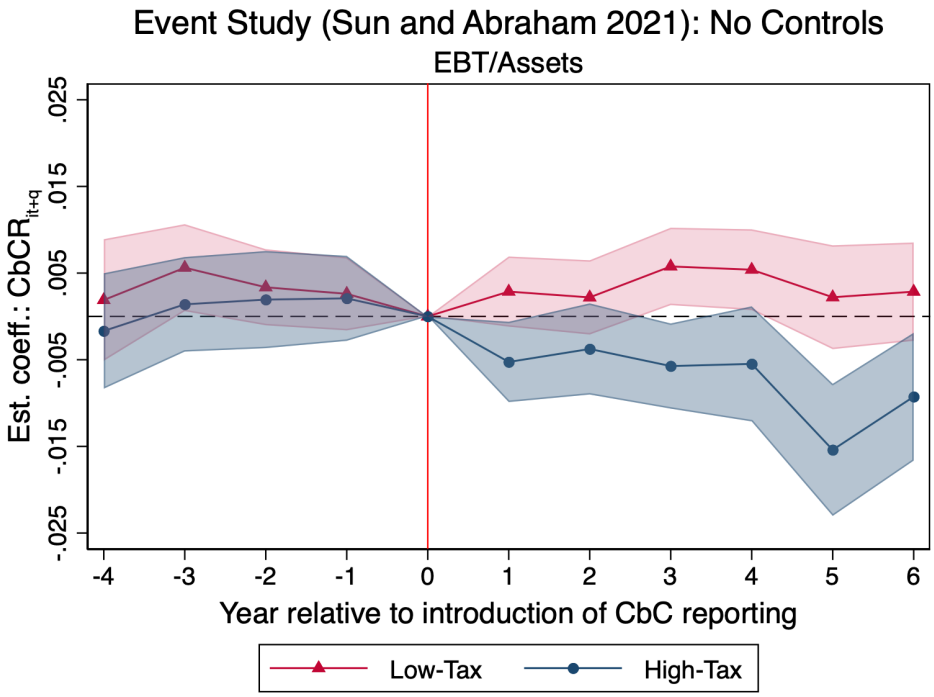
	Low-Tax		High-Tax	
	Treatment	Control	Treatment	Control
EBT/Assets	0.07	0.06	0.06	0.05
EBT (ths. EUR)	10,037	3,723	9,473	4,217
Total Assets (ths. EUR)	188,915	70,373	202,408	109,324
Fixed Assets (ths. EUR)	106,548	36,257	104,375	58,016
Employees(number)	406	192	378	229
GDP (bln. EUR)	1,135,964	1,196,766	2,550,372	2,185,060
Tax Rate (%)	20	22	30	31
Observations	69,704	115,588	70,519	101,745

Note: Affiliate-level data from Orbis for the years 2012–2021. *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. *EBT/Assets* is the affiliate's *Profit Before Tax* divided by *Total Assets*. Panel A shows the full sample. Panel B splits the sample for which we observe firm-level controls into low-tax and high-tax affiliates and into treatment and control group. 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. Panel B shows mean values of the variables only.

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).[39] Figure 1 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.

Figure 1: EBT/Assets over Time: Event Study, Sun and Abraham (2021)



Note: 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. Affiliate-level data from Orbis for 2012–2021.

Table 2 presents our main regression results. Panel A splits up the sample for low-tax and high-tax affiliates, where being high-tax or low-tax is defined based on the within-MNC median tax rate.

[39] In Figure A.3 in the appendix we re-estimate the event study using the estimators proposed by Callaway and Sant'Anna (2021) and De Chaisemartin and D'Haultfœuille (2024), finding similar patterns.

In columns (1) and (2), we present our baseline specification (26), which includes affiliate and country-year fixed effects, but no further control variables. Affiliates in low-tax countries report significantly higher profitability after becoming subject to CbC reporting, indicating that they shift less profits to tax havens. In contrast, affiliates in high-tax countries become less profitable, indicating that they shift more profits to tax havens after the introduction of CbC reporting.

The estimates in columns (1) and (2) indicate that upon becoming subject to CbC reporting, low-tax (high-tax) affiliates exhibit 9.7% higher (11.8% lower) profitability from a baseline EBT/Assets of 0.06 (0.05). These baseline estimates are in line with the mechanism proposed in our theory model: As CbC reporting penalizes the amount of profits in tax havens, MNCs replace shifting profits out of low-tax countries to tax havens by shifting more profits out of high-tax countries. Column (3) shows that this pattern of profit shifting is robust to the inclusion of affiliate-level and country-level control variables for low-tax affiliates. For high-tax affiliates, however, the estimate loses significance in column (4).

In Panel B of Table 2, we show results of estimating eq. (27).[40] We observe the expected signs: CbC reporting implies higher profitability in low-tax countries, but the effect decreases as the tax rate increases. In the specification without control variables, the direct effect of CbC reporting is estimated imprecisely. Based on the specification with control variables (column 3), the effect of introducing CbC reporting turns negative if the tax rate is above 27%.[41] 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 27% or higher. This critical value lies well within the range of high-tax countries in our sample period, and close to the median tax rates used in Panel A.

[40]Note that the number of observations in Panel B is higher than in the corresponding specifications in Panel A. The reason is that we exclude singleton observations, in line with Correia (2015). These singleton observations occur as affiliates switch high-tax or low-tax status in Panel A. In the full sample analysis in Panel B, these affiliates do not become singletons.

[41]The critical tax rate at which CbC reporting does not affect profitability is obtained by differentiating equation (27) with respect to $CbCR_{m,t}$. Doing so leads to the condition $\gamma_2 + \delta \cdot TaxRate_{i,t} = 0$ such that $t^{critical} = -\frac{\gamma_2}{\delta} = -\frac{0.0080}{-0.0003} = 0.2667$.

Table 2: Main Regressions

Panel A: Sample Split

Sample:	(1) Low-Tax	(2) High-Tax	(3) Low-Tax	(4) High-Tax
CbCR	0.0058***	-0.0059***	0.0049***	-0.0005
	(0.0016)	(0.0019)	(0.0018)	(0.0015)
Firm FE	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes
Firm Ctrs.	No	No	Yes	Yes
Obs.	248,294	248,492	185,292	172,264
R^2	0.50	0.55	0.54	0.58

Panel B: Flexible Specification

	(1)	(2)	(3)
CbCR x Tax Rate	-0.0002**	-0.0003***	-0.0003***
	(0.0001)	(0.0001)	(0.0001)
CbCR	0.0041	0.0081***	0.0080***
	(0.0028)	(0.0029)	(0.0029)
Tax Rate	-0.0002	0.0000	-0.0000
	(0.0002)	(0.0002)	(0.0002)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm Ctrs.	No	Yes	Yes
Ctry. Ctrs.	No	No	Yes
Obs.	501,280	362,917	362,917
R^2	0.51	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 *Profit Before Tax* divided by *Total Assets*. 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. We cluster standard errors by multinational, interacted with year. ***, ** and * indicate significance at the 1%, 5% and 10% levels.

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

We next provide some robustness tests for our main results. We first show that our results are robust to using different samples in Panel A of Table 3. For these tests, we use our main specification without firm-level controls, as in columns (1) and (2) of Table 2.

First, in columns (1) and (2) we exclude affiliates from MNCs that report consolidated revenue close to the threshold (between EUR 740 million and EUR 760 million) in any year. The results are similar to the main results, showing that manipulation around the threshold is not driving our findings. Second, in columns (3) and (4), 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. Lastly, in columns (5) and (6), we consider affiliates only of those MNCs that according to Orbis have at least one tax-haven affiliate (based on the tax haven list by Hines, 2010).[42] This step reduces our sample by more than half, but should focus it more on those MNCs that are active profit shifters. Indeed, the estimated coefficients increase substantially.

Empirical settings with variation in treatment timing (such as ours) can lead to inaccurately estimated treatment effects (Goodman-Bacon, 2021). The estimated effects are a weighted linear combination of estimates across different groups of treated and not (yet) treated units of observation. Thus, the estimated effects do not necessarily capture the dynamic treatment effect from its corresponding period but can pick up spurious effects from treatments in other periods. 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.[43] We therefore expect that the issues associated with heterogeneous treatment effects are minor in our setting. This is confirmed by the Bacon decomposition (based on Goodman-Bacon, 2021), which shows that the regular two-way fixed effects estimator used above does not suffer from negative weighting (see Table A.1 in the appendix).

Nevertheless, in Panel B of Table 3, we replicate our main results using three "new" estimators that are robust to treatment heterogeneity. As these estimators have been developed for two-way fixed effects settings, we use affiliate and year fixed effects (and no additional controls) in these specifications. In columns (1) and (2), we show estimates using Sun and Abraham (2021), where the control cohort is formed by the never-treated MNCs. Columns

[42] Again, we use the list of subsidiaries provided for global ultimate owners in Orbis, where we observe tax-haven affiliates even if Orbis does not provide accounting data for these subsidiaries. We do not observe branches and thus drop some MNCs that are active in tax havens.

[43] 99.98% of affiliates are part of MNCs that are active in countries where they would be treated in 2016 if they had crossed the size threshold. By 2016, 60.49% of affiliates are actually subject to CbC reporting. This share increases to 65.25% by 2021.

(3) and (4) show estimates using Callaway and Sant'Anna (2021), where the control observations are the not-yet-treated. Columns (5) and (6) show estimates using De Chaisemartin and D'Haultfœuille (2024), including estimating six effects and four placebos. For the latter two estimators, we cluster standard errors at the level of the MNC, as the clustering needs to be nested within the panel dimension.

The results with these estimators are similar to the main results, although results for low-tax countries with the latter two estimators (and more conservative clustering) are less precisely estimated. For Callaway and Sant'Anna (2021), we carry out a χ^2 test of the difference between the estimated coefficients of the low-tax and high-tax affiliates. This test yields a P-value of 0.002, confirming a significant difference in the profitability of low-tax versus high-tax affiliates. Furthermore, for Sun and Abraham (2021), we test whether the estimates differ significantly, which yields a Z-statistic with a P-value of 0.001. Due to a smaller number of observations used in the regression, the same exercise does not yield a significant Z-statistic for De Chaisemartin and D'Haultfœuille (2024), however.

Table 3: Robustness

Panel A: Different Samples

	Excluding MNCs with €740-760m Revenue		Including U.S. MNCs		Only MNCs with Tax Haven Affiliates	
	(1) Low-Tax	(2) High-Tax	(3) Low-Tax	(4) High-Tax	(5) Low-Tax	(6) High-Tax
CbCR	0.0049***	-0.0066***	0.0055***	-0.0057***	0.0085***	-0.0126***
	(0.0016)	(0.0020)	(0.0015)	(0.0018)	(0.0032)	(0.0037)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	No	No	No	No	No
Obs.	238,873	240,932	291,850	277,489	91,739	119,346
R^2	0.50	0.55	0.50	0.56	0.49	0.57

Panel B: Different Estimators

	Sun & Abraham (2021)		Callaway & Sant'Anna (2021)		De Chaisemartin & D'Haultfoeuille (2024)	
	(1) Low-Tax	(2) High-Tax	(3) Low-Tax	(4) High-Tax	(5) Low-Tax	(6) High-Tax
CbCR	0.0036	-0.0075***	0.0026	-0.0064*	0.0026	-0.0064*
	(0.0022)	(0.0025)	(0.0025)	(0.0034)	(0.0026)	(0.0033)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	No	No	No	No	No	No
Obs.	248,294	248,492	230,297	240,939	151,576	134,518

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*. Panel A shows robustness regarding the sample. Compared to the main analysis, columns (1) and (2) exclude MNCs with consolidated revenues between EUR 740 million and EUR 760 million, columns (3) and (4) include U.S. MNCs, and columns (5) and (6) only include MNCs with at least one tax haven affiliate. Panel B shows estimates using different estimators. Columns (1) and (2) show estimates using Sun and Abraham (2021); columns (3) and (4) using Callaway and Sant'Anna (2021), and columns (5) and (6) using De Chaisemartin and D'Haultfoeuille (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 in Panel A and in columns (1) and (2) of Panel B; in the remaining columns we cluster by multinational. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

We also confirm our results in a regression discontinuity design (RDD). We provide these results for better comparability with earlier literature. However, in our sample, there is bunching *above* the threshold of EUR 750 million.[44] This potentially biases the estimated local average treatment effect. As shown in Table A.2 and Figure A.4 in the appendix, we estimate a small positive, but insignificant, coefficient for affiliates in low-tax countries. The estimates for affiliates in high-tax countries are negative, but very small and insignificant. One potential explanation why we are unable to find significant results in the RDD setting is that MNCs that have just crossed the threshold need time to restructure their profit-shifting activities; it may also simply be the case that due to the smaller number of observations close to the threshold we do not have sufficient power to detect a significant effect, or that estimates are biased due to the observed bunching above the threshold.

Lastly, based on the empirical analysis, we can make a back-of-the-envelope comparison. In Table A.3, we compare the relative gains and losses in tax revenue of high-tax and low-tax countries as a result of CbC reporting. The mean of affiliates' pre-tax profits in high-tax countries in 2015 is EUR 6.57 million, while in low-tax countries it is EUR 11.86 million. Multiplying with the number of high-tax and low-tax affiliates, we estimate total EBT. We multiply this with the baseline estimated coefficient in Table 2 to find the change in the amount taxable profit. The gain in tax base in the low-tax country is larger than the loss in tax base in the high-tax country so that the direct effect of CbC reporting decreases profit shifting overall. We can then illustrate the substitution effect by multiplying the change in profit with an average tax rate of 32.37% for high-tax countries and 20.65% for low-tax countries to find the change in tax payments. Doing so, we find that high-tax countries lose 0.59% of the pre-CbC corporate tax payments obtained from affected firms, with a lower bound of 0.22% and an upper bound of 0.96% (based on the estimate's 95% confidence interval).[45] Conversely, we find that low-tax countries gain 0.58% of corporate tax payments of the affected firms, with a lower bound of 0.28% and an upper bound of 0.89%, based on the estimate's 95% confidence interval. The low-tax country gains slightly less in corporate tax revenue than the high-tax country loses. This rationalizes insignificant findings for changes in the ETR in previous literature.

[44] This contrasts with Hugger (2024). He finds that there is substantial bunching below the EUR 750 million threshold as a result of regulatory avoidance.

[45] As an approximation, we calculate corporate tax payments by multiplying the sum of earnings before taxes with the statutory tax rate. We only use this number to calculate the percentage change in tax payments.

8 Conclusion

We model the effects of (private) CbC reporting and identify the presence of a substitution (or rebalancing) 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 behind this effect is that CbC reporting increases the cost of shifting to the tax haven at the MNC group level. Thus, to save on overall audit costs, it is optimal to focus more on shifting from high-tax affiliates and to reduce shifting from low-tax affiliates, as tax savings in high-tax affiliates are larger. In sum, MNCs sacrifice some tax savings to reduce overall audit costs by effectively shifting profits from high-tax to low-tax affiliates and reducing tax-haven exposure.

In the case of identical tax planning cost functions in both the high-tax and the low-tax country, we have shown that CbC reporting reduces overall profit shifting (to tax havens). Furthermore, we find that remaining profit shifting follows a pattern: (1) Tax havens always lose tax base. (2) Low-tax countries gain from CbC reporting due to the substitution effect that leads to a rebalancing of overall profit shifting. (3) Due to the substitution effect, high-tax countries benefit less from a decrease in overall profit shifting and can—under plausible conditions—even lose tax base.

The theoretical model in this paper aims to reconcile the mixed empirical evidence on the effects of CbC reporting in addressing BEPS. Our empirical analysis confirms the pattern of MNCs' profit-shifting behaviour and suggests that profit shifting from high-tax countries increased after MNCs become subject to CbC reporting, whereas profit shifting from low-tax countries decreased. The pattern of profit shifting described in this paper is relevant to tax authorities because it provides insight into MNCs' responses to CbC reporting. Additionally, our findings offer an explanation why the implementation of CbC reporting happened rather sluggishly and why the new transparency instrument did not end up as the expected game changer for tax authorities.

A Appendix on Alternative Audit Cost Specification

As an alternative to our audit cost specification, we can model the 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 audit costs as a probability, i.e., $C_i^A = p(P_i + \alpha P_j)$. We assume that the probability increases in the total amount of profits shifted, that is, $p'(P_i + \alpha P_j) > 0$. Then, the total (expected) costs for tax planning become $C_i = p(P_i + \alpha P_j)C_i(P_i) = p(P_i + \alpha P_j)\ \frac{\theta_i}{2}P_i^2$.

In that case, the maximization problem of the MNC becomes

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

and the corresponding first-order conditions are

$$\begin{aligned}\frac{\partial \Pi}{\partial P_H} &= (t_H - t_1) - p(P_H + \alpha P_L)\theta_H P_H - p'(P_H + \alpha P_L)\frac{\theta_H}{2}P_H^2 - p'(P_L + \alpha P_H)\frac{\theta_L}{2}P_L^2\alpha = 0, \\ \frac{\partial \Pi}{\partial P_L} &= (t_L - t_1) - p(P_L + \alpha P_H)\theta_L P_L - p'(P_L + \alpha P_H)\frac{\theta_L}{2}P_L^2 - p'(P_H + \alpha P_L)\frac{\theta_H}{2}P_H^2\alpha = 0.\end{aligned}$$

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 simplified 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 simplified approach in the main text. Qualitatively, the results and driving forces remain unchanged.

Importantly, the substitution effect also remains when the probability linearly increases in the amount of profits shifted. Formally, applying $p(P_H + \alpha P_L) = P_H + \alpha P_L$ simplifies the first-order conditions, but does not eliminate the substitution effect:

$$\begin{aligned}\frac{\partial \Pi}{\partial P_H} &= (t_H - t_1) - (P_H + \alpha P_L)\theta_H P_H - \frac{\theta_H}{2}P_H^2 - \frac{\theta_L}{2}P_L^2\alpha = 0, \\ \frac{\partial \Pi}{\partial P_L} &= (t_L - t_1) - (P_L + \alpha P_H)\theta_L P_L - \frac{\theta_L}{2}P_L^2 - \frac{\theta_H}{2}P_H^2\alpha = 0.\end{aligned}$$

B Appendix on Comparative Statics

In this appendix, we directly focus on the more general case of heterogeneous tax planning costs, that is, on differences in the parameter for tax planning costs, $\theta_H \neq \theta_L$. All results in the main text result by setting $\theta_H = \theta_L = \theta$.

B.1 Optimal MNC Behavior under Heterogeneous Tax Planning Costs

For general costs parameters $\theta_H \neq \theta_L$, the optimization problem of the MNC reads

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

and the first-order conditions result as

$$\frac{\partial \Pi}{\partial P_H} = (t_H - t_1) - \left[\theta_H + \theta_A(1+\alpha^2)\right] P_H - 2\alpha\theta_A P_L = 0, \tag{A.3}$$

$$\frac{\partial \Pi}{\partial P_L} = (t_L - t_1) - \left[\theta_L + \theta_A(1+\alpha^2)\right] P_L - 2\alpha\theta_A P_H = 0. \tag{A.4}$$

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

$$P_i = \frac{t_i - t_1}{\theta_i + \theta_A} \quad i = H, L, \quad \text{for} \quad \alpha = 0. \tag{A.5}$$

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

B.2 Comparative-static analysis

Fully differentiating the first-order conditions (A.3) and (A.4) leads to

$$-[\theta_H + (1+\alpha^2)\theta_A]dP_H - 2\alpha\theta_A dP_L = [2\theta_A(\alpha P_H + P_L)]d\alpha - dt_H + dt_1, \tag{A.6}$$

$$-2\alpha\theta_A dP_H - [\theta_L + (1+\alpha^2)\theta_A]dP_L = [2\theta_A(P_H + \alpha P_L)]d\alpha - dt_L + dt_1, \tag{A.7}$$

which can be rearranged to find

$$\begin{pmatrix} -\left[\theta_H + (1+\alpha^2)\theta_A\right] & -2\alpha\theta_A \\ -2\alpha\theta_A & -\left[\theta_L + (1+\alpha^2)\theta_A\right] \end{pmatrix} \begin{pmatrix} dP_H \\ dP_L \end{pmatrix} = \begin{pmatrix} 2\theta_A(\alpha P_H + P_L) \\ 2\theta_A(P_H + \alpha P_L) \end{pmatrix} d\alpha + \begin{pmatrix} -dt_H \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ -dt_L \end{pmatrix} + \begin{pmatrix} dt_1 \\ dt_1 \end{pmatrix}. \tag{A.8}$$

The second-order conditions of the MNC optimization problem imply that the determinant of the Hessian on the left-hand side of equation (A.8) is positive, that is

$$|H| = [\theta_H + (1+\alpha^2)\theta_A][\theta_L + (1+\alpha^2)\theta_A] - 4\alpha^2\theta_A^2 > 0. \tag{A.9}$$

Applying Cramer's Rule and imposing $\theta_H = \theta_L = \theta$ directly results in the comparative-static results in the main text.

Importantly, note that the results (7) to (10) carry over to the general case with heterogeneous cost parameters for tax planning costs without any real change, the last effect just turns into

$$\begin{aligned} \frac{d(P_H + P_L)}{d\alpha} &= -\frac{2\theta_A\left[\theta_L(\alpha P_H + P_L) + \theta_H(P_H + \alpha P_L) + 2\theta_A(1-\alpha^2)(1-\alpha)(P_H + P_L)\right]}{H} \\ &< 0. \end{aligned} \tag{A.10}$$

Similarly, the finding that CbC reporting always reduces profit shifting in the low-tax country, $\frac{dP_L}{d\alpha} = \frac{det_{P_L\alpha}}{|H|} < 0$, remains unchanged as

$$det_{P_L\alpha} = -2\theta_H\theta_A(P_H + \alpha P_L) - 2\theta_\alpha^2(1-\alpha^2)(P_H - \alpha P_L) < 0, \forall\alpha \leq 1, \tag{A.11}$$

where our earlier assumption ensures $P_H > P_L$.

Additionally, the effect of CbC reporting on profit shifting from the high-tax affiliate remains non-monotonic under heterogeneous cost parameters, where the relevant term is

$$\begin{aligned} det_{P_H\alpha} &= -2\theta_A\left[\alpha P_H + P_L\right]\left[\theta_L + (1+\alpha^2)\theta_A\right] + 4\alpha\theta_A^2\left[P_H + \alpha P_L\right] \\ &= -2\theta_L\theta_A(\alpha P_H + P_L) + 2\theta_A^2(1-\alpha^2)(\alpha P_H - P_L). \end{aligned} \tag{A.12}$$

The local effects of introducing CbC reporting and completing full CbC reporting are still negative as

$$det_{P_H\alpha}|_{\alpha=0} = -2\theta_L\theta_A P_L - 2\theta_A^2 P_L < 0 \quad \Rightarrow \quad \left.\frac{dP_H}{d\alpha}\right|_{\alpha=0} < 0, \tag{A.13}$$

$$det_{P_H\alpha}|_{\alpha=1} = -2\theta_L\theta_A(P_H + P_L) < 0 \quad \Rightarrow \quad \left.\frac{dP_H}{d\alpha}\right|_{\alpha=1} < 0. \tag{A.14}$$

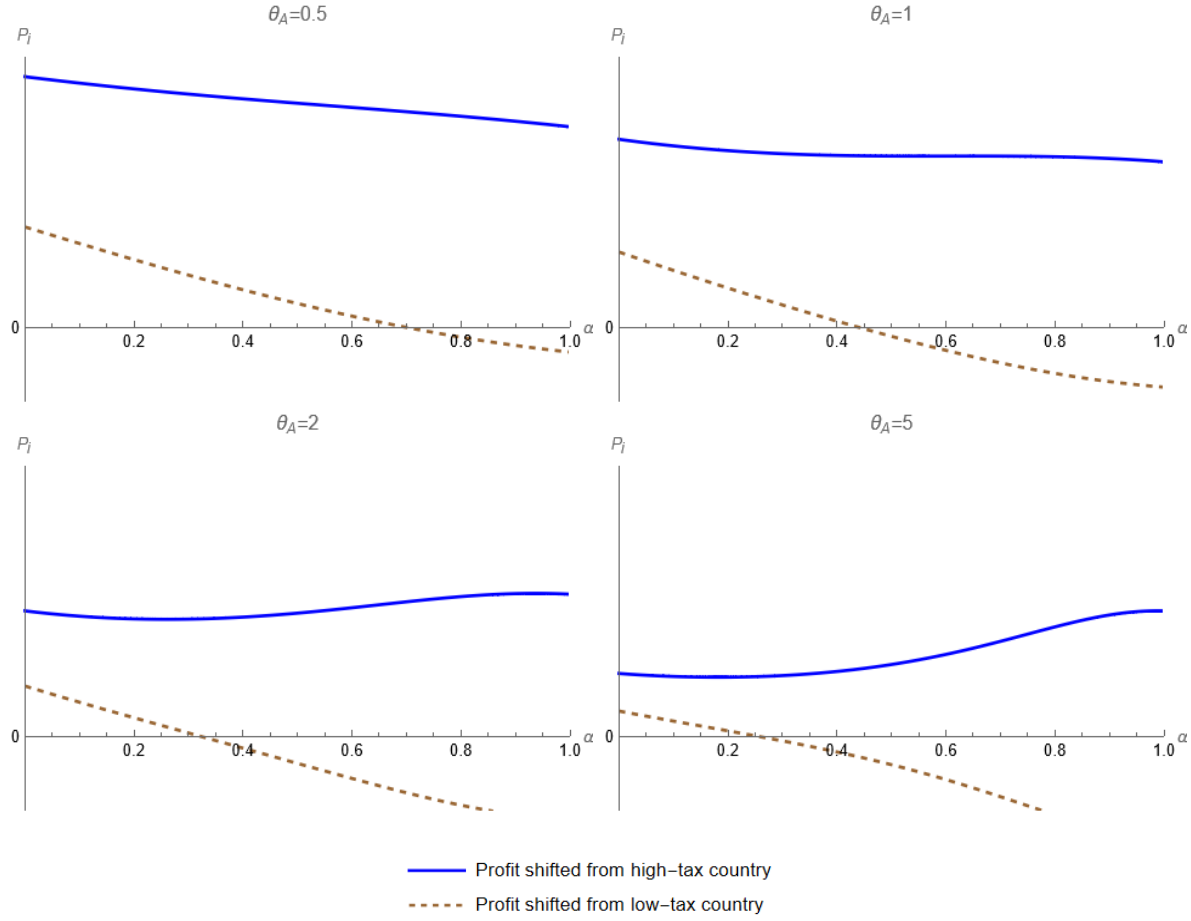
C Simulating the Effect of Country-by-Country Reporting under Cost Heterogeneity

Under heterogeneous tax planning costs, we know from equation (A.11) that profit shifting from the low-tax country, P_L, decreases with increasing completeness of CbC reporting, that is, with the parameter α. This effect has a positive impact on (A.12). With a sufficiently large parameter θ_A for the audit costs, the derivative $\frac{\partial P_H}{\partial \alpha}$ turns positive for an intermediate range of CbC reporting α. It even leads to increased shifting from the high-tax country overall if the effects on the intermediate range are sufficient to overcompensate the local decrease for the introduction of CbC reporting and the local decrease at complete CbC reporting, see equations (A.13) and (A.14). To shed more light on this, we need to rely on simulations.

For the simulations, we again use $t_H = 30\%$, $t_L = 15\%$ and $t_1 = 5\%$, a reasonable representation of the current reality. In Figure A.1 and Figure A.2, we plot how much profit the MNC shifts to the tax haven. We first return to the case with homogeneous tax planning costs and consider the effect of the difference between profit shifting and audit costs. Thus, in Figure A.1, we set $\theta_H = \theta_L = 1$ and plot shifted profits for different values of θ_A. For all parameter values, the MNC shifts more profit from the high-tax country (blue line) than from the low-tax country (brown dashed line). For low values of θ_A ($\theta_A = 0.5$ in the top left and $\theta_A = 1$ in the top right panel), the direct effect dominates and profit shifting from both countries declines with additional CbC reporting. However, when audits costs are substantially higher than the tax planning costs, the substitution effect starts to matter: For some values of α, the firm shifts more profits from the high-tax country if there is CbC reporting (see bottom panels of Figure A.1; with $\theta_A = 2$ in the bottom left and $\theta_A = 5$ in the bottom right panel). Also note that the profit shifted from the low-tax country becomes negative, indicating that the MNC relocates profits from the tax haven (or, indirectly, from the high-tax country) to lower audit costs.

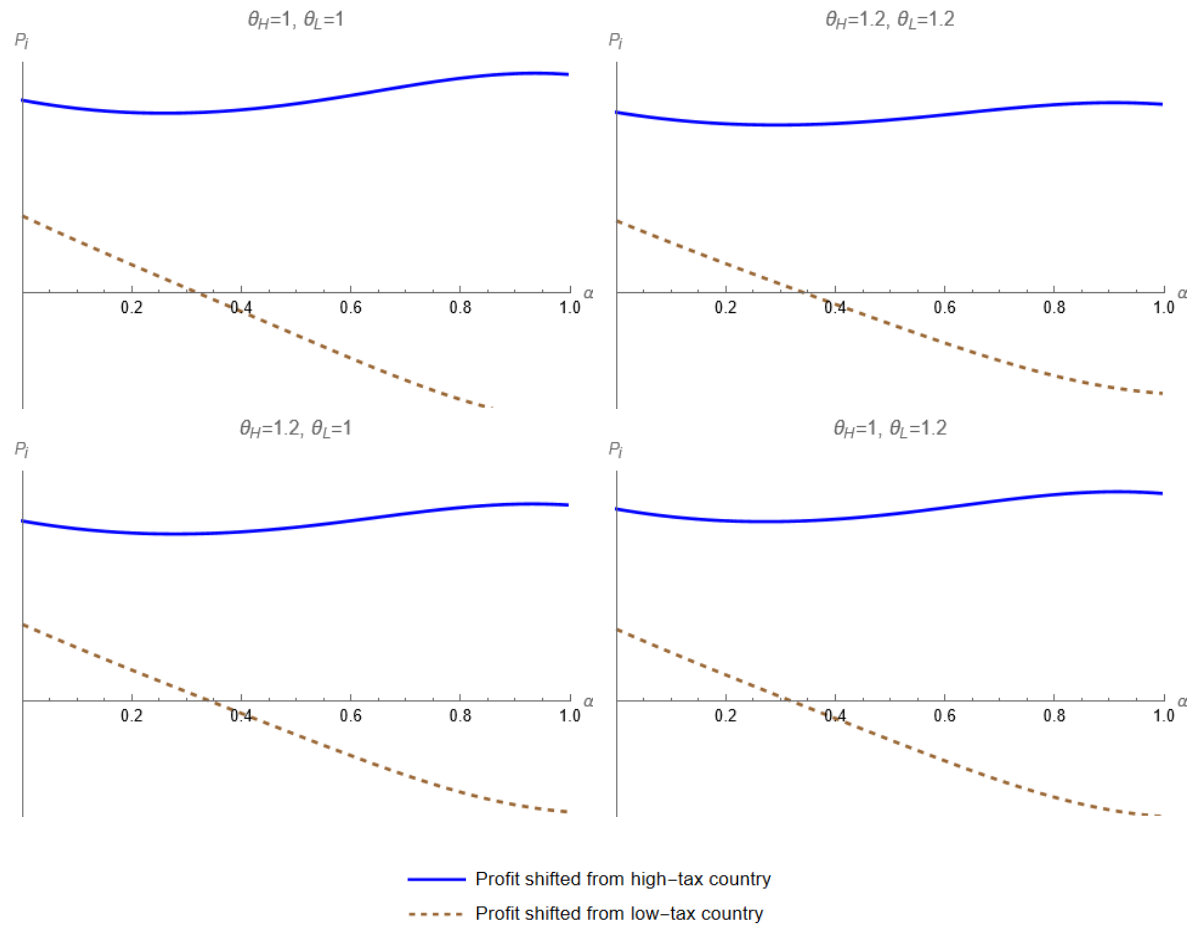
Next, we consider how the results change with heterogeneous tax planning costs. To do so, we set audit costs $\theta_A = 2$ and consider different values of θ_H, θ_L in Figure A.2. Again, for some intermediate values of α, the high-tax country indeed shifts more profits to the tax haven when α increases. In line with the analytical results, there is a locally negative effect for very high values of α. Note that the simulations confirm that it is possible that introducing CbC reporting leads to an increase in profits shifted from the high-tax country.

Figure A.1: Simulation Results: Homogeneous Tax Planning Costs



Note: Simulations for the profit shifted from the high-tax country (blue line) and from the low-tax country (brown dashed line). Parameters: $t_H = 30\%$, $t_L = 15\%$, $t_1 = 5\%$, $\theta_H = \theta_L = 1$. θ_A varies between panels. α indicates the scope of CbC reporting information sharing ($\alpha = 0$ no, $\alpha = 1$ full information sharing among tax authorities).

Figure A.2: Simulation Results: Heterogeneous Tax Planning Costs



Note: Simulations for the profit shifted from the high-tax country (blue line) and from the low-tax country (brown dashed line). Parameters: $t_H = 30\%$, $t_L = 15\%$, $t_1 = 5\%$, $\theta_A = 2$. The top panels show homogeneous tax planning costs (left panel: $\theta_H = \theta_L = 1$; right panel: $\theta_H = \theta_L = 1.2$). The bottom panels show heterogeneous tax planning costs (left panel: $\theta_H = 1.2, \theta_L = 1$; right panel: $\theta_H = 1, \theta_L = 1.2$). α indicates the scope of CbC reporting information sharing ($\alpha = 0$ no, $\alpha = 1$ full information sharing among tax authorities).

D Additional Tables and Figures

Table A.1: Bacon Decomposition

	Low-Tax		High-Tax	
	Weight	ATT	Weight	ATT
Earlier Treatment vs. Later Control	0.0131	0.0087	0.0013	-0.0006
Later Treatment vs. Earlier Control	0.1478	-0.0014	0.1360	-0.0040
Treated vs. Never Treated	0.8391	0.0010	0.8627	-0.0081

Note: Table shows results of the Bacon decomposition for decomposing difference-in-differences estimation results with variation in treatment timing (Goodman-Bacon, 2021), estimated using Goodman-Bacon et al. (2022). Treatment coded to stay on after becoming first-treated. 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. Clustering at MNC-level.

Table A.2: EBT/Assets, Regression Discontinuity Design

	(1) Low-Tax	(2) High-Tax
CbCR	0.0023	-0.0000
	(0.0122)	(0.0097)
Firm Ctrs.	No	No
Ctry. Ctrs.	No	No
Year Dummies	Yes	Yes
Obs.	17,653	12,859
Bandwidth left	500,000	500,000
Bandwidth right	1,000,000	1,000,000

Note: Affiliate-level data from Orbis for 2016–2021. Data excludes U.S. MNCs. Robust estimates for a second-order polynomial regression. The dependent variable is *EBT/Assets*, defined as the affiliate's *Profit Before Tax* divided by *Total Assets*. 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. Regression includes year dummies. We cluster standard errors by multinational interacted with year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A.3: Back-of-the-Envelope Calculation

Panel A: High-Tax Countries

	Baseline	Lower Bound	Upper Bound
Mean EBT (million)	6.57	6.57	6.57
Observations	19,941	19,941	19,941
Total EBT (million)	130,933	130,933	130,933
Estimated Coefficient	-0.0059	-0.0096	-0.0022
Lost EBT (million)	-775	-1,259	-291
Average Tax Rate (pct)	32	32	32
Benchmark Tax Payments (million)	42,380	42,380	42,380
Tax Payments with CbCR (million)	42,129	41,972	42,286
Tax Payments Lost (pct)	0.59	0.96	0.22

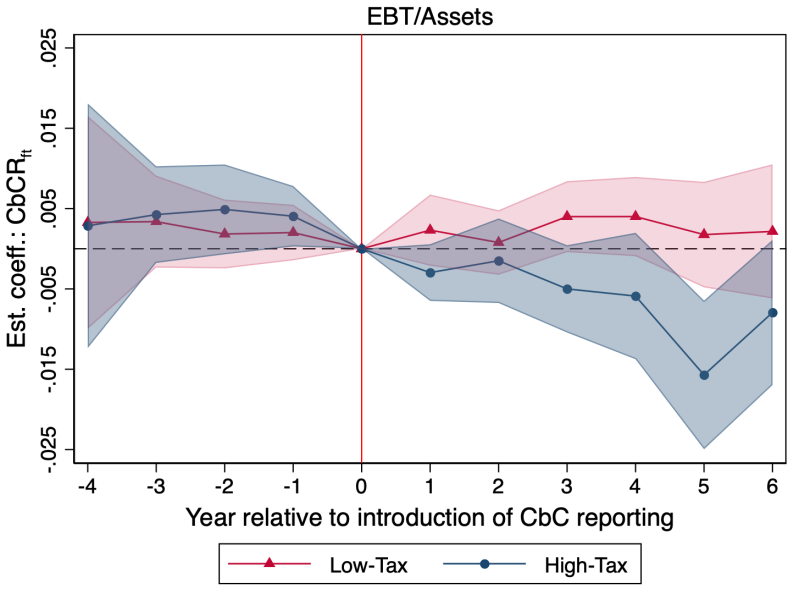
Panel B: Low-Tax Countries

	Baseline	Lower Bound	Upper Bound
Mean EBT (million)	11.86	11.86	11.86
Observations	14,302	14,302	14,302
Total EBT (million)	169,657	169,657	169,657
Estimated coefficient	0.0058	0.0028	0.0089
Gained EBT (million)	992	470	1,513
Average Tax Rate	21	21	21
Benchmark Tax Payments (million)	35,039	35,039	35,039
Tax Payments with CbCR (million)	35,244	35,136	35,352
Tax Payments Gained (pct)	0.58	0.28	0.89

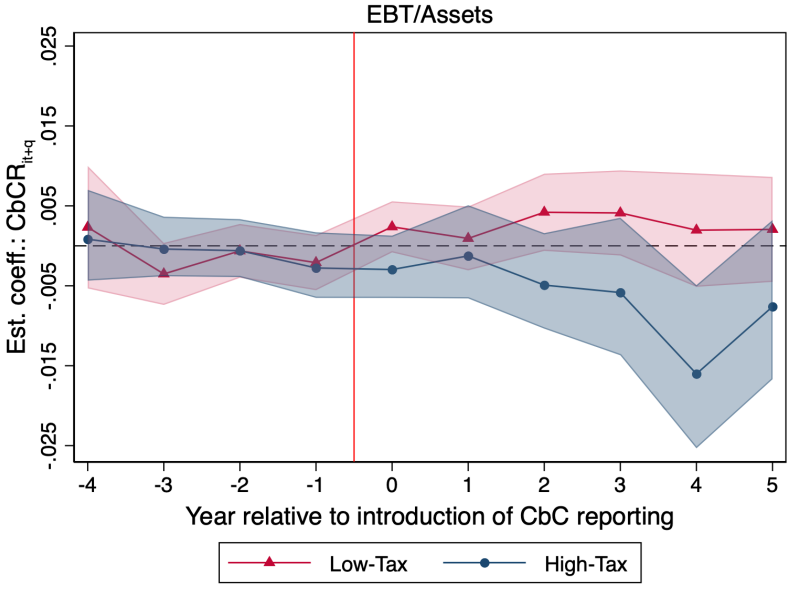
Note: Table shows back-of-the-envelope estimate of lost tax payments in high-tax versus gained tax payments in low-tax countries in percentages. All numbers are based on the sample values in 2015.

Figure A.3: Alternative Event Study Estimators

(a) Panel A: De Chaisemartin and D'Haultfœuille (2024)

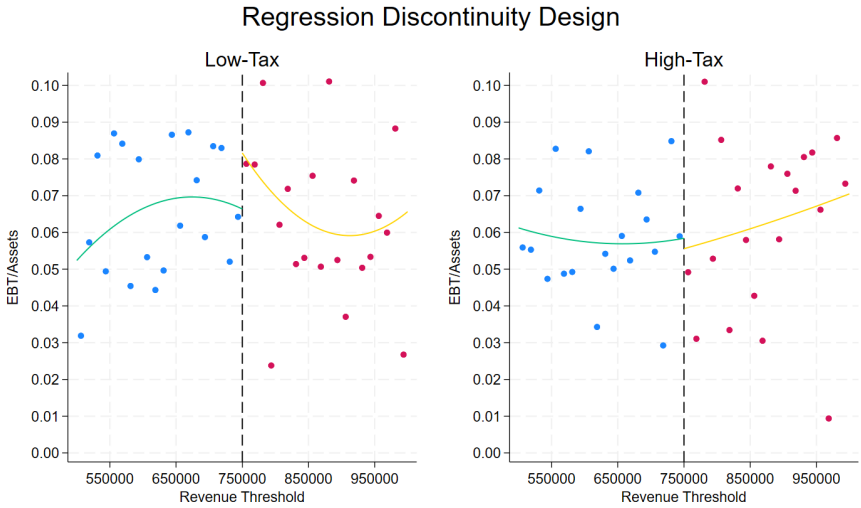


(b) Panel B: Callaway and Sant'Anna (2021)



Note: Event studies based on 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*. 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 De Chaisemartin and D'Haultfœuille (2024) in Panel A and Callaway and Sant'Anna (2021) in Panel B. Estimation includes affiliate and year fixed effects. Standard errors clustered by MNC.

Figure A.4: Regression Discontinuity Design



Note: Affiliate-level data from Orbis for 2016–2021. Data excludes U.S. MNCs. Robust estimates for a second-order polynomial regression. The dependent variable is *EBT/Assets*, defined as the affiliate's *Profit Before Tax* divided by *Total Assets*. 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.

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